***Dw2*, a New Dwarfing Locus in Apple Rootstocks and Its Relationship to Induction of Early Bearing in Apple Scions**

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ABSTRACT. The ability of certain apple rootstocks to dwarf their scions has been known for centuries and their use revolutionized apple (*Malus ×domestica*) production systems. In this investigation, several apple rootstock breeding populations, planted in multiple replicated field and pot experiments, were used to ascertain the degree of dwarfing when grafted with multiple scions. A previous genetic map of a breeding population derived from parents ‘Ottawa 3’ (O.3) and ‘Robusta 5’ (R5) was used for quantitative trait locus (QTL) analysis of traits related to scion vigor suppression, induction of early bearing, and other tree size measurements on own-rooted and grafted trees. The analysis confirmed a previously reported QTL that imparts vigor control [*Dw1*, log of odds (LOD) = 7.2] on linkage group (LG) 5 and a new QTL named *Dw2* (LOD = 6.4) on LG11 that has a similar effect on vigor. The data from this population were used to study the interaction of these two loci. To validate these findings, a new genetic map comprised of 1841 single-nucleotide polymorphisms was constructed from a cross of the dwarfing, precocious rootstocks ‘Geneva 935’ (G.935) and ‘Budagovsky 9’ (B.9), resulting in the confirmation and modeling of the effect of *Dw1* and *Dw2* on vigor control of apple scions. Flower density and fruit yield data allowed the identification of genetic factors *Eb1* (LOD = 7.1) and *Eb2* (LOD = 7.6) that cause early bearing of scions, roughly colocated with the dwarfing factors. The major QTL for mean number of fruit produced per tree colocated with *Dw2* (LOD = 7.0) and a minor QTL was located on LG16 (LOD = 3.5). These findings will aid the development of a marker-assisted breeding strategy, and the discovery of additional sources for dwarfing and predictive modeling of new apple rootstocks in the Geneva® apple rootstock breeding program.

Grafting scions from trees with desirable fruit onto different tree root systems is an ancient technique and perhaps one of the first forms of clonal propagation. Most temperate fruit trees

planted in commercial orchards are the result of the union of two genotypes: the scion (which yields the fruit) and the rootstock (which serves as an interface between the scion and

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the soil). This dual system has allowed for remarkable efficiencies in the development of new fruit cultivars because it divides breeding for the whole plant into its component environmental interactions and functions that require very different selection traits for improvement: the root system interactions with the soil (anchorage, soil profile exploration, water and nutrient absorption, and interaction with soil biota) and the scion (fruit production, quality, storability, photosynthesis, tree architecture, disease and insect resistance, and climate stress tolerance).

The benefits of selecting and using specific rootstocks for apple fruit production were likely realized by European fruit fanciers who used dwarf apple trees as the graft recipients of vigorous apple cultivars, and used the same dwarf or dwarfing apple combinations in espalier production of apple fruit (Monceau, 1768). Dwarfing and the induction of early fruit production (early bearing) when apples are grafted on 'Paradise' or Creeper stocks (Loudon, 1822) were probably what initially made these apple trees attractive, especially for small gardens or glasshouses. The rootstock cultivars English Paradise and Doucin Stock were recognized in the early 19th century as dwarfing and early-bearing (Lindley, 1828). The dwarfing properties of these stocks were recognized for their ability to shape trees into a pyramidal shape and increase the productivity of the orchard (Rivers, 1866). By the late 19th century these rootstocks were propagated clonally by rooted suckers (stools) under many different 'Paradise' rootstock names often representing mixtures of related genetic material (Wertheim, 1998) sometimes with different phenotypic characteristics and dwarfing effects. This confusion spurred an effort in the late 19th (Barron, 1889) and early 20th century to collect apple rootstock material from France, Germany, England, and The Netherlands, catalogue it and characterize it through detailed phenotypic observations at the East Malling Wye Agricultural Research Station (Hatton, 1917). This resulted in the description of the initial 'Malling' (M.xx) series of apple rootstocks M.1 to M.9, which contained both dwarfing and precocious types (M.3, M.4, M.8, M.9) and vigorous non-precocious types (M.1, M.2, M.5, M.6, M.7) (Hatton, 1919). Several of these 'Malling' selections were found to belong to the *Malus × domestica* cluster when molecular markers were used to ascertain their relationships. Some (including M.8 and M.9) formed a tight cluster, suggesting close familial relationships (Fazio et al., 2011; Oraguzie et al., 2005). Some have ascribed the 'Paradise' dwarfing apple stocks to a Persian or Armenian origin (dwarf apple of Armenia) (Budagovskii, 1940; Rivers, 1866), whereas a recent genetic analysis shows a much closer relationship of 'Malling' rootstocks with old apple cultivars than with native Iranian (Persian) apple cultivars (Gharghani et al., 2009), possibly because the 'Paradise' stocks were the result of hybridization with old world cultivars or perhaps the sampling of Persian cultivars did not include dwarf apples.

In the 20th century several breeding programs located in important apple growing regions have used the dwarfing 'Malling' selections to breed new apple rootstocks more adapted to local pedo-climatic conditions (Cummins and Aldwinckle, 1974; Fischer, 1974; Spangelo et al., 1974; Watkins et al., 1973; Webster et al., 2000), resulting in several new rootstock cultivars with increased performance and disease resistance than the initial 'Malling' selections (Russo et al., 2007; Wertheim, 1998). M.9 and its clones and B.9, derived

from M.8, represent the most planted apple rootstocks with over 50 million trees planted worldwide each year, a testament to the importance of the dwarfing and early-bearing genetics of these stocks. The use of dwarfing rootstocks has dramatically reduced worker injuries, the volume of protectant sprays used, and other cultural expenses while increasing per-acre productivity in apple orchard systems (Autio et al., 2011a; Marini et al., 2008). The use of dwarfing rootstocks also improves fruit quality and consistency.

The effect of dwarfing rootstocks on the phenotype of grafted scions can be measured at the cellular level with dramatic changes in gene expression of hundreds of scion genes (Jensen et al., 2010, 2012) and changes of scion wood properties (Tworkoski and Fazio, 2011; Tworkoski and Miller, 2007). The messenger system causing these changes is not well understood. Several models have been proposed for the dwarfing/early-bearing mechanism caused by M.9 and derived rootstocks on scion cultivars, such as changes in hydraulic conductivity (Atkinson et al., 2003), diverse mechanisms of plant hormone translocation (Kamboj et al., 1998, 1999; van Hooijdonk et al., 2010, 2011) and modification of graft union anatomy and auxin transport (Soumelidou et al., 1994a, 1994b), but none has been definitively identified as the causative agents of dwarfing. The effect of dwarfing rootstocks is slow and cumulative, causing an early set of terminal buds and stopping cumulative growth earlier in the season than vigorous rootstocks, resulting in an overall reduction of nodes in the scion (Seleznova et al., 2003, 2008). From a tree architecture standpoint, the dwarfing mechanism has been described as faster physiological aging, related to the reduction in length of the first annual shoot of bottom branches and the high flowering on this shoot (Lauri et al., 2006). The influence of rootstocks on scion architecture can also encompass changes in the number of lateral branches (feathers) and their angle with the trunk (Fazio and Robinson, 2008). These rootstock-mediated changes seem to be physiologically different from the inherently dwarf or columnar scions and other heritable architecture types described in apple (Conner et al., 1998; Hemmat et al., 1997). Quantitative trait analysis and genetic mapping have greatly increased our understanding of the inheritance and control of several of these inherent apple architectural traits (Kenis and Keulemans, 2007; Segura et al., 2009). Within the Geneva, NY, apple rootstock breeding program, the dwarfing trait has been shown to be highly heritable and is easily recovered in rootstock breeding populations derived from M.9, M.8, and their relatives (Fazio and Mazzola, 2004).

An important step forward was the discovery and mapping of the dwarfing locus (*Dw1*) derived from M.9 using the bulk segregant analysis approach using a cross between M.9 and *Malus robusta* R5. *Dw1* was placed at the top of LG5 between markers CH03a09 and NZraAM18-700 (Celton et al., 2009; Pilcher et al., 2008), which, on the physical map, is in a region between CH03a09 (7.63 Mb) and the telomere (Velasco et al., 2010). The sequence for marker NZraAM18-700 has not been revealed. Segregation of *Dw1* could not explain the continuous variation for vigor control observed in the M.9 × R5 population to study dwarfing (Pilcher et al., 2008). Several apple rootstock maps have been produced (Antanaviciute et al., 2012; Celton et al., 2009; Moriya et al., 2012) with the intent to increase the knowledge of rootstock-inherent and -mediated traits. These maps have been used to study the inheritance of root architecture in apple rootstocks (Fazio et al., 2009), fire blight (*Erwinia*

amylovora) resistance (Gardiner et al., 2012), and absorption and translocation of nutrients by apple roots (Fazio et al., 2012a, 2013). Better, publicly available molecular markers associated with dwarfing will be very useful in apple rootstock breeding because of their potential to increase the proportion of highly desired dwarfs in breeding populations and reduce breeding cycles by 7 to 10 years. Map-based cloning of the dwarfing gene(s) will enhance the understanding of this trait and provide information useful for other members of Rosaceae. This study uses two rootstock populations to elucidate the location and effects of two major QTLs on rootstock-mediated early-bearing and dwarfing of apples.

Materials and Methods

PLANT MATERIAL AND DNA EXTRACTION. Several segregating populations were used in this evaluation: 1) population named O3R5: 186 progeny from the interspecific cross between two apple rootstocks, ‘Ottawa 3’ (Spangelo et al., 1974) and R5. This population segregated for many important rootstock traits including resistance to fire blight (Gardiner et al., 2012), wooly apple aphid (*Eriosoma lanigerum*), powdery mildew (*Podosphaera leucotricha*) (Wan and Fazio, 2011), root architecture (Fazio et al., 2009), dwarfing, induction of early-bearing, yield efficiency, root suckering, and formation of burr knots and spines; 2) population G935B9: 126 progeny from a cross between G.935 and B.9 apple rootstocks; 3) population MM106G65: 216 progeny derived from a cross between ‘Malling-Merton 106’ (MM.106) and ‘Geneva® 65’ (G.65); 4) population G65G16: 187 progeny derived from a cross between G.65 and ‘Geneva® 16’ (G.16); 5) population B491G16: 45 progeny derived from a cross between ‘Budagovsky 491’ (B.491) and G.16; 6) population G11P16: 53 progeny derived from a cross between ‘Geneva® 11’ (G.11) and ‘Polish 16’ (P.16); and 7) population P2G11: 100 progeny derived from the cross between ‘Polish 2’ (P.2) and G.11.

DNA from was extracted using the DNeasy 96 plant miniprep kit (Qiagen, Valencia, CA) according to the manufacturer’s specifications. DNA was quantified using Hoechst Dye (FluoReporter Blue Fluorometric dsDNA Quantitation Kit, Invitrogen F-2962; Life Technologies, Grand Island, NY) on a Tecan Spectrafluor Microplate Reader (Tecan Systems, San Jose, CA) (2-μL DNA sample, 48 μL Tris-EDTA, 50 μL Hoechst/Tris-Acetate-EDTA). Fluorescence was measured at 360/465 nm and compared with a serial dilution of calf thymus DNA.

PHENOTYPIC EVALUATIONS. Although the establishment year of each of the populations may differ, all seedling populations from the crosses mentioned in this study underwent evaluation stages spanning 5 to 12 years designed for the purpose of determining the degree of dwarfing and induction of early-bearing by the rootstocks (Cummins et al., 1983; Johnson et al., 2001). Briefly, 20- to 30-cm tall seedlings were planted in a rootstock nursery at the New York State Agricultural Experiment Station, Geneva, NY (NYSAES) in the spring of Year 1. The plants were allowed to grow for one season to strengthen the mother plant and the top was removed in the spring of Year 2 to stimulate sucker growth in preparation for propagation by stooling (Quamme and Brownlee, 1990). New shoots were mounded with sawdust during the second growing season to promote adventitious rooting on the shoots under the sawdust, and rooted shoots (rootstock liners) were harvested from

mother plants in late fall of Year 2. Five to seven rootstock liners per genotype were planted in a tree nursery at NYSAES in the spring of Year 3 and were chip-budded with scions ‘Mutsu’ or ‘Gala’ at the end of summer of Year 3. In the spring of Year 4 the budded liners were topped to stimulate graft growth and budlings were trained to one shoot to produce an unbranched tree (whip). Finished trees were dug from the nursery in the fall of Year 4. Root systems were graded and tree height and diameter measurements made on finished trees. Finished trees were planted in a completely randomized design at a 1.5 × 4-m spacing in a field at NYSAES. Diameter and trunk cross-sectional area measurements at 15 cm above the graft union and number (or estimate) of flower clusters were collected on each tree during the spring of Years 5 to 13. Number of fruit and weight of fruit per tree were measured during the fall of Years 5 to 13. Seedling mother plants were allowed to stool for Year 3 to collect measurements on liner quality, length, presence of spines, and level of adventitious rooting on cut stools in the fall–winter of Year 3. Leaf color (red or green) was recorded for the G935B9 population in Year 3. Mother plants were then allowed to grow in Years 4 to 7 in the stoolbed to evaluate vigor and flowering on 3-year-old shoots. In addition, the mother plants of the O3R5 population were mounded with sawdust and rooted shoots were cut in the fall of Years 5 to 8 to generate rootstock liners. Rooted liners from Year 5 were planted in a nursery in 2007 and were chip-budded with ‘Brookfield Gala’ scion, whereas liners from Year 8 were planted in a nursery in 2010 and chip-budded with ‘Spur Red Delicious’ scion. Three to five replicates of the ‘Brookfield Gala’ chip-budded plants were harvested from the nursery as dormant budlings (“sleeping eye tree”) in Fall 2007 and planted in May 2008 in 14.5-L pots filled with 50% screened topsoil (sandy loam, pH 6.5) and 50% Cornell Potting Mix (50 peatmoss:50 vermiculite with 6.2 kg·m⁻³ lime, 1.25 kg·m⁻³ superphosphate, and 0.62 kg·m⁻³ calcium nitrate) in a completely randomized design. Trees were headed 6 cm above the scion bud to push bud growth and allowed to grow into their natural form without any nursery training (side-limbing). Standard drip irrigation was used to water the pots at field capacity everyday. Plants were manually fertilized with soluble fertilizer [17N–1.3P–14.1K with micronutrients (Peters Professional Peat light Neutral Cal-Mag; Scotts, Marysville, OH)] at weekly intervals for 10 weeks (total of 26 g of soluble fertilizer for the vegetative season). Root system descriptions were collected before planting including root mass, root length, mean primary root angle, and fine root formation (Fazio et al., 2009). Measurements on bud burst, tree height, and number and length of feathers were measured at regular monthly intervals from May to October. Then plants were harvested and roots were washed to measure the whole plant, and root and scion wet and dry weight.

Two or three replicates of the ‘Spur Red Delicious’ finished trees were harvested from the nursery in Fall 2011 as fully grown finished trees and planted in May 2012 in 14.5-L pots with 50% screened topsoil (sandy loam, pH 6.5) and 50% Cornell Potting Mix (50 peatmoss:50 vermiculite with 6.2 kg·m⁻³ lime, 1.25 kg·m⁻³ superphosphate, and 0.62 kg·m⁻³ calcium nitrate) in a completely randomized design. Trees were allowed to grow in their natural form without any side-limbing. Standard drip irrigation was used daily to water the pots at field capacity. Plants were manually fertilized with soluble fertilizer (17N–1.3P–14.1K with micronutrients) at weekly

intervals for 10 weeks (total of 26 g of soluble fertilizer for the vegetative season). Measurements on those trees included final tree height, trunk cross-sectional area, number and length of feathery, and total canopy length (tree height + total length of feathery). Phenotypic data means, regressions, analyses of variance, and graphs were generated with a number of statistical packages including Minitab 16 (Minitab, State College, PA), Statistica 9 (Statsoft, Tulsa, OK), and JMP 10 (SAS Institute, Cary, NC).

GENETIC MAPS. Genetic maps were constructed for the O3R5 and the G935B9 populations spanning all 17 apple chromosomes. The O3R5 pseudo-testcross map (Wan and Fazio, 2011) is comprised of a total of 529 markers [171 simple sequence repeat (SSR), 319 amplified length polymorphisms, 16 random amplified polymorphic DNA, and 17 expressed sequence tag (EST) derived sequence characterized amplified regions] constructed using JoinMap 4.1 mapping software (Van Ooijen, 2011). Marker order for SSR, EST, and other sequence-based markers was confirmed against the published physical sequence of apple (Velasco et al., 2010). This map data has already been used successfully for previous QTL analyses (Fazio et al., 2009, 2012a, 2013; Gardiner et al., 2012; Wan and Fazio, 2011). The G935B9 pseudo-testcross map is comprised of 1841 segregating single nucleotide polymorphism (SNP) loci resolved using the International RosBREED SNP Consortium (IRSC) Infinium® II (Illumina, San Diego, CA) array developed through the RosBREED project (Chagné et al., 2012; Iezzoni, 2010) and used to genotype an M.27 × M.106 apple rootstock population (Antanaviciute et al., 2012). Parental and progeny DNA was assayed with the 8788 SNP features (7867 *Malus* and 921 *Pyrus*) on the RosBREED apple array following the manufacturer's specifications (Illumina). Briefly, genomic DNA was amplified, fragmented, and hybridized to a BeadChip (Illumina) featuring probes for all SNPs. BeadChips were washed to remove non-hybridized DNA and an enzymatic single base extension reaction was performed using two differentially labeled nucleotides. Bead fluorescence was imaged using the HiScan BeadChip scanner and scan data were transferred into the GenomeStudio (Illumina) for SNP calling. According to the manufacturer's recommendations, SNP features were initially auto-scored using a GenCall score cutoff value of 0.15. All remaining features were then manually checked for accuracy in cluster calls, parent-child errors, and manually corrected according to the procedures outlined in the GenomeStudio Manual Chapter 3, and features displaying null alleles were eliminated from further analysis. SNP calls output from GenomeStudio (AA = homozygous for allele 1, AB = heterozygous, BB = homozygous for allele 2) were transferred to Excel (Microsoft, Redmond, WA) for recoding in preparation for genetic map construction. Output was sorted by parental segregation type (Class 1 = SNP heterozygous only in G.935, Class 2 = SNP heterozygous only in B.9, Class 3 = SNP heterozygous in both G.935 and B.9) and recoded into JoinMap 4.1 allele codes (Class 1 = Im, Il; Class 2 = nn, np; Class 3 = hh, hk, kk) according to their segregation types. To keep marker names under the JoinMap 4.1 limit, the unique BeadChip address was used with an additional putative chromosome code (1 to 17) affixed at the end of the name. Mapping was performed using the recommended steps outlined in the JoinMap 4.1 manual using the multiple regression algorithm and the Kosambi function: 1) Grouping using LOD 3.0 and higher to generate groups of linked markers followed by inspection of

strongest cross links (SCL) among groups and correction for misplaced markers having SCL value greater than 10; 2) mapping with a Start Order corresponding to physical map; 3) elimination of markers for which a linkage phase could not be determined; 4) calculation options using markers with recombination fraction threshold of 0.4 and LOD greater than 2.0 with ripple value of one and goodness-of-fit threshold; and 5) three maps were calculated for each linkage group: one for each parent and a consensus map.

QTL ANALYSIS. QTL analysis was performed using the MapQTL 6 software package (Kyazma, Wageningen, The Netherlands). Briefly, a preliminary QTL analysis was performed by a Kruskal-Wallis test on all traits as described in the software instruction manual. Subsequently, interval mapping using the regression analysis method and the LOD test statistic with a step size of one was performed to identify putative QTL regions as described in the MapQTL 6 software manual. The resulting outputs were parsed for QTLs having LOD values of 3.0 and higher and selected for further analysis. Empirical 95% confidence limits (chromosome and genome wide) for the LOD statistic were calculated for all traits using 10,000 permutations to ensure the statistical validity of the QTL against false-positives. The location of all QTL peaks with LOD 3.0 and higher was extracted as well as values for mean parental allele combination contribution (μ_{ac} , μ_{ad} , μ_{bc} , μ_{bd}), variance, and percent variance explained by interval. In MapQTL 6, the contribution of the parental alleles is coded so that marker alleles "a," "b," or "lm"; "ll" are derived from Parent 1 ('Ottawa 3' and G.935) and alleles "c," "d," or "nn"; and "np" are from Parent 2 (R5 and B.9). As recommended by the MapQTL 6 manual, the location of the QTL peaks was refined by multiple-QTL mapping analysis, which uses nearby markers as cofactors in the analysis.

LOCUS INTERACTION ANALYSIS. Individual phenotypic data (parametric) and corresponding JoinMap 4.1-coded marker data (non-parametric) were entered in a Statistica 9 or JMP 10 workbook for marker model-building and testing. The main effects and interaction effects on several phenotypic variables were examined by using markers linked to *Dw1* and *Dw2* as the main effects and the interaction (*Dw1* × *Dw2*) using the generalized linear models procedure in Statistica 9.

Results

TRAIT CORRELATION. The overall Pearson correlation coefficient in tree size between the rootstock mother plants and derived 3-year-old grafted finished trees of four breeding populations (B491G16, G11P16, MM106G65, P2G11) was 0.579 ($P = 0.000$). When populations were analyzed separately (Fig. 1), their regression coefficients were unique to each population and showed a significant correlation between mother plant size and finished tree size. Similarly, the correlation between the maximum length of 1-year shoots of mother plants and mean trunk diameter of 4-year-old finished trees of the O3R5 population was 0.552 ($P < 0.05$). There was a significant negative correlation (-0.21 , $P < 0.05$) between trunk diameter of 4-year-old trees and the number of flower clusters on the same trees in the O3R5 population. Similarly, the correlation between number of fruit harvested on replicated finished trees and trunk diameters in 2011 for the G935B9 population was -0.30 ($P < 0.05$). Correlation coefficients of a similar magnitude have been calculated for many progenies throughout the history of the Geneva® breeding program.

Fig. 1. Regression lines ($P < 0.000$) between mother plant stature (increasing vigor classes one through five) and tree diameter of 3-year-old grafted trees for four apple rootstock breeding populations (B491G16, G11P16, MM106G65, P2G11), where mother plants were allowed to grow after liners were harvested for grafting replicated field trials. Three of the four slopes have similar values because they are derived from crosses between dwarfing parents (B.491, P.2, G.11, P.16, and G.16) indicating that dwarfing progeny are easily recovered in these crosses because the dwarfing loci can reach homozygosity. The line with a different slope is a cross of MM.106 (non-dwarfing) by G.65 (dwarfing).

G.935 × B.9 SNP GENETIC MAP. Supplementary Tables 1 to 3 contain the results of the genetic linkage map construction. A graphical example of the alignments of such maps is given in Figure 4. The genetic map had a total length of 942 cM and spanned all 17 chromosomes of apple for the female parent (G.935); it was constructed with 762 SNP markers that were heterozygous only in G.935. The genetic map for the male parent B.9 had a total length of 1530 cM; it spanned all 17 chromosomes with 773 SNP markers that were heterozygous only in B.9. Markers heterozygous in both parents allowed for the construction of a consensus map of 1841 markers with a total length of 1414 cM. Concordance between genetic map assignment and physical map location was good for 1597 markers. Chromosomal assignment for 244 of the 1841 total mapped markers (13.25%) was not in accordance with published physical map location of the SNPs.

QTL DISCOVERY AND VALIDATION. The discovery of *Dw1* and *Dw2* within the Geneva® breeding program was initially achieved using a genome scan approach (Patocchi et al., 2005) with several breeding populations (data not included). This was followed by a more rigorous QTL mapping approach with progeny from the O3R5 cross under multiple experimental conditions (traits; QTL locations are described in Tables 1 and 2) and validated with progeny from a related breeding population (G935B9). All experiments were in concordance that the first dwarfing locus *Dw1* is located on the top of LG05 between markers Hi15e04 and Hi09b04. The second dwarfing locus, *Dw2*, is located in the middle of LG11 between markers Ch02d08 and C13243. The induction of early-bearing *Eb1* is to some extent colocated with *Dw1*, the highest LOD being observed in the C3843x–Hi04a08 interval and *Eb2* colocated with *Dw2* in the interval Ch02d08 and C13243. QTLs corresponding to mean number of fruit per tree (Table 2) did not colocate with *Dw1*, but a recurring QTL (*FrN1*) for years 2011

and 2012 colocated with *Dw2* and a new QTL for the same trait was identified on LG16. The *FrN1* QTL was validated in the G935B9 population where cumulative fruit yields seemed to be modulated more by *Dw2* than *Dw1* (Fig. 6). Locations for *Dw1* and *Dw2* are similar in the SNP maps of the G935B9 populations for own-rooted and grafted trees. The red leaf color segregating in the G935B9 population, used to validate map and QTL detection ability, coincided with the published location of the *Rni/MdMYB10* gene affecting apple anthocyanin production (Esp-ley et al., 2006).

LOCUS INTERACTION ANALYSIS. In the O3R5 progeny, the most dwarfing rootstocks were the ones that inherited both *Dw1* and *Dw2* from the dwarfing parent ‘Ottawa 3’, because only heterozygotes at each locus were expected in the progeny. These were also the most early-bearing inducing rootstocks. In the heterozygous state, each dwarfing locus reduced vigor of the trees independently of the other (Table 3; Fig. 2). In the G935B9 population, a similar trend was observed, but now because both parents were heterozygous for *Dw1* and *Dw2*, the homozygous classes could be studied and com-

pared. Vigorous trees were obtained from rootstocks that were homozygous for the non-dwarfing alleles of *Dw1* regardless of the allelic status of *Dw2* (Table 4; Fig. 3). The same is also true with *Dw2*, in which individuals homozygous for the non-dwarfing allele generated vigorous plants regardless of the allelic status of *Dw1*. The smallest trees were obtained with rootstocks that were homozygous at both loci. Immediately dwarfing trees were obtained in the other heterozygous combinations. The regression model based on the main effects of *Dw1* and *Dw2* and their interaction in the G935B9 population was statistically significant ($R^2 = 0.80$, $P < 0.0001$), the predictive power being the greatest when seedlings were homozygous at one or both loci (Fig. 5).

Discussion

The ability to reduce tree vigor by apple rootstocks has been well characterized. There are many factors that influence scion vigor: the influence of the rootstock, soil fertility and water availability, soilborne diseases, and scion genetics. Therefore, if T was the size of a grafted scion (S) on a rootstock (R) in orchard A, then the size of such tree at maturity would be $T = A_{\text{fertility}} + A_{\text{water}} + A_{\text{disease}} + A_{\text{system}} + S_{\text{vigor}} + R_{\text{dwarfing}}$ where $A_{\text{fertility}}$ is the fertility of orchard A soil, A_{water} is the availability of water in orchard A, A_{disease} is the presence of diseases that decreases the vigor of the scion, A_{system} is the orchard system used, S_{vigor} is the inherent vigor of the scion (e.g., a ‘Honeycrisp’ scion is less vigorous than a ‘Fuji’ scion), and R_{dwarfing} is the rootstock genetic potential for dwarfing the scion. Because the rootstock is the conduit for water and nutrients and can be susceptible or resistant to diseases, the genetic composition of such rootstock has been shown to interact with all such variables. For example, water and nutrient availability can be drastically influenced by the rootstock (Cohen et al., 2007;

Table 1. Summary table of phenotypic data collected on composite apple trees (scion/rootstock) or own-rooted apple rootstock plants, the abbreviated trait names (referred to in Table 2), and type of analyses they were used in.

Abbreviated name	Trait description	Scion/rootstock population (planting)	Analysis
MeanDiam	Mean of trunk diameters for each rootstock genotype's tree replicates in the same orchard experiment	'Brookfield Gala'/O3R5 (orchard) 'Golden Supreme'/G935B9 (orchard) 'Red Delicious'/O3R5 (potted trees)	Correlation, quantitative trait loci (QTL) discovery, mean comparison, marker regression model
MeanCluster	Mean number of flower clusters for each rootstock genotype's tree replicates in the same orchard experiment (second growing season)	'Brookfield Gala'/O3R5, (orchard)	Correlation, QTL discovery, mean comparison, marker regression model
FruitCount(20xx)	Mean number of fruit for each rootstock genotype's tree replicates in the same orchard experiment (year)	'Brookfield Gala'/O3R5, (orchard), 'Golden Supreme'/G935B9 (orchard)	Correlation, QTL discovery, mean comparison, marker regression model
MXL	Maximum length of 1-year shoots of mother plants in stool bed	O3R5 (mother plants)	Correlation, QTL discovery, mean comparison, marker regression model
Trunk Diameter	Mean of trunk diameters for tree replicates in the same orchard experiment	'Mutsu'/B491G16 (orchard), 'Mutsu'/G11P16 (orchard), 'Mutsu'/MM106G65 (orchard), 'Mutsu'/P2G11 (orchard)	Trait correlation analysis
Mother Plant Vigor Class	Visual assessment of plant vigor of own rooted 5-year-old mother plants into five vigor classes	B491G16, G11P16, MM106G65, P2G11 (mother plants)	Trait correlation analysis
Mean Tree Height	Mean of scion tree height measurements from graft union to tallest apex of experimental replicates	'Brookfield Gala'/O3R5 (potted trees) 'Red Delicious'/O3R5 (potted trees)	Correlation, QTL discovery, mean comparison, marker regression model
Mean Total Canopy Length	Mean of scion canopy measurements for each branch including main trunk of experimental replicates	'Brookfield Gala'/O3R5 (potted trees) 'Red Delicious'/O3R5 (potted trees)	Correlation, QTL discovery, mean comparison, marker regression model
Rootstock Height	Maximum height of 4-year-old mother plants	'Golden Supreme'/G935B9 (orchard)	Correlation, QTL discovery, mean comparison, marker regression model
Rootstock Leaf Color	Red leaf vs. green leaf	G935B9 (mother plants)	QTL validation, map validation

Fallahi et al., 2011; Fazio et al., 2012a, 2012b, 2013) and tolerance to replant disease affects the size and productivity of the apple tree (Auvil et al., 2011; Leinfelder and Merwin, 2006; Mazzola, 1998). Therefore, genetic variation for these traits within apple rootstocks will have an effect on tree size and productivity. The dwarfing phenotype can also be observed when interstems of dwarfing rootstocks are used between a vigorous rootstock and a vigorous scion (Koike and Tsukahara, 1988) and the dwarfing effect is proportional to the size of the dwarfing interstems (Carlson and Oh, 1975). This study shows that in the Geneva® apple rootstock breeding program, there are at least two genetic factors being used in breeding new rootstocks that affect the rootstock ability to reduce scion vigor. The effect of these two loci in the orchard is evidenced in the scion by the early termination of growth (apical and radial), which cumulatively season after season results in a dramatic dwarfing effect.

Within breeding populations of the Geneva® breeding program, the ability of individual rootstocks to dwarf scions is correlated with the own-rooted tree size of each rootstock genotype (Fig. 1). The QTLs for *Dw1* and *Dw2* were significant

whether measured on the own-rooted mother plants or on the finished trees derived from those mother plants. This suggests that it may be possible to select dwarfing apple rootstocks based on the size that mother plants reach after 3 to 5 years. Given similarities between genomes of Rosaceae tree crops (Dirlewanger et al., 2004), it may be possible to select dwarfing rootstocks or breeding material in tree crops that currently lack dwarfing precocious rootstocks [e.g. pear (*Pyrus communis*)] based only on vigor of mother plants in the stool beds.

The predictive ability of a two-locus model to explain dwarfing phenotypic variation on finished trees was tested in the G935B9 population. This model used the allelic constitution of the main dwarfing loci *Dw1* and *Dw2* to predict the diameter of the trees. Given that both parents were heterozygous at both loci, eight classes of progeny were predicted (Table 4), some having nearly an identical predicted dwarfing effect. Although the model fit well in the higher and lower ranges of the curve, it was somewhat variable in the middle of the curve. In other words, a plot of residuals vs. predicted tree size shows greater scattering in the middle of the curve. This may be the result of differential partial dominance in the effects

Table 2. Results from the quantitative trait loci (QTL) analyses combining phenotypic data from orchard and potted experiments on compound apple trees (scion/rootstock) and own-rooted apple rootstock plants including designated QTL names, level of significance expressed in LOD values obtained with the QTL analyses, genomic intervals represented by flanking markers, population/experiment that generated the trait data, and trait description.

QTL name	Significance (LOD)	Genomic interval ² represented by flanking markers	Linkage group (LG)	Population/expt.	Trait description
<i>Dw1</i>	7.2	Hi15e04–Hi09b04	LG05	‘Brookfield Gala’/ O3R5 (orchard), stoolbed	MeanDiam, MXL
<i>Dw2</i>	6.4	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (orchard), stoolbed	MeanDiam, MXL
<i>Eb1</i>	7.1	C3843x–Hi04a08	LG05	‘Brookfield Gala’/ O3R5 (orchard)	MeanCluster
<i>Eb2</i>	7.6	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (orchard)	MeanCluster
<i>FrN1(2011)</i>	7.0	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (orchard)	FruitCount(20xx)
<i>FrN2(2011)</i>	3.5	Hi22f06–Ch01f03	LG16	‘Brookfield Gala’/ O3R5 (orchard)	FruitCount(20xx)
<i>FrN1(2012)</i>	7.1	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (orchard)	FruitCount(20xx)
<i>Dw1</i>	2.7	Hi15e04–Hi09b04	LG05	‘Brookfield Gala’/ O3R5 (pots)	Mean Tree Height
<i>Dw2</i>	3.9	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (pots)	Mean Tree Height
<i>Dw2</i>	3.0	Ch02d08–C13243	LG11	‘Brookfield Gala’/ O3R5 (pots)	Total Canopy Length
<i>Dw1</i>	4.2	Hi15e04–Hi09b04	LG05	‘Red Delicious’/ O3R5 (pots)	MeanDiam
<i>Dw1</i>	3.8	Hi15e04–Hi09b04	LG05	‘Red Delicious’/ O3R5 (pots)	Mean Total Canopy Length
<i>Dw1</i>	4.7	RosBREEDSNP_SNP_TC_984342_Lg5_01694_MAF10_1654238_exon3–RosBREEDSNP_SNP_GA_4178848_Lg5_01566_MAF50_1687376_exon1	LG05	‘Golden Supreme’/ G935B9 (orchard)	MeanDiam
<i>Dw2</i>	6.9	RosBREEDSNP_SNP_GA_12188459_Lg11_00240_MAF10_MDP0000713484_exon1–RosBREEDSNP_SNP_GA_8445216_Lg11_00185_MAF40_531216_exon5	LG11	‘Golden Supreme’/ G935B9 (orchard)	MeanDiam
<i>Dw1</i>	3.7	RosBREEDSNP_SNP_TC_984342_Lg5_01694_MAF10_1654238_exon3–RosBREEDSNP_SNP_GA_4178848_Lg5_01566_MAF50_1687376_exon1	LG05	‘Golden Supreme’/ G935B9 (orchard)	Rootstock Height
<i>Dw2</i>	6.3	RosBREEDSNP_SNP_GA_12188459_Lg11_00240_MAF10_MDP0000713484_exon1–RosBREEDSNP_SNP_GA_8445216_Lg11_00185_MAF40_531216_exon5	LG11	‘Golden Supreme’/ G935B9 (orchard)	Rootstock Height
<i>FrN1(2012)</i>	4.5	RosBREEDSNP_SNP_GA_12188459_Lg11_00240_MAF10_MDP0000713484_exon1–RosBREEDSNP_SNP_GA_8445216_Lg11_00185_MAF40_531216_exon5	LG11	‘Golden Supreme’/ G935B9 (orchard)	Rootstock Height
<i>Rni/MdMYB10</i>	27.15	GDsnp02482–GDsnp00467	LG09	G935B9 (mother plants)	Rootstock Leaf Color

²Markers with the Ch or Hi designation are described in Liebhard et al. (2002) and Silfverberg-Dilworth et al. (2006), markers with the C designation are described in Wang et al. (2012), and markers with RosBREED or GD designation are described in Chagné et al. (2012). LOD = log of odds.

of both loci, which was not calculated in the model. Another explanation may be additional loci that may play a smaller role in vigor reduction of the scion. Even the parents, although being

genetically similar at the dwarfing loci, have significantly different dwarfing potential as measured in field trials around the world (Autio et al., 2011b; Auvil et al., 2011; Robinson

Table 3. Least square (LS) means estimated for the trunk diameters of compound apple trees (scion/rootstock) of ‘Brookfield Gala’ grafted onto the O3R5 apple rootstock segregating population showing the *Dw1* × *Dw2* interaction originating from segregation of dwarfing heterozygous loci in parent ‘Ottawa 3’ (*Dw1* = lm and ll, *Dw2* = lm and ll) and homozygous non-dwarfing loci in parent ‘Robusta 5’.^z

<i>Dw1</i>	<i>Dw2</i>	Trunk diam LS means (mm)	SE
lm	lm	69.47667	2.494386
lm	ll	61.96491	2.861257
ll	lm	63.73437	2.204747
ll	ll	45.26754	2.023214

^zAllele “l” is dwarfing and allele “m” is normal.

et al., 2011a; Russo et al., 2007), where G.935 tends to produce a tree that is 20% more vigorous than a tree on B.9. Other factors relating to nutrition, disease resistance, scion compatibility, early-bearing induction, water use efficiency, and root architecture may explain variation not resulting from the dwarfing genes.

In the O3R5 pot trials in which two different scions were used, the influence of the *Dw2* QTL was absent in the weaker scion (‘Spur Red Delicious’), possibly indicating the inability of *Dw2* to be expressed with a weaker scion. The ‘Gala’/O3R5 combination did display both dwarfing QTLs even in pots where water and nutrient conditions were maintained at optimum levels. This finding may have implications for breeding new rootstocks because specific rootstock/scion combinations may result in optimum growth and production of a tree. Semidwarfing apple rootstocks G.210 and G.969 (O3R5 derivatives) could be used for cultivation of weaker scions of ‘Red Delicious’ or ‘Honeycrisp’, whereas dwarfing rootstock G.214 may perform better with vigorous scions of ‘Fuji’ or ‘Mutsu’.

The ability to induce early flowering/bearing in scion cultivars, otherwise known as precocity, is a major selection criterion for breeding dwarfing apple rootstocks. Precocity requires 6 to 8 years to evaluate in the orchard and is one of the major targets for marker-assisted selection in the Geneva® breeding program. Although precocity has been associated with dwarfing (Webster and Warrington, 1995), very little is known about its inheritance in apple rootstocks. Early observations in the Geneva® breeding program indicated that dwarfing and

Table 4. Least square (LS) means estimated for the trunk diameters of compound apple trees (scion/rootstock) of ‘Golden Supreme’ scion grafted onto the G935B9 apple rootstock segregating population showing the *Dw1* × *Dw2* interaction originating from segregation of heterozygous loci in parents G.935 and B.9.^z

<i>Dw1</i>	<i>Dw2</i>	Trunk diam LS means (mm)	SE
hh	hh	37.416667	1.4527052
hh	hk	37.683333	1.4527052
hh	kk	39.050000	2.5161593
hk	hh	37.716667	1.1861289
hk	hk	28.133368	0.8163499
hk	kk	22.780000	1.5913589
kk	hh	36.770000	1.5913589
kk	hk	21.972875	1.2580796
kk	kk	18.250000	2.5161593

^zAllele “k” is dwarfing and allele “h” is normal.

Fig. 2. Interaction between *Dw1* and *Dw2* observed in the progeny of a cross between a vigorous apple parent (R5) and a dwarfing parent heterozygous at both loci (‘Ottawa 3’). Codes lm and ll are the same as in the JoinMap (Van Ooijen, 2011) and MapQTL (Kyazma, Wageningen, The Netherlands) software; they are assigned to alleles contributed by Parent 1 (Ottawa3) and represent allele constitution of progenies (in this case in a testcross configuration). Whiskers denote the 95% confidence interval. Allele “l” is dwarfing and allele “m” is normal. Maximum dwarfing is achieved in rootstocks that possess the ‘Ottawa 3’ allele at both dwarfing loci. Individuals that feature the ‘Ottawa 3’ allele at one of either loci show intermediate dwarfing capacity, whereas individuals possessing none show no dwarfing capacity.

precocity were loosely associated genetically and as such the induction of early-bearing has been relatively easy to recover in the progeny of apple rootstock crosses. In our research, early-bearing induction is influenced by two loci (*Eb1* and *Eb2*), which seem to colocate with *Dw1* and *Dw2*. The Gala/O3R5 orchard data show that although the QTLs may be colocated,

Fig. 3. Interaction between *Dw1* and *Dw2* as observed in the progeny of two double heterozygous apple parents (G.935 and B.9). Codes hh, hk, and kk are the same as in the JoinMap (Van Ooijen, 2011) and MapQTL (Kyazma, Wageningen, The Netherlands) software; they are assigned to alleles contributed by both heterozygous (hk) and represent allele constitution of progenies possible in this cross. Allele “k” is dwarfing and allele “h” is normal. What is peculiar about these observations is that homozygous individuals for non-dwarfing alleles at either *Dw2* or *Dw1* invalidate the effect of the dwarfing ability of the other dwarfing locus. In addition, the heterozygote individuals at either locus have somewhat of a different capacity to dwarf the scion, where *Dw2* seems to dwarf slightly less than *Dw1*.

Fig. 4. Graphical representation of apple linkage Group 1 genetic maps for G.935 (left) consensus (middle), and B.9 (right) map developed with the RosBREED Infinium single nucleotide polymorphism (SNP) chip. In this figure the chip address was used instead of the SNP name according to Chagné et al. (2012). Full map information for G.935, B.9, and consensus maps

the traits are not highly correlated, suggesting the influence of other environmental or genetic factors in the expression of such trait. Loss of juvenility and subsequent induction of flowering in apple seedlings seem to be related to the distance from the root system or the amount of trunk growth (Aldwinckle, 1975; Zimmerman, 1972). Increasing interstem size of early-bearing inducing rootstocks can also lessen the juvenility stage significantly (Carlson and Oh, 1975) suggesting that the interstem tissue might reduce the amount of an unidentified signal originating from the roots causing juvenility in the scions (van Hooijdonk et al., 2011). The genetic factors inducing early-bearing identified in this research may be used in the process of fast breeding (Volz et al., 2009) to decrease the juvenility stage of grafted scions and increase the efficiency of apple breeding programs.

Two QTLs (*FrN1* and *FrN2*) associated with the number of fruit produced by each Gala/O3R5 tree were identified in two seasons. The first collocated with *Dw2*, *Eb2*, and a fine root trait QTL (Fazio et al., 2009) on LG11, whereas a second QTL of minor effect located in the middle of LG 16 was detected for only one season. The *FrN1* QTL was also validated in the 'Golden'/G935B9 planting over 2 years. The cumulative fruit number (Fig. 6) seems to be modulated by a factor on LG11 that collocated with *Dw2*. The dwarfing locus *Dw1* did not seem to have much effect on early fruit production other than homozygous non-dwarfing rootstocks being less productive than the other classes. Early and steady production of apples is important for modern fruit production because high-density training systems require a significant capital investment that needs early returns to be profitable (Robinson et al., 2011b).

The new genetic maps of apple rootstocks G.935 and B.9 and a consensus map featuring 1841 SNP markers analyzed on the IRSC Illumina Infinium® II array (Chagné et al., 2012; Iezzoni, 2010) were used for QTL validation of the O3R5 QTLs. Genetic mapping revealed that 1597 of 1841 SNP markers agreed with the chromosomal assignment based on the published physical map of apple; however, 244 SNP (13.25%) did not match with the physical map, in agreement with the incongruence rate (13.7%) reported by Antanaviciute et al. (2012) using the same array on a similar apple rootstock progeny. Incongruence has been explained partially by probes detecting more than one locus, rearrangements within the genome, indels, and mis-assignment of sequences in the 'Golden Delicious' genome sequence (Khan et al., 2012). A higher recombination rate was detected in the B.9 parent than the G.935 parent resulting in a longer map of B.9. This may partially be explained by the fact that B.9 is the result of a cross within *M. ×domestica*, whereas G.935 is the result of a series of interspecific crosses between *M. ×domestica*, *M. ×robusta*, and *M. prunifolia*. The use of the G935B9 map for trait analysis was checked by mapping the red leaf color trait heterozygous in the B.9 parent. Simple association analysis placed this trait in the same location as the

including physical location (chromosome and position in bps), mapped linkage group (LG), position in centi-Morgans (cM), segregation type, marker phase, and classification in JoinMap 4.1 format (Van Ooijen, 2011) are available in the Supplementary Tables. Although the great majority of mapped SNP markers mapped synchronously with the published 'Golden Delicious' physical map, 244 SNP (13.25%) did not match with the physical map. In addition, a greater map length (increased number of recombinations) was observed in B.9 than G.935 probably because G.935 is a result of an interspecific cross.

Fig. 5. Regression model obtained for the interaction between *Dw1* and *Dw2* in the G935B9 finished apple tree progeny where the main effects (*Dw1* and *Dw2*) and their interaction (*Dw1* × *Dw2*) were all statistically significant ($P < 0.0001$; $R^2 = 0.80$). Thanks to this model, it is therefore possible to predict with some certainty what dwarfing capacity each allelic combination may have. The model seems to be more predictive where either of the dwarfing loci are homozygous (the upper and lower parts of the curve) but less predictive where either or both loci are heterozygous.

Rni/MdMYB10 gene affecting apple anthocyanin production (Espley et al., 2006). These maps served the purpose of validating the effects and location of *Dw1* and *Dw2* in a different progeny and will continue to be a resource for understanding the genetic factors underlying more traits as more phenotypic measurements become available for clonally propagated seedlings of the same progeny.

Fig. 6. Genotypic means display of cumulative fruit production of G935B9 apple trees of the interaction between *Dw1* and *Dw2* loci. The heterozygote rootstocks for *Dw2* are the highest producers. With the exception of the *Dw1* non-dwarfing homozygote rootstocks, the *Dw1* allele constitution does not seem to affect the trends set by the *Dw2* allele constitution. Codes hh, hk, and kk are the same as in the JoinMap (Van Ooijen, 2011) and MapQTL software (Kyazma, Wageningen, The Netherlands); they are assigned to alleles contributed by both heterozygous (hk) and represent allele constitution of progenies possible in this cross. Allele “k” is dwarfing and allele “h” is normal.

We have identified a second dwarfing locus (*Dw2*) in apple rootstocks and investigated the relationship of two dwarfing loci with early-bearing induction on scions. The effect of these loci was validated in additional breeding populations and we constructed new high-density maps for apple rootstock progenies. We have also used this new information to construct a predictive model based on the allelic constitution at the dwarfing loci. This model will aid in the breeding process by helping predict progeny performance and efficient crosses. These findings are being used to increase the efficiency of the breeding program and to develop a predictive marker-assisted breeding system for apple rootstocks.

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Supplementary Table 1. Consensus genetic map of apple rootstock cross G935B9 developed with the RosBREED Infinium single nucleotide polymorphism (SNP) chip. SNP name, chip address, physical location [chromosome and position in base pairs (bp)] are according to Chagne et al. 2012. Mapped linkage group (LG), position in centi-Morgans (cM), segregation type, marker phase and classification are outputs from JoinMap 4.1 (Kryazma, Wageningen, The Netherlands) mapping software.

Single nucleotide polymorphism name									
Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification		
RosBREEDSNP_SNP_CT_31552040_Lg8_00246_MAF20_MDP0000230081_exon1	8	31552040	LG_01	0	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_CT_31576918_Lg8_MDP0000659362_MAF30_MDP0000659362_exon1	8	31576918	LG_01	0.713	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_AG_18706948_Lg11_00212_MAF10_MDP0000204530_exon1	11	18706948	LG_01	0.784	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_GA_31133782_Lg8_01576_MAF20_1643087_exon2	8	31133782	LG_01	3.84	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_GA_11499061_Lg1_01815_MAF30_516837_exon4	1	11499061	LG_01	3.872	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_CT_12194485_Lg1_00420_MAF40_1648508_exon1	1	12194485	LG_01	4.516	<nnxp>	{-0}	(nn,np)		
GDsnp02334	1	12355343	LG_01	4.516	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_TC_12356741_Lg1_02334_MAF20_1681645_exon3	1	12356741	LG_01	4.579	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_TC_12382050_Lg1_02334_MAF40_MDP0000219571_exon3	1	12382050	LG_01	5.071	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_AC_121548_Lg1_00288_MAF30_MDP0000151845_exon1	1	121548	LG_01	5.484	<hkxhk>	{11}	(hh,hk,kk)		
RosBREEDSNP_SNP_CT_2754910_Lg1_00370_MAF10_MDP0000147384_exon7	1	2754910	LG_01	5.484	<hkxhk>	{11}	(hh,hk,kk)		
GDsnp01815	1	11506001	LG_01	6.657	<hkxhk>	{00}	(hh,hk,kk)		
RosBREEDSNP_SNP_GA_13037789_Lg1_01494_MAF30_840712_exon1	1	13037789	LG_01	7.074	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_CT_13068176_Lg1_01494_MAF50_MDP0000298776_exon4	1	13068176	LG_01	7.079	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_CT_20598176_Lg11_01187_MAF10_561225_exon1	11	20598176	LG_01	7.854	<lmxl>	{-1}	(ll,lm)		
GDsnp01826	1	5262520	LG_01	7.858	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_AG_4746500_Lg1_MDP0000213515_MAF40_MDP0000213515_exon1	1	4746500	LG_01	7.886	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_AG_5237634_Lg1_01826_MAF20_1669688_exon1	1	5237634	LG_01	7.886	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_AG_8776668_Lg1_02428_MAF20_157084_exon1	1	8776668	LG_01	7.886	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_TC_18735096_Lg4_00148_MAF20_MDP0000252585_exon1	4	18735096	LG_01	7.886	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_TC_20579317_Lg11_01187_MAF10_1674826_exon2	11	20579317	LG_01	7.886	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_TC_3466990_Lg12_01391_MAF10_1661773_exon1	12	3466990	LG_01	7.886	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_AG_11508677_Lg1_01815_MAF50_1661682_exon1	1	11508677	LG_01	8.518	<hkxhk>	{01}	(hh,hk,kk)		
RosBREEDSNP_SNP_AC_11489706_Lg1_01815_MAF40_873112_exon1	1	11489706	LG_01	8.647	<hkxhk>	{10}	(hh,hk,kk)		
RosBREEDSNP_SNP_TC_9490105_Lg1_02580_MAF40_282950_exon1	1	9490105	LG_01	8.678	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_AG_11457267_Lg1_01815_MAF20_MDP0000120020_exon9	1	11457267	LG_01	8.815	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_GA_11485470_Lg1_01815_MAF20_864893_exon1	1	11485470	LG_01	8.815	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_CT_16623809_Lg1_02538_MAF50_MDP0000163421_exon1	1	16623809	LG_01	13.135	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_CT_16626073_Lg1_02538_MAF50_MDP0000518676_exon1	1	16626073	LG_01	13.175	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_CT_16653424_Lg1_02538_MAF40_MDP0000214470_exon2	1	16653424	LG_01	14.556	<nnxp>	{-0}	(nn,np)		
RosBREEDSNP_SNP_AG_14529153_Lg1_RosCOS2921_MAF30_59140_exon1	1	14529153	LG_01	15.436	<hkxhk>	{01}	(hh,hk,kk)		
RosBREEDSNP_SNP_TG_14148062_Lg1_01058_MAF10_1670627_exon2	1	14148062	LG_01	17.26	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_CT_14662213_Lg1_RosCOS1779_MAF30_MDP0000321450_exon1	1	14662213	LG_01	17.31	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_CT_20947388_Lg4_00686_MAF50_MDP0000716924_exon1	4	20947388	LG_01	17.939	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_TG_17880738_Lg1_00440_MAF20_944294_exon1	1	17880738	LG_01	18.053	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_TG_14699213_Lg1_RosCOS1779_MAF50_MDP0000321447_exon9	1	14699213	LG_01	18.187	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_CT_11829738_Lg8_MDP0000234975_MDP0000234975_exon1	8	11829738	LG_01	18.192	<lmxl>	{-1}	(ll,lm)		
RosBREEDSNP_SNP_CT_14708397_Lg1_RosCOS1779_MAF40_343966_exon1	1	14708397	LG_01	18.194	<lmxl>	{-0}	(ll,lm)		
RosBREEDSNP_SNP_AC_17882923_Lg1_00440_MAF40_1646533_exon1	1	17882923	LG_01	18.235	<nnxp>	{-1}	(nn,np)		
RosBREEDSNP_SNP_AG_17236158_Lg1_RosCOS3372_MAF30_45786_exon1	1	17236158	LG_01	18.248	<lmxl>	{-0}	(ll,lm)		

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_17912183_Lg1_00440_MAF40_1634418_exon1	39775364	1	17912183	LG_01	20.105	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_17921038_Lg1_00440_MAF50_527792_exon4	15791458	1	17921038	LG_01	20.105	<lmxl>	{0-}	(ll,lm)
GDsnp01783	67630329	1	18093626	LG_01	20.105	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_18056530_Lg1_01783_MAF30_1629293_exon3	51640501	1	18056530	LG_01	20.113	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_18084371_Lg1_01783_MAF20_1683854_exon4	49602437	1	18084371	LG_01	20.117	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_18064090_Lg1_01783_MAF50_708296_exon1	26758316	1	18064090	LG_01	22.128	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_18067488_Lg1_01783_MAF40_MDP00000211915_exon1	26698444	1	18067488	LG_01	22.128	<hkxhk>	{01}	(hh,hk,kk)
GDsnp02731	55664444	1	18836933	LG_01	22.897	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_18831803_Lg1_02731_MAF30_MDP0000147688_exon19	40771309	1	18831803	LG_01	23.547	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_18794918_Lg1_02731_MAF30_1632516_exon5	36627391	1	18794918	LG_01	23.693	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_18791535_Lg1_02731_MAF40_MDP0000186097_exon1	15744431	1	18791535	LG_01	23.818	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_20951649_Lg1_02302_MAF50_MDP00000470227_exon1	54628460	1	20951649	LG_01	26.021	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_19399012_Lg11_01878_MAF30_MDP00000215073_exon3	21810423	11	19399012	LG_01	26.021	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_25721098_Lg1_00087_MAF10_755773_exon1	56657451	1	25721098	LG_01	33.233	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_35787897_Lg1_241489_MAF30_241489_exon1	10792367	1	35787897	LG_01	35.559	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_21289759_Lg1_02518_MAF20_1636950_exon6	24690385	1	21289759	LG_01	35.888	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_21327009_Lg1_02518_MAF40_1678261_exon1	67646447	1	21327009	LG_01	36.192	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_21291785_Lg1_02518_MAF30_1687981_exon1	11603479	1	21291785	LG_01	36.34	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_4050147_Lg15_snpeB134400_MAF20_667091_exon1	62733463	15	4050147	LG_01	36.733	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_23134240_Lg1_109586_109586_exon1	64655475	1	23134240	LG_01	36.851	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_26262680_Lg1_00674_MAF40_1669479_exon3	30670495	1	26262680	LG_01	37.613	<lmxl>	{0-}	(ll,lm)
GDsnp00107	58709489	1	16499097	LG_01	44.799	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_27060614_Lg1_01693_MAF40_1665698_exon2	41743302	1	27060614	LG_01	45.089	<lmxl>	{1-}	(ll,lm)
GDsnp01693	72620371	1	27104702	LG_01	45.089	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_26734911_Lg1_01228_MAF50_MDP0000236938_exon8	50699506	1	26734911	LG_01	45.949	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_26763910_Lg1_01228_MAF40_855624_exon1	18623469	1	26763910	LG_01	47.675	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_26743462_Lg1_01228_MAF20_477610_exon1	23600428	1	26743462	LG_01	47.825	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_27108076_Lg1_01693_MAF30_172317_exon1	40632494	1	27108076	LG_01	50.654	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_27095198_Lg1_01693_MAF30_332314_exon1	61628500	1	27095198	LG_01	50.669	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_30192576_Lg1_CXE4_MAF20_1677085_exon1	46667499	1	30192576	LG_01	50.798	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_29158464_Lg1_10005_MAF40_519911_exon1	62765365	1	29158464	LG_01	54.376	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_31359482_Lg1_327822_MAF50_327822_exon5	62680312	1	31359482	LG_01	55.593	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_30217061_Lg1_CXE4_MAF40_MDP00000318149_exon1	38703490	1	30217061	LG_01	56.233	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_3176288_Lg1_325795_MAF20_325795_exon2	24646449	1	3176288	LG_01	56.903	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_31626705_Lg1_00583_MAF40_MDP0000288458_exon4	25782415	1	31626705	LG_01	56.925	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_31945251_Lg1_RosCOS2794_MAF40_1665084_exon1	27680463	1	31945251	LG_01	56.992	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_33651725_Lg1_01371_MAF30_328158_exon1	46701303	1	33651725	LG_01	57.598	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_33707916_Lg1_01371_MAF10_1658573_exon3	23798330	1	33707916	LG_01	57.598	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_31359569_Lg1_327822_327822_exon5	15650404	1	31359569	LG_01	57.689	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31642444_Lg1_00583_MAF50_178942_exon1	24603461	1	31642444	LG_01	57.689	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31657598_Lg1_00583_MAF40_422699_exon1	62737432	1	31657598	LG_01	57.689	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31681861_Lg1_00583_MAF30_1623756_exon3	68676466	1	31681861	LG_01	57.689	<nnxnp>	{-0}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_31941783_Lg1_RosCOS2794_MAF10_1683106_exon1	15730397	1	31941783	LG_01	57.689	<nnxp>	{-1}	(nn,np)
GDsnp01371	73769397	1	33685381	LG_01	57.689	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33699826_Lg1_01371_MAF10_MDP0000282836_exon15	27729457	1	33699826	LG_01	57.689	<nnxp>	{-1}	(nn,np)
MdBF7b	74793304	1	31715446	LG_01	57.699	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30494924_Lg1_250444_250444_exon2	62689486	1	30494924	LG_01	57.975	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_33682524_Lg1_01371_MAF20_74867_exon1	24641485	1	33682524	LG_01	57.994	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_30590177_Lg1_136617_MAF30_136617_exon1	15719450	1	30590177	LG_01	58.317	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_35468899_Lg1_02092_MAF50_138030_exon2	69628320	1	35468899	LG_01	62.052	<hxxhk>	{01}	(hh,hk,kk)
GDsnp00583	69623352	1	31661465	LG_01	62.207	<hxxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_35192538_Lg1_00495_MAF30_MDP0000302199_exon5	36798370	1	35192538	LG_01	62.42	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_35251020_Lg1_00495_MAF50_1650375_exon3	64663358	1	35251020	LG_01	62.42	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_35422934_Lg1_02092_MAF20_7047_exon1	14729490	1	35422934	LG_01	62.913	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_34439805_Lg1_02371_MAF40_MDP0000282186_exon3	14734448	1	34439805	LG_01	64.073	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_34453757_Lg1_02371_MAF20_MDP0000286439_exon1	28753354	1	34453757	LG_01	64.073	<hxxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_34470881_Lg1_02371_MAF20_566613_exon1	28613460	1	34470881	LG_01	64.073	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_34487221_Lg1_02371_MAF10_MDP0000194123_exon7	20748506	1	34487221	LG_01	64.073	<hxxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_34421998_Lg1_19307_19307_exon2	68701501	1	34421998	LG_01	64.102	<hxxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_34510440_Lg1_02371_MAF50_1642607_exon7	40769392	1	34510440	LG_01	64.603	<hxxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_35202609_Lg1_00495_MAF50_361322_exon1	21796446	1	35202609	LG_01	64.709	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_35621874_Lg1_MDP0000950316_MAF20_MDP0000950316_exon17	67772458	1	35621874	LG_01	66.478	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_30208839_Lg8_01764_MAF10_MDP0000273337_exon1	53667471	8	30208839	LG_01	66.478	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_35195077_Lg1_00495_MAF20_MDP0000302199_exon8	69714462	1	35195077	LG_01	66.536	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_35197485_Lg1_00495_MAF10_1665417_exon1	53720472	1	35197485	LG_01	66.536	<nnxp>	{-1}	(nn,np)
GDsnp00495	62800487	1	35210132	LG_01	66.58	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_35428600_Lg1_02092_MAF40_1632735_exon1	64684313	1	35428600	LG_01	67.452	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_1229074_Lg2_01134_MAF10_1625597_exon3	14794322	2	1229074	LG_02	-0.013	<hxxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_1260672_Lg2_01134_MAF40_1677893_exon1	26643452	2	1260672	LG_02	0	<hxxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_1272762_Lg2_01134_MAF50_617054_exon1	18714491	2	1272762	LG_02	0	<hxxhk>	{00}	(hh,hk,kk)
GDsnp01134	71808404	2	1273320	LG_02	0	<hxxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_1958621_Lg2_AAT1_MAF20_1677156_exon1	72782319	2	1958621	LG_02	0.349	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_1926287_Lg2_01735_MAF50_1659427_exon1	43709480	2	1926287	LG_02	0.436	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1910740_Lg2_01735_MAF10_458777_exon1	15602314	2	1910740	LG_02	0.625	<nnxp>	{-0}	(nn,np)
GDsnp01565	59791371	2	2436335	LG_02	1.107	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1908444_Lg2_01735_MAF50_979810_exon1	43785376	2	1908444	LG_02	1.185	<hxxhk>	{11}	(hh,hk,kk)
snpCO903605	51810358	2	1582965	LG_02	1.722	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CA_1966785_Lg2_AAT1_MAF30_262653_exon1	11717484	2	1966785	LG_02	2.096	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_3303584_Lg2_RosCOS1998_MAF30_1632534_exon4	10790360	2	3303584	LG_02	2.226	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2425858_Lg2_01565_MAF50_1673213_exon1	18748487	2	2425858	LG_02	2.627	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_2504650_Lg2_00959_MAF30_MDP0000305192_exon3	64618441	2	2504650	LG_02	3.616	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_2607533_Lg2_226032_MAF30_226032_exon1	52682461	2	2607533	LG_02	3.909	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_3273690_Lg2_RosCOS1998_MAF30_67740_exon1	50790416	2	3273690	LG_02	4.466	<hxxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_3307093_Lg2_RosCOS1998_MAF50_MDP000022416_exon8	31801427	2	3307093	LG_02	6.19	<lmxl>	{0}	(ll,lm)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_3420282_Lg2_01641_MAF40_1669340_exon1	15608413	2	3420282	LG_02	6.706	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_3428296_Lg2_01641_MAF50_MDP000024420_exon9	74782509	2	3428296	LG_02	6.706	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_4012052_Lg2_01476_MAF30_143988_exon1	15673500	2	4012052	LG_02	7.945	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_4085993_Lg2_01476_MAF10_MDP0000283614_exon4	28761398	2	4085993	LG_02	7.945	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3463154_Lg2_01641_MAF30_MDP0000943030_exon1	70728304	2	3463154	LG_02	8.252	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_4030165_Lg2_01476_MAF50_MDP0000298759_exon1	70789446	2	4030165	LG_02	9.795	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_3753597_Lg2_127385_exon2	73806331	2	3753597	LG_02	10.047	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_4176344_Lg2_00203_MAF50_1638544_exon5	16637486	2	4176344	LG_02	10.385	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_4183020_Lg2_00203_MAF40_1638035_exon3	32727308	2	4183020	LG_02	10.385	<hkxhk>	{11}	(hh,hk,kk)
GDsnp01476	57763304	2	4053400	LG_02	11.447	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4194273_Lg2_00203_MAF30_436930_exon1	14758473	2	4194273	LG_02	12.474	<lmxll>	{0-}	(ll,lm)
GDsnp00203	39757346	2	4208469	LG_02	12.474	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4215730_Lg2_00203_MAF30_1629274_exon2	57660314	2	4215730	LG_02	12.474	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4445083_Lg2_RosCOS2816_MAF50_1649480_exon3	32751356	2	4445083	LG_02	15.305	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4554201_Lg2_MDP0000519575_MAF20_MDP0000519575_exon1	17736492	2	4554201	LG_02	19.365	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_4554235_Lg2_MDP0000519575_MAF20_MDP0000519575_exon1	29744415	2	4554235	LG_02	19.456	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_5929140_Lg2_01663_MAF30_MDP0000144357_exon3	67805339	2	5929140	LG_02	21.339	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_5868090_Lg2_01663_MAF40_265196_exon1	32640440	2	5868090	LG_02	21.411	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_10706980_Lg2_01223_MAF40_MDP0000288614_exon11	59670326	2	10706980	LG_02	24.015	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_6261234_Lg2_00308_MAF40_MDP0000292425_exon4	52802372	2	6261234	LG_02	24.382	<lmxll>	{0-}	(ll,lm)
GDsnp00308	23604451	2	6305841	LG_02	24.387	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6266265_Lg2_00308_MAF40_1675094_exon1	63696478	2	6266265	LG_02	24.394	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_6290792_Lg2_00308_MAF20_596831_exon1	41729498	2	6290792	LG_02	24.394	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6306962_Lg2_00308_MAF50_1623248_exon5	64737359	2	6306962	LG_02	24.394	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_6477411_Lg2_01162_MAF20_147931_exon1	61804485	2	6477411	LG_02	26.303	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6473341_Lg2_01162_MAF40_1639321_exon2	35799300	2	6473341	LG_02	26.321	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_6522059_Lg2_01162_MAF50_MDP0000125143_exon6	10767406	2	6522059	LG_02	28.169	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_10678809_Lg2_01223_MAF30_1669670_exon1	66653322	2	10678809	LG_02	28.546	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_7255188_Lg2_00505_MAF50_571945_exon1	74762311	2	7255188	LG_02	31.085	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_7302620_Lg2_RosCOS718_MAF20_1672533_exon2	51734503	2	7302620	LG_02	31.325	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_7276626_Lg2_00505_MAF20_1623305_exon9	42792452	2	7276626	LG_02	31.398	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_7279497_Lg2_00505_MAF20_MDP0000886637_exon4	48804386	2	7279497	LG_02	31.398	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_11451663_Lg2_00159_MAF50_331702_exon1	22780311	2	11451663	LG_02	31.772	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_11438433_Lg2_00159_MAF50_1633417_exon7	49804437	2	11438433	LG_02	31.817	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_11509973_Lg2_01005_MAF30_504806_exon3	73644317	2	11509973	LG_02	31.817	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_8922212_Lg2_00407_MAF40_779714_exon1	40709422	2	8922212	LG_02	32.256	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_8931588_Lg2_00407_MAF20_1644091_exon1	62635302	2	8931588	LG_02	32.326	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_8936738_Lg2_00407_MAF50_483435_exon1	72656346	2	8936738	LG_02	32.326	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_10654569_Lg2_01223_MAF40_MDP0000265378_exon1	70603487	2	10654569	LG_02	32.326	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_10700420_Lg2_01223_MAF30_693524_exon1	67608468	2	10700420	LG_02	32.326	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_11512294_Lg2_01005_MAF50_791189_exon1	55700393	2	11512294	LG_02	32.771	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_11777704_Lg2_00614_MAF40_1665749_exon5	60674473	2	11777704	LG_02	33.691	<nnxnp>	{-0}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_11972340_Lg2_RosCOS2709_MAF40_889572_exon1	62774468	2	11972340	LG_02	33.691	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_11998839_Lg2_RosCOS2709_MAF50_1680670_exon1	55707437	2	11998839	LG_02	33.691	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_11799850_Lg2_00614_MAF50_MDP0000175404_exon2	30697465	2	11799850	LG_02	36.566	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_11993525_Lg2_RosCOS2709_MAF10_163123_exon1	41603501	2	11993525	LG_02	36.824	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_12903929_Lg2_01552_MAF30_1660471_exon1	53644428	2	12903929	LG_02	37.326	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_12926120_Lg2_01552_MAF50_683506_exon1	65764459	2	12926120	LG_02	37.331	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_12942637_Lg2_01552_MAF50_MDP0000683486_exon1	67741392	2	12942637	LG_02	37.331	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13641108_Lg2_00214_MAF40_MDP0000281231_exon6	73671392	2	13641108	LG_02	37.971	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13651288_Lg2_00214_MAF50_MDP0000131675_exon2	40758446	2	13651288	LG_02	38.038	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_13673501_Lg2_00214_MAF30_MDP0000235958_exon9	54733370	2	13673501	LG_02	39.045	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_12933833_Lg2_01552_MAF40_1644477_exon4	71739412	2	12933833	LG_02	39.626	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_13921344_Lg2_248148_exon1	18687458	2	13921344	LG_02	40.113	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_11409481_Lg2_00159_MAF20_MDP0000320576_exon13	24725474	2	11409481	LG_02	40.871	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_11505111_Lg2_01005_MAF40_1655071_exon2	48691442	2	11505111	LG_02	40.871	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_14500796_Lg2_00002_MAF50_1621685_exon5	61746331	2	14500796	LG_02	41.554	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_14571102_Lg2_00987_MAF50_85433_exon1	26686453	2	14571102	LG_02	41.596	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14478242_Lg2_00002_MAF40_MDP0000805105_exon1	38788390	2	14478242	LG_02	41.737	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_14599407_Lg2_00987_MAF40_375341_exon1	11653475	2	14599407	LG_02	41.754	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_14581355_Lg2_00987_MAF50_517545_exon1	60729437	2	14581355	LG_02	43.337	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_15230080_Lg2_00222_MAF40_1630459_exon1	74748488	2	15230080	LG_02	43.734	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_16177297_Lg2_01309_MAF50_330377_exon1	62661305	2	16177297	LG_02	44.529	<nnxp>	{-0}	(nn,np)
GDsnp00222	38759371	2	15229760	LG_02	45.791	<hkxhk>	{00}	(hh,hk,kk)
GDsnp01309	50671434	2	16224102	LG_02	46.77	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_14503620_Lg2_00002_MAF50_180022_exon1	41803343	2	14503620	LG_02	47.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_14524819_Lg2_00002_MAF20_493559_exon1	12770349	2	14524819	LG_02	47.412	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_17179731_Lg2_327287_MAF30_327287_exon1	42773403	2	17179731	LG_02	48.273	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17179364_Lg2_327287_MAF40_327287_exon1	55679385	2	17179364	LG_02	48.456	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_17179555_Lg2_327287_MAF30_327287_exon1	37707367	2	17179555	LG_02	48.456	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_18003967_Lg2_325713_MAF20_325713_exon3	68806421	2	18003967	LG_02	49.752	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18004558_Lg2_72623_MAF40_72623_exon1	54801314	2	18004558	LG_02	49.764	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18005006_Lg2_325713_MAF20_325713_exon1	26803394	2	18005006	LG_02	50.072	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_18005035_Lg2_325713_MAF40_325713_exon1	14707497	2	18005035	LG_02	50.182	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18843281_Lg2_02651_MAF20_1673395_exon1	43680442	2	18843281	LG_02	54.097	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_18785188_Lg2_02076_MAF10_MDP0000141906_exon1	47785311	2	18785188	LG_02	54.158	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_18848241_Lg2_02651_MAF30_1636407_exon1	17276320	2	18848241	LG_02	54.182	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_19261463_Lg2_00934_MAF20_1667145_exon5	21766467	2	19261463	LG_02	54.182	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_18840569_Lg2_02651_MAF40_MDP0000799945_exon3	13620489	2	18840569	LG_02	54.646	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_18746181_Lg2_02076_MAF20_MDP0000178428_exon1	18694438	2	18746181	LG_02	54.658	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18882549_Lg2_02651_MAF50_MDP0000535127_exon1	65738462	2	18882549	LG_02	54.658	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18837099_Lg2_02651_MAF30_426760_exon2	57739455	2	18837099	LG_02	54.661	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_18748787_Lg2_02076_MAF20_MDP0000274383_exon1	67693316	2	18748787	LG_02	54.673	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_19239039_Lg2_00934_MAF30_1661651_exon1	11744469	2	19239039	LG_02	55.508	<nnxp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00934	49609472	2	19288490	LG_02	55.508	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_19320246_Lg2_00934_MAF40_MDP0000226838_exon3	53614419	2	19320246	LG_02	55.508	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19323566_Lg2_00934_MAF40_MDP0000226838_exon8	73665352	2	19323566	LG_02	55.508	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_19557571_Lg2_01840_MAF30_1661441_exon2	56785401	2	19557571	LG_02	55.508	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19258873_Lg2_00934_MAF30_MDP0000306825_exon1	70769379	2	19258873	LG_02	55.519	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_18979012_Lg2_MDP0000488361_MAF30_MDP00000488361_exon5	66668382	2	18979012	LG_02	55.521	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_24744626_Lg2_00833_MAF50_MDP0000263007_exon1	62696485	2	24744626	LG_02	56.984	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_23924101_Lg2_327954_327954_exon1	65727496	2	23924101	LG_02	57.014	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_30237440_Lg1_CXE4_MAF50_526206_exon1	52613482	1	30237440	LG_02	57.28	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_24105532_Lg2_MDP0000136940_MAF30_MDP0000136940_exon2	35807436	2	24105532	LG_02	57.28	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_32112556_Lg2_00022_MAF20_1651674_exon1	26805404	2	32112556	LG_02	57.881	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_30314379_Lg2_01251_MAF50_MDP0000246555_exon1	74770385	2	30314379	LG_02	57.903	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_24821574_Lg2_00833_MAF40_MDP0000316384_exon1	40757444	2	24821574	LG_02	58.009	<lmxl>	{-0}	(ll,lm)
GDsnp00092	24772322	2	26385906	LG_02	58.009	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_30846147_Lg2_261916_261916_exon2	51694483	2	30846147	LG_02	58.009	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_23095096_Lg2_RosCOS292_MAF40_1643572_exon1	27738469	2	23095096	LG_02	58.213	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_23091711_Lg2_RosCOS292_MAF50_1635004_exon3	42731359	2	23091711	LG_02	58.225	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_32152313_Lg2_00022_MAF30_13530_exon1	57736499	2	32152313	LG_02	59.027	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_24747820_Lg2_00833_MAF30_45322_exon1	64629302	2	24747820	LG_02	59.065	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_29827721_Lg2_MDP0000556302_MAF30_MDP0000556302_exon1	64726320	2	29827721	LG_02	60.482	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_33013805_Lg2_02223_MAF40_MDP0000310234_exon6	58714317	2	33013805	LG_02	60.829	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_25674246_Lg2_01935_MAF40_1688931_exon1	12745385	2	25674246	LG_02	60.956	<nnxp>	{-0}	(nn,np)
GDsnp01251	26771477	2	30347457	LG_02	62.162	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_29828059_Lg2_MDP0000556302_MAF30_MDP0000556302_exon1	17607411	2	29828059	LG_02	63.684	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_30846235_Lg2_263337_MAF20_263337_exon2	11756382	2	30846235	LG_02	63.684	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27303643_Lg2_02271_MAF40_MDP0000305756_exon1	24738399	2	27303643	LG_02	63.687	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_32997136_Lg2_02223_MAF20_570205_exon1	53602438	2	32997136	LG_02	64.645	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_36478711_Lg2_00669_MAF10_MDP0000164775_exon2	15790426	2	36478711	LG_02	65.429	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_32171222_Lg2_00022_MAF40_980613_exon1	54720340	2	32171222	LG_02	66.412	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32203002_Lg2_00022_MAF50_MDP0000225372_exon1	10781420	2	32203002	LG_02	66.445	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_36195544_Lg2_00914_MAF30_MDP0000491083_exon10	63808393	2	36195544	LG_02	67.016	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_36217156_Lg2_00914_MAF50_266158_exon1	64622435	2	36217156	LG_02	67.078	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_34225113_Lg2_00624_MAF40_1624980_exon2	28772426	2	34225113	LG_02	67.288	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_34233785_Lg2_00624_MAF20_983148_exon1	36616498	2	34233785	LG_02	67.315	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_32854243_Lg2_MDP0000185319_MAF20_MDP0000185319_exon1	10606450	2	32854243	LG_02	67.641	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32854273_Lg2_MDP0000185319_MAF20_MDP0000185319_exon1	20756349	2	32854273	LG_02	67.641	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32974291_Lg2_02223_MAF30_283352_exon1	52677313	2	32974291	LG_02	68.057	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_33290900_Lg2_00629_MAF50_534007_exon1	71697489	2	33290900	LG_02	68.58	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_39497984_Lg2_00167_MAF50_1631668_exon6	13774415	2	39497984	LG_02	71.513	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_39526012_Lg2_00167_MAF50_1641137_exon4	24776309	2	39526012	LG_02	71.513	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_40079809_Lg2_02535_MAF50_1678854_exon4	57660467	2	40079809	LG_02	71.513	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_39558990_Lg2_00167_MAF30_MDP0000471340_exon1	14633463	2	39558990	LG_02	72.255	<lmxl>	{-0}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_36462247_Lg2_00669_MAF50_262678_exon2	52770303	2	36462247	LG_02	73.441	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_34194147_Lg2_RosCOS2050_MAF50_838967_exon2	64663399	2	34194147	LG_02	73.89	<nnxnp>	{-0}	(nn,np)
GDsnp01349	66754504	2	33913022	LG_02	74.044	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_39505783_Lg2_00167_MAF20_MDP0000862491_exon1	43681481	2	39505783	LG_02	75.771	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_39010781_Lg2_00995_MAF50_262964_exon3	28627463	2	39010781	LG_02	76.156	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_39014029_Lg2_00995_MAF50_MDP0000215541_exon1	19758317	2	39014029	LG_02	76.277	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_38921890_Lg2_00995_MAF20_520403_exon1	30790456	2	38921890	LG_02	76.492	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_37999186_Lg2_10007_MAF30_514932_exon1	17692496	2	37999186	LG_02	76.705	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_35458744_Lg2_00267_MAF30_MDP0000279745_exon2	53797492	2	35458744	LG_02	77.466	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_35487462_Lg2_00267_MAF50_MDP0000296536_exon3	72666424	2	35487462	LG_02	77.466	<nnxnp>	{-0}	(nn,np)
GDsnp00624	44772491	2	34271311	LG_02	77.813	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2465980_Lg3_RosCOS1398_MAF40_MDP0000299171_exon7	34619461	3	2465980	LG_03	0	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17380823_Lg6_RosCOS414_MAF20_1680701_exon1	48696448	6	17380823	LG_03	13.296	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_705112_Lg3_RosCOS2149_MAF30_1661159_exon2	60761415	3	705112	LG_03	13.321	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_721363_Lg3_RosCOS2149_MAF30_887355_exon2	38622432	3	721363	LG_03	13.321	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_17417078_Lg6_RosCOS414_MAF10_553681_exon1	51747331	6	17417078	LG_03	13.321	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_994373_Lg3_00506_MAF40_MDP0000137429_exon1	40747438	3	994373	LG_03	14.645	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_1101058_Lg3_00866_MAF40_1635871_exon1	55774385	3	1101058	LG_03	15.027	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1024417_Lg3_00506_MAF20_MDP0000302259_exon1	62732503	3	1024417	LG_03	15.043	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1105743_Lg3_00866_MAF20_1662285_exon1	35764406	3	1105743	LG_03	15.043	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1951063_Lg3_RosCOS1698_MAF40_482829_exon1	73602402	3	1951063	LG_03	15.828	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_1607374_Lg3_EH034548_MAF20_1638462_exon1	68695307	3	1607374	LG_03	16.436	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_1625242_Lg3_EH034548_MAF20_1688644_exon1	11691463	3	1625242	LG_03	16.642	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_1646354_Lg3_EH034548_MAF50_1686875_exon1	62786465	3	1646354	LG_03	16.642	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1741931_Lg3_EBI40229_MAF40_MDP0000190972_exon3	54642347	3	1741931	LG_03	16.642	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1142062_Lg3_00866_MAF50_MDP0000268101_exon2	39792373	3	1142062	LG_03	16.941	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_690435_Lg3_RosCOS2149_MAF40_1683552_exon3	65706379	3	690435	LG_03	17.058	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_693011_Lg3_RosCOS2149_MAF50_30133_exon2	38740304	3	693011	LG_03	17.058	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_725753_Lg3_RosCOS2149_MAF50_464828_exon1	63608434	3	725753	LG_03	17.058	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_17378070_Lg6_RosCOS414_MAF50_1662541_exon2	70612438	6	17378070	LG_03	17.058	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_2627039_Lg3_02300_MAF20_MDP0000206447_exon4	43739486	3	2627039	LG_03	18.007	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_3455475_Lg11_01167_MAF30_MDP0000377782_exon2	20808318	11	3455475	LG_03	18.127	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2659646_Lg3_02300_MAF40_1678362_exon5	70637401	3	2659646	LG_03	18.354	<hkxhk>	{10}	(hh,hk,kk)
GDsnp02300	65800314	3	2634665	LG_03	18.684	<hkxhk>	{01}	(hh,hk,kk)
GDsnp00124	60781306	3	3863841	LG_03	23.816	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_6181881_Lg3_00073_MAF10_1646857_exon1	54688371	3	6181881	LG_03	27.51	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6539382_Lg3_01921_MAF30_1666387_exon1	47786364	3	6539382	LG_03	30.293	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6578401_Lg3_01921_MAF30_1638332_exon1	71683390	3	6578401	LG_03	30.321	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_6563127_Lg3_01921_MAF20_1676724_exon4	31736403	3	6563127	LG_03	30.351	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5923532_Lg3_01263_MAF30_1677920_exon1	37606419	3	5923532	LG_03	30.71	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_7178316_Lg3_01493_MAF30_1666882_exon4	53800494	3	7178316	LG_03	31.247	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_9987791_Lg9_02031_MAF20_1656683_exon2	55610327	9	9987791	LG_03	31.247	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_6242616_Lg3_00073_MAF30_1679536_exon2	70758337	3	6242616	LG_03	31.745	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6561113_Lg3_01921_MAF40_962276_exon1	45660485	3	6561113	LG_03	31.745	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_7146440_Lg3_01493_MAF20_MDP0000315272_exon4	58602319	3	7146440	LG_03	32.682	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_7157009_Lg3_01493_MAF20_1685346_exon2	53676423	3	7157009	LG_03	32.71	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_8503130_Lg3_RosCOS3572_MAF40_6179_exon1	10806479	3	8503130	LG_03	35.489	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_9104035_Lg3_RosCOS449_MAF40_MDP0000739342_exon1	50688474	3	9104035	LG_03	35.558	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_9121744_Lg3_RosCOS449_MAF10_491206_exon2	74663437	3	9121744	LG_03	36.524	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_9464559_Lg3_02195_MAF10_1626126_exon1	58634482	3	9464559	LG_03	36.524	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_9099550_Lg3_RosCOS449_MAF20_MDP00001941114_exon8	72796312	3	9099550	LG_03	36.801	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_9532664_Lg3_02195_MAF50_MDP0000680806_exon1	27641466	3	9532664	LG_03	37.5	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_9544220_Lg3_02195_MAF50_1685314_exon2	17782460	3	9544220	LG_03	37.5	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9966749_Lg3_01990_MAF10_266458_exon1	45622486	3	9966749	LG_03	38.48	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_9091637_Lg3_RosCOS449_MAF40_1667685_exon1	54664344	3	9091637	LG_03	38.587	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_10518958_Lg3_00194_MAF10_109422_exon1	73645386	3	10518958	LG_03	42.933	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_10537812_Lg3_00194_MAF30_436195_exon1	65714432	3	10537812	LG_03	42.939	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_28402636_Lg15_RosCOS3315_MAF20_467121_exon1	54749450	15	28402636	LG_03	44.607	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_10540206_Lg3_00194_MAF20_346466_exon1	41662497	3	10540206	LG_03	44.923	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11552808_Lg3_02220_MAF20_MDP0000197315_exon2	56790306	3	11552808	LG_03	46.707	<lmxl>	{1-}	(ll,lm)
GDsnp02220	38750440	3	11554199	LG_03	47.206	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_11949117_Lg3_01885_MAF20_1678957_exon1	18755406	3	11949117	LG_03	47.723	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_11994788_Lg3_01885_MAF30_511837_exon1	26677466	3	11994788	LG_03	47.723	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_12744729_Lg3_02020_MAF20_1619446_exon9	59713479	3	12744729	LG_03	51.698	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_27149833_Lg3_01487_MAF20_MDP0000289672_exon3	10754444	3	27149833	LG_03	54.925	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_27212656_Lg3_01487_MAF30_45401_exon1	12732359	3	27212656	LG_03	54.925	<nnxnp>	{-0}	(nn,np)
GDsnp01124	67805381	3	14444935	LG_03	56.144	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_14445035_Lg3_01124_MAF50_530134_exon1	42765445	3	14445035	LG_03	56.153	<lmxl>	{1-}	(ll,lm)
GDsnp02804	37600458	3	18982239	LG_03	60.959	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_18396097_Lg3_02690_MAF30_MDP0000659822_exon2	37794356	3	18396097	LG_03	60.964	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_18978889_Lg3_02804_MAF50_501695_exon2	16771506	3	18978889	LG_03	60.964	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_23257985_Lg3_snpEB148130_MAF40_MDP0000171430_exon1	65651332	3	23257985	LG_03	60.964	<lmxl>	{0-}	(ll,lm)
snpEB148130	55781376	3	23307024	LG_03	60.964	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_23354406_Lg3_00663_MAF30_396803_exon1	67608440	3	23354406	LG_03	60.964	<lmxl>	{1-}	(ll,lm)
GDsnp01728	11658464	3	24142722	LG_03	60.964	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_24158738_Lg3_01728_MAF30_MDP0000161781_exon1	59694308	3	24158738	LG_03	60.964	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_24169409_Lg3_01728_MAF20_MDP0000142667_exon1	47794344	3	24169409	LG_03	60.964	<lmxl>	{0-}	(ll,lm)
GDsnp02644	70709458	3	22040001	LG_03	60.986	<lmxl>	{0-}	(ll,lm)
GDsnp01487	15640410	3	27191675	LG_03	62.537	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_25471087_Lg3_00278_MAF20_267651_exon1	45782423	3	25471087	LG_03	62.764	<lmxl>	{1-}	(ll,lm)
GDsnp00278	56708476	3	25513271	LG_03	64.572	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_25875765_Lg3_01642_MAF30_616296_exon1	11696389	3	25875765	LG_03	64.572	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_25896512_Lg3_01642_MAF30_MDP0000239694_exon1	56693318	3	25896512	LG_03	64.572	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_25900349_Lg3_01642_MAF50_1642190_exon4	23804421	3	25900349	LG_03	64.572	<lmxl>	{1-}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_8416086_Lg11_00185_MAF30_MDP0000729342_exon1	11	8416086	LG_03	65.276	<nnxp>	{-0}	(nn,np)
GDsnp01969	3	29651033	LG_03	65.624	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_29881269_Lg3_01604_MAF20_705158_exon1	3	29881269	LG_03	66.401	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_29953702_Lg3_01937_MAF20_411765_exon1	3	29953702	LG_03	66.401	<lmxl>	{-1}	(ll,lm)
GDsnp01937	3	29957246	LG_03	66.401	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_29674295_Lg3_01969_MAF50_919825_exon1	3	29674295	LG_03	67.685	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_29678862_Lg3_01969_MAF10_1631032_exon3	3	29678862	LG_03	67.685	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29843361_Lg3_01604_MAF50_1651320_exon3	3	29843361	LG_03	67.685	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29946084_Lg3_01937_MAF50_1629511_exon2	3	29946084	LG_03	68.538	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_31143040_Lg3_01779_MAF50_MDP0000140211_exon2	3	31143040	LG_03	70.343	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_34439805_Lg3_02030_MAF50_1676194_exon1	3	34439805	LG_03	72.976	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_34442034_Lg3_02030_MAF40_MDP0000149890_exon2	3	34442034	LG_03	72.976	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_36475074_Lg3_RosCOSI799_MAF30_MDP0000264703_exon3	3	36475074	LG_03	73.421	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_36483536_Lg3_RosCOSI799_MAF40_107803_exon1	3	36483536	LG_03	74.77	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_31543437_Lg3_MDP0000678562_MAF40_MDP0000678562_exon1	3	31543437	LG_03	75.482	<nnxp>	{-0}	(nn,np)
RosBREED_SNP_TC_32129472_Lg3	3	32129472	LG_03	77.82	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_37069303_Lg3_00664_MAF40_MDP0000320472_exon4	3	37069303	LG_03	78.488	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_37087735_Lg3_00664_MAF40_83350_exon1	3	37087735	LG_03	79.066	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_34459777_Lg3_02030_MAF40_MDP0000286021_exon3	3	34459777	LG_03	80.489	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_3321359_Lg3_01667_MAF10_MDP0000169320_exon2	3	3321359	LG_03	83.214	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_33641386_Lg3_01014_MAF10_401159_exon1	3	33641386	LG_03	84.819	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33676570_Lg3_01014_MAF50_1683154_exon2	3	33676570	LG_03	86.055	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_33703347_Lg3_01014_MAF10_1641371_exon1	3	33703347	LG_03	86.09	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_34431436_Lg3_02030_MAF20_MDP0000155220_exon12	3	34431436	LG_03	86.09	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_36486314_Lg3_RosCOSI799_MAF40_MDP0000794885_exon4	3	36486314	LG_03	89.507	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_37496618_Lg3_01822_MAF20_377044_exon1	3	37496618	LG_03	96.138	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_37545191_Lg3_01822_MAF30_263823_exon1	3	37545191	LG_03	96.138	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_38255070_Lg3_snpCN897901_MAF50_405974_exon1	3	38255070	LG_03	96.992	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_38273471_Lg3_snpCN897901_MAF50_1683481_exon5	3	38273471	LG_03	96.992	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_38265327_Lg3_snpCN897901_MAF20_146428_exon2	3	38265327	LG_03	97.038	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_38459727_Lg3_00319_MAF40_MDP0000278460_exon11	3	38459727	LG_03	97.872	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33128436_Lg14_00023_MAF20_MDP0000702770_exon1	14	33128436	LG_03	98.752	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_16809725_Lg9_MDP0000300208_MAF40_MDP0000300208_exon1	9	16809725	LG_04	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_16979476_Lg9_01648_MAF20_MDP0000195966_exon1	9	16979476	LG_04	0.597	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_17000017_Lg9_01648_MAF20_MDP0000386963_exon1	9	17000017	LG_04	0.63	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_17012386_Lg9_01648_MAF50_53337_exon1	9	17012386	LG_04	1.074	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_17039375_Lg9_01648_MAF50_MDP0000272132_exon5	9	17039375	LG_04	1.074	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_15422057_Lg9_Hi01e10_MAF10_MDP0000131856_exon2	9	15422057	LG_04	2.95	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_15369270_Lg9_Hi01e10_MAF20_393145_exon1	9	15369270	LG_04	2.991	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_4864606_Lg17_02703_MAF10_MDP0000309549_exon1	17	4864606	LG_04	2.991	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_3124108_Lg15_01814_MAF40_448082_exon3	15	3124108	LG_04	3.891	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_3118408_Lg15_01814_MAF50_725445_exon2	15	3118408	LG_04	3.912	<nnxp>	{-0}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_13239431_Lg15_230036_230036_exon3	38685426	15	13239431	LG_04	3.912	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13823700_Lg15_00863_MAF30_MDP0000242464_exon15	63664335	15	13823700	LG_04	5.527	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_13853418_Lg15_00863_MAF40_1677104_exon1	58698478	15	13853418	LG_04	5.535	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_9983148_Lg1_RosCOS404_MAF40_MDP0000950390_exon1	13722371	1	9983148	LG_04	7.203	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_9980149_Lg1_RosCOS404_MAF40_MDP0000403248_exon1	55679486	1	9980149	LG_04	7.223	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_15407371_Lg9_Hi01e10_MAF10_MDP0000617956_exon1	31670444	9	15407371	LG_04	8.063	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_13819818_Lg15_00863_MAF10_1621452_exon2	57719424	15	13819818	LG_04	9.808	<hxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_830930_Lg4_01597_MAF30_1668681_exon1	54660455	4	830930	LG_04	15.866	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_849833_Lg4_01597_MAF40_666094_exon2	50676364	4	849833	LG_04	15.866	<hxhk>	{01}	(hh,hk,kk)
GDsnp01597	52695424	4	868357	LG_04	16.389	<hxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_9924715_Lg15_MDP0000157164_MAF30_MDP0000157164_exon4	31659432	15	9924715	LG_04	19.445	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_9924291_Lg15_MDP0000157164_MAF10_MDP0000157164_exon2	60663372	15	9924291	LG_04	19.542	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_9924033_Lg15_MDP0000157164_MAF20_MDP0000157164_exon1	74739463	15	9924033	LG_04	19.61	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_9792492_Lg15_01989_MAF20_MDP0000264506_exon4	25731338	15	9792492	LG_04	20.089	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_9808692_Lg15_01989_MAF40_MDP0000949683_exon1	23604459	15	9808692	LG_04	20.86	<hxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_9789795_Lg15_01989_MAF30_MDP0000264506_exon1	63624491	15	9789795	LG_04	20.902	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_4578560_Lg4_00705_MAF20_MDP0000176523_exon9	73793494	4	4578560	LG_04	23.67	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4580974_Lg4_00705_MAF10_MDP0000244070_exon1	52767465	4	4580974	LG_04	23.717	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_4826865_Lg4_snpCO576145_MAF40_1650910_exon1	67659323	4	4826865	LG_04	24.261	<hxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_4838321_Lg4_snpCO576145_MAF20_1639247_exon4	72681508	4	4838321	LG_04	24.261	<hxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_4844832_Lg4_snpCO576145_MAF30_MDP0000127501_exon10	45780464	4	4844832	LG_04	24.526	<hxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_4849635_Lg4_snpCO576145_MAF30_94178_exon1	29740323	4	4849635	LG_04	24.583	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_13457909_Lg6_146323_MAF40_146323_exon1	17676464	6	13457909	LG_04	25.403	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_5104584_Lg2_00077_MAF40_1653806_exon1	46669430	2	5104584	LG_04	26.304	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_5884301_Lg4_02263_MAF50_749161_exon1	38641479	4	5884301	LG_04	26.304	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_8716037_Lg4_02646_MAF20_476635_exon2	45712477	4	8716037	LG_04	26.304	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_5892500_Lg4_02263_MAF50_MDP0000232101_exon5	68735350	4	5892500	LG_04	26.327	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_5915458_Lg4_02263_MAF30_1619610_exon2	30716482	4	5915458	LG_04	26.327	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_5920541_Lg4_02263_MAF20_1618391_exon2	58774325	4	5920541	LG_04	26.327	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_7227340_Lg4_00363_MAF20_499164_exon1	36612464	4	7227340	LG_04	26.327	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_8708313_Lg4_02646_MAF40_162157_exon1	68653360	4	8708313	LG_04	26.327	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_8718175_Lg4_02646_MAF30_1661104_exon4	46784403	4	8718175	LG_04	26.327	<lmxl>	{-1}	(ll,lm)
GDsnp01886	37733468	4	10814523	LG_04	26.327	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_12296545_Lg4_01353_MAF40_1651204_exon1	18782349	4	12296545	LG_04	27.195	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_7204908_Lg4_00363_MAF30_376770_exon1	66753374	4	7204908	LG_04	27.312	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_13312189_Lg4_RosCOS3641_MAF20_110683_exon1	37699400	4	13312189	LG_04	29.06	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_13341945_Lg4_RosCOS3641_MAF40_1621447_exon6	33798399	4	13341945	LG_04	29.06	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_13524873_Lg4_RosCOS2954_MAF40_1654195_exon2	72758360	4	13524873	LG_04	31.638	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_14061369_Lg4_01929_MAF20_668064_exon1	38805469	4	14061369	LG_04	32.059	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_14081728_Lg4_01929_MAF30_MDP0000828295_exon1	66608400	4	14081728	LG_04	32.059	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_14084215_Lg4_01929_MAF20_MDP0000254943_exon6	67729343	4	14084215	LG_04	32.059	<lmxl>	{-0}	(ll,lm)
GDsnp01095	22608491	4	14234570	LG_04	32.689	<lmxl>	{-0}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_13073783_Lg4_4744_MAF40_4744_exon1	4	13073783	LG_04	33.404	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_14559093_Lg4_01292_MAF20_1652080_exon1	4	14559093	LG_04	38.079	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CA_14580745_Lg4_01292_MAF10_1659652_exon1	4	14580745	LG_04	38.079	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_14563884_Lg4_01292_MAF30_409786_exon2	4	14563884	LG_04	38.537	<nnxnp>	{-0}	(nn,np)
GDsnp00928	4	14535903	LG_04	38.542	<nnxnp>	{-0}	(nn,np)
GDsnp01292	4	14606098	LG_04	38.958	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_16134794_Lg4_00321_MAF30_264514_exon1	4	16134794	LG_04	41.198	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_12695374_Lg3_02020_MAF40_MDP0000135469_exon1	3	12695374	LG_04	41.333	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_29615350_Lg3_01969_MAF40_272742_exon2	3	29615350	LG_04	41.342	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_16090074_Lg4_01777_MAF50_1682043_exon1	4	16090074	LG_04	41.342	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_16168045_Lg4_00321_MAF20_344464_exon1	4	16168045	LG_04	41.342	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16093765_Lg4_01777_MAF30_MDP0000320984_exon2	4	16093765	LG_04	41.352	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_16184302_Lg4_00321_MAF40_1638811_exon1	4	16184302	LG_04	41.766	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_16191177_Lg4_00321_MAF50_MDP0000630319_exon2	4	16191177	LG_04	41.766	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_16719136_Lg4_64850_MAF30_64850_exon1	4	16719136	LG_04	44.908	<nnxnp>	{-1}	(nn,np)
GDsnp00321	4	16160833	LG_04	46.197	<lmxl>	{-1}	(ll,lm)
RosBREED_SNP_CT_18330692_Lg4	4	18330692	LG_04	47.134	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_18418044_Lg4_00619_MAF30_MDP0000312342_exon1	4	18418044	LG_04	47.134	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_18541730_Lg4_02277_MAF10_MDP0000294856_exon1	4	18541730	LG_04	47.134	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_18544856_Lg4_02277_MAF40_790526_exon1	4	18544856	LG_04	47.134	<lmxl>	{0}	(ll,lm)
GDsnp00324	4	18806147	LG_04	47.134	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_19480551_Lg4_00881_MAF50_1636549_exon1	4	19480551	LG_04	48.035	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_19738916_Lg4_01481_MAF10_1635038_exon2	4	19738916	LG_04	48.035	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_19748645_Lg4_01481_MAF10_1675186_exon1	4	19748645	LG_04	48.037	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_18783781_Lg4_00324_MAF50_MDP0000225751_exon4	4	18783781	LG_04	49.121	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_20463993_Lg4_01773_MAF30_98103_exon1	4	20463993	LG_04	49.846	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_20512923_Lg4_01773_MAF30_MDP0000205358_exon1	4	20512923	LG_04	49.846	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_20963489_Lg4_00686_MAF10_1682093_exon6	4	20963489	LG_04	49.867	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GT_21424923_Lg4_01558_MAF30_MDP0000270110_exon15	4	21424923	LG_04	50.755	<lmxl>	{0}	(ll,lm)
GDsnp01558	4	21460136	LG_04	50.755	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_21176452_Lg4_01236_MAF30_MDP0000663534_exon4	4	21176452	LG_04	50.777	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CA_23204023_Lg13_RosCOS979_MAF40_MDP0000236905_exon6	13	23204023	LG_04	51.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16979237_Lg3_00921_MAF50_133104_exon1	3	16979237	LG_04	52.66	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_22205875_Lg4_01026_MAF50_1685729_exon4	4	22205875	LG_04	52.66	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_19511608_Lg4_00881_MAF10_1628401_exon7	4	19511608	LG_04	53.926	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23359599_Lg4_01567_MAF20_347484_exon1	4	23359599	LG_04	56.458	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_23383939_Lg4_01567_MAF10_1664500_exon1	4	23383939	LG_04	56.458	<lmxl>	{0}	(ll,lm)
GDsnp01026	4	22193695	LG_04	57.399	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AC_23733006_Lg4_00388_MAF10_1669799_exon2	4	23733006	LG_04	57.399	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_23737329_Lg4_00388_MAF20_MDP0000295593_exon9	4	23737329	LG_04	58.319	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_23751350_Lg4_00388_MAF50_1621108_exon2	4	23751350	LG_04	58.319	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_23839160_Lg4_00681_MAF10_MDP0000198074_exon2	4	23839160	LG_04	59.252	<lmxl>	{0}	(ll,lm)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_34831911_Lg12_01874_MAF10_1649255_exon1	12	34831911	LG_04	59.252	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_23872020_Lg4_00681_MAF20_1637093_exon1	4	23872020	LG_04	60.19	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_21150813_Lg4_01236_MAF10_1650238_exon2	4	21150813	LG_04	64.482	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_20956520_Lg4_00686_MAF20_1664939_exon4	4	20956520	LG_04	64.678	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_24262161_Lg4_00283_MAF30_176010_exon5	4	24262161	LG_04	65.051	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_25034592_Lg4_00136_MAF10_1687814_exon1	4	25034592	LG_04	65.94	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_21427720_Lg4_01558_MAF50_512626_exon1	4	21427720	LG_04	66.714	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_21432277_Lg4_01558_MAF40_1628710_exon9	4	21432277	LG_04	66.889	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_22760342_Lg4_02025_MAF20_MDP0000309706_exon3	4	22760342	LG_04	67.603	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_23405259_Lg4_01567_MAF30_228756_exon1	4	23405259	LG_04	69.372	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_24140264_Lg4_00232_MAF30_378430_exon1	4	24140264	LG_04	71.495	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_23832343_Lg4_00681_MAF50_1640858_exon5	4	23832343	LG_04	74.334	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23730745_Lg4_00388_MAF30_290225_exon2	4	23730745	LG_04	74.366	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_23735217_Lg4_00388_MAF30_MDP0000295593_exon8	4	23735217	LG_04	74.366	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23895459_Lg4_00681_MAF30_493392_exon2	4	23895459	LG_04	75.647	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_24174303_Lg4_00232_MAF50_MDP0000296655_exon2	4	24174303	LG_04	77.515	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_477972_Lg5_MDP0000217438_MAF20_MDP0000217438_exon1	5	477972	LG_05	0	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_551887_Lg5_00737_MAF20_MDP0000694976_exon1	5	551887	LG_05	0	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_575860_Lg5_00737_MAF30_MDP0000493647_exon1	5	575860	LG_05	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_981417_Lg5_01694_MAF50_1679637_exon2	5	981417	LG_05	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1037516_Lg5_01694_MAF40_1659922_exon1	5	1037516	LG_05	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_568363_Lg5_00737_MAF40_852041_exon1	5	568363	LG_05	0.088	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_579407_Lg5_00737_MAF40_528780_exon1	5	579407	LG_05	0.088	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1194802_Lg5_01956_MAF40_1630694_exon5	5	1194802	LG_05	0.088	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_477752_Lg5_MDP0000217438_MAF10_MDP0000217438_exon2	5	477752	LG_05	0.292	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1198941_Lg5_01956_MAF40_1644721_exon1	5	1198941	LG_05	0.944	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_788558_Lg5_00460_MAF30_MDP0000297044_exon4	5	788558	LG_05	2.245	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_984342_Lg5_01694_MAF10_1654238_exon3	5	984342	LG_05	3.182	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_1227390_Lg5_01956_MAF50_458390_exon1	5	1227390	LG_05	3.255	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_2446003_Lg5_00179_MAF50_MDP0000293843_exon2	5	2446003	LG_05	3.706	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_2429897_Lg5_00179_MAF40_1681882_exon1	5	2429897	LG_05	6.612	<hkxhk>	{10}	(hh,hk,kk)
GDsnp02457	5	2367854	LG_05	6.976	<hkxhk>	{10}	(hh,hk,kk)
GDsnp01566	5	4180442	LG_05	8.211	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_4173950_Lg5_01566_MAF50_823038_exon1	5	4173950	LG_05	8.244	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_1216653_Lg5_01956_MAF20_1658001_exon2	5	1216653	LG_05	8.514	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_1218831_Lg5_01956_MAF30_1629562_exon8	5	1218831	LG_05	8.514	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_4345700_Lg5_01623_MAF50_1683824_exon3	5	4345700	LG_05	10.158	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_4273093_Lg5_01623_MAF20_1681896_exon6	5	4273093	LG_05	11.218	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_4178848_Lg5_01566_MAF50_1687376_exon1	5	4178848	LG_05	12.988	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_4197027_Lg5_01566_MAF10_1659241_exon1	5	4197027	LG_05	12.988	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_5218379_Lg5_00544_MAF50_MDP0000933747_exon2	5	5218379	LG_05	13.091	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5246563_Lg5_00544_MAF20_497394_exon2	5	5246563	LG_05	13.091	<nnxp>	{-1}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00544	20627434	5	5258785	LG_05	13.339	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4277208_Lg5_01623_MAF40_291927_exon1	72770326	5	4277208	LG_05	13.874	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_5391928_Lg5_01697_MAF40_932139_exon1	22723459	5	5391928	LG_05	13.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5394062_Lg5_01697_MAF10_1624817_exon5	45771328	5	5394062	LG_05	13.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5470612_Lg5_MDP0000282167_MAF40_MDP0000282167_exon4	19809455	5	5470612	LG_05	13.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5471550_Lg5_MDP0000282167_MAF40_MDP0000282167_exon3	61789493	5	5471550	LG_05	13.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_5472549_Lg5_MDP0000282167_MDP0000282167_exon2	34743317	5	5472549	LG_05	13.996	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6022284_Lg5_139135_MAF20_139135_exon1	63797399	5	6022284	LG_05	15.948	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_5725342_Lg5_00264_MAF20_353640_exon1	39616498	5	5725342	LG_05	16.304	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_5713160_Lg5_00264_MAF30_MDP0000257478_exon1	70667313	5	5713160	LG_05	17.67	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6230318_Lg5_01333_MAF50_439245_exon1	43735386	5	6230318	LG_05	18.613	<nnxnp>	{-1}	(nn,np)
GDsnp00264	67661451	5	5726945	LG_05	19.359	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_6789459_Lg5_00238_MAF40_MDP0000204819_exon5	28716443	5	6789459	LG_05	20.466	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_6801757_Lg5_00238_MAF40_84995_exon1	24692397	5	6801757	LG_05	20.466	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_7087864_Lg5_01151_MAF20_480759_exon1	66788487	5	7087864	LG_05	21.922	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_7089884_Lg5_01151_MAF10_1634546_exon3	67710344	5	7089884	LG_05	21.922	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_AC_7085646_Lg5_01151_MAF30_1655896_exon1	56643454	5	7085646	LG_05	22.159	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_7095813_Lg5_01151_MAF50_1629285_exon8	60720319	5	7095813	LG_05	22.159	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_7082370_Lg5_01151_MAF20_1658252_exon9	69600344	5	7082370	LG_05	22.183	<nnxnp>	{-1}	(nn,np)
GDsnp01333	38665385	5	6201894	LG_05	22.393	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_7236236_Lg5_MDP0000322440_MAF40_MDP0000322440_exon1	20767334	5	7236236	LG_05	22.778	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_7097872_Lg5_01151_MAF30_MDP0000247378_exon23	63750415	5	7097872	LG_05	22.974	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_8173286_Lg5_00189_MAF30_MDP0000231454_exon2	15752468	5	8173286	LG_05	23.114	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8345524_Lg5_01208_MAF30_973835_exon1	32783300	5	8345524	LG_05	24.03	<nnxnp>	{-1}	(nn,np)
GDsnp01896	47610439	5	9269756	LG_05	24.808	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_8666295_Lg5_01942_MAF30_1669212_exon1	70615424	5	8666295	LG_05	24.934	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_8655302_Lg5_01942_MAF20_MDP0000264936_exon5	36644485	5	8655302	LG_05	24.938	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8684631_Lg5_01942_MAF10_327965_exon12	10798347	5	8684631	LG_05	24.938	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8675063_Lg5_01942_MAF40_1636846_exon1	73704405	5	8675063	LG_05	24.941	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_14314788_Lg5_02834_MAF30_MDP0000189637_exon1	57748300	5	14314788	LG_05	25.21	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_9472015_Lg5_01781_MAF20_51436_exon1	46686493	5	9472015	LG_05	25.585	<lmxll>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_14376292_Lg5_02834_MAF40_MDP0000184755_exon1	36727425	5	14376292	LG_05	25.806	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_14412254_Lg5_02834_MAF50_983625_exon1	31775402	5	14412254	LG_05	25.806	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_14520956_Lg5_151123_151123_exon1	61628469	5	14520956	LG_05	26.221	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_14438057_Lg5_229408_MAF50_229408_exon1	44779316	5	14438057	LG_05	26.651	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14520985_Lg5_151123_151123_exon1	69695405	5	14520985	LG_05	26.654	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_14520884_Lg5_151123_151123_exon1	20705472	5	14520884	LG_05	26.655	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_14674287_Lg5_MDP0000553609_MAF40_MDP0000553609_exon3	65658491	5	14674287	LG_05	27.615	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_14674789_Lg5_MDP0000553609_MAF50_MDP0000553609_exon3	28750390	5	14674789	LG_05	27.615	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_13038857_Lg10_RosCOS724_MAF40_MDP000068434_exon2	70651367	10	13038857	LG_05	28.457	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_9503447_Lg5_01781_MAF20_1621382_exon9	11754394	5	9503447	LG_05	28.474	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_10327041_Lg5_01651_MAF10_1667691_exon1	28747492	5	10327041	LG_05	28.521	<lmxll>	{0}	(ll,lm)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_9499250_Lg5_01781_MAF50_MDP0000532191_exon1	37726310	5	9499250	LG_05	28.579	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_9507490_Lg5_01781_MAF30_381189_exon1	19778317	5	9507490	LG_05	28.579	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_26152795_Lg14_00453_MAF20_1634125_exon1	32741375	14	26152795	LG_05	28.638	<nnnp>	{-1}	(nn,np)
GDsnp01651	29638459	5	10324465	LG_05	29.375	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_10296435_Lg5_01651_MAF40_436577_exon1	72745429	5	10296435	LG_05	29.406	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11445563_Lg5_RosCOS1953_MAF50_MDP0000204582_exon4	71750462	5	11445563	LG_05	30.17	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_11479429_Lg5_RosCOS1953_MAF50_517811_exon4	74773453	5	11479429	LG_05	30.17	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_10293726_Lg5_01651_MAF30_1668032_exon1	13716479	5	10293726	LG_05	30.616	<hxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_11403959_Lg5_RosCOS1953_MAF20_MDP0000216403_exon1	17722469	5	11403959	LG_05	34.162	<hxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_11705984_Lg5_RosCOS544_MAF30_MDP0000186563_exon2	48660479	5	11705984	LG_05	34.25	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11732907_Lg5_RosCOS544_MAF30_1666925_exon1	26663428	5	11732907	LG_05	34.25	<nnnp>	{-0}	(nn,np)
GDsnp01319	63802319	5	12009896	LG_05	35.425	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_11972840_Lg5_01319_MAF30_MDP0000280921_exon2	17609507	5	11972840	LG_05	36.153	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11965940_Lg5_01319_MAF40_1673368_exon2	25782406	5	11965940	LG_05	36.181	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_15472298_Lg5_01616_MAF30_1682170_exon2	31642462	5	15472298	LG_05	36.309	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_11970050_Lg5_01319_MAF40_MDP0000594281_exon1	63796342	5	11970050	LG_05	36.938	<hxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_12019658_Lg5_01319_MAF20_MDP0000314823_exon3	42784462	5	12019658	LG_05	36.938	<hxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_15491385_Lg5_01616_MAF40_1680720_exon1	12705468	5	15491385	LG_05	38	<hxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_24622707_Lg5_01304_MAF50_1627174_exon3	54614502	5	24622707	LG_05	38.018	<hxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_24528761_Lg5_01304_MAF40_1643253_exon1	69749382	5	24528761	LG_05	38.111	<hxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_24406956_Lg5_AT11_MAF40_1672725_exon1	27760361	5	24406956	LG_05	39.144	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_14723486_Lg16_00356_MAF50_MDP0000317332_exon1	38631392	16	14723486	LG_05	39.144	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_24403609_Lg5_AT11_MAF20_1620320_exon1	29803434	5	24403609	LG_05	39.217	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_13680239_Lg5_00978_MAF50_MDP0000255099_exon2	43783359	5	13680239	LG_05	39.591	<hxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_13669196_Lg5_00978_MAF20_1680837_exon1	35761499	5	13669196	LG_05	40.126	<hxhk>	{01}	(hh,hk,kk)
GDsnp00978	25724443	5	13662241	LG_05	42.986	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_18043587_Lg5_MDP0000580952_MAF20_MDP0000580952_exon7	26671487	5	18043587	LG_05	44.934	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18053412_Lg5_267073_MAF40_267073_exon1	14740309	5	18053412	LG_05	45.855	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18232690_Lg5_MDP0000193167_MAF30_MDP0000193167_exon10	24751431	5	18232690	LG_05	46.808	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18232808_Lg5_MDP0000193167_MAF20_MDP0000193167_exon10	27728483	5	18232808	LG_05	46.808	<nnnp>	{-0}	(nn,np)
Pear_Bartlett_SNP_CA_214_911618	18746311	15	214	LG_05	47.454	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_18592757_Lg5_00323_MAF30_MDP0000260108_exon6	27734412	5	18592757	LG_05	47.845	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_18753255_Lg5_MDP0000309680_MAF20_MDP0000309680_exon1	66694402	5	18753255	LG_05	48.541	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_18754379_Lg5_MDP0000309680_MAF30_MDP0000309680_exon1	72678323	5	18754379	LG_05	48.541	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18579919_Lg5_00323_MAF30_MDP0000291499_exon1	65684302	5	18579919	LG_05	48.544	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_19493983_Lg5_01478_MAF40_MDP0000141888_exon1	26777323	5	19493983	LG_05	49.434	<hxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_19498219_Lg5_01478_MAF10_1647389_exon1	29619393	5	19498219	LG_05	49.461	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_19550690_Lg5_01478_MAF20_382832_exon2	72807477	5	19550690	LG_05	49.461	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_19577005_Lg5_01478_MAF50_1664633_exon1	32764471	5	19577005	LG_05	49.461	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19699729_Lg5_00867_MAF40_1675010_exon4	28794432	5	19699729	LG_05	49.461	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_19678308_Lg5_00867_MAF30_980776_exon1	62750375	5	19678308	LG_05	49.467	<nnnp>	{-0}	(nn,np)
GDsnp00867	19767444	5	19698424	LG_05	49.681	<hxhk>	{01}	(hh,hk,kk)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_20289532_Lg5_RosCOS452_MAF30_1659924_exon3	68772347	5	20289532	LG_05	50.411	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_20340265_Lg5_RosCOS452_MAF30_1670309_exon4	72783384	5	20340265	LG_05	50.411	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_20331733_Lg5_RosCOS452_MAF40_1624630_exon1	57709404	5	20331733	LG_05	54.616	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_11138850_Lg8_107520_MAF30_107520_exon1	61727389	8	11138850	LG_05	55.992	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_11273420_Lg8_RosCOS936_MAF30_MDP0000781859_exon1	55727388	8	11273420	LG_05	58.566	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11286204_Lg8_RosCOS936_MAF30_MDP0000165239_exon1	18782313	8	11286204	LG_05	59.002	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11289162_Lg8_RosCOS936_MAF20_MDP0000165239_exon3	69722303	8	11289162	LG_05	59.402	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_11293201_Lg8_RosCOS936_MAF40_MDP0000154963_exon1	62807453	8	11293201	LG_05	59.402	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11298510_Lg8_RosCOS936_MAF20_950609_exon1	17760364	8	11298510	LG_05	59.402	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_11338203_Lg8_RosCOS936_MAF50_MDP0000274626_exon5	39612332	8	11338203	LG_05	59.435	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_24545181_Lg5_01304_MAF30_MDP0000610390_exon1	50627445	5	24545181	LG_05	60.301	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_15277675_Lg8_00354_MAF10_1648872_exon2	44794483	8	15277675	LG_05	61.401	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_15274311_Lg8_00354_MAF30_148978_exon1	39745463	8	15274311	LG_05	62.017	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_25133972_Lg5_00373_MAF30_1683155_exon6	20810396	5	25133972	LG_05	65.301	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_9717153_Lg8_RosCOS2185_MAF20_MDP0000405748_exon1	73694387	8	9717153	LG_05	65.386	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_9709301_Lg8_RosCOS2185_MAF50_MDP0000126398_exon2	48684505	8	9709301	LG_05	66.227	<hxxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_25113506_Lg5_00373_MAF20_1648847_exon1	27773494	5	25113506	LG_05	67.273	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_25120947_Lg5_00373_MAF40_25601_exon2	71720413	5	25120947	LG_05	67.273	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_26970454_Lg5_02729_MAF30_1664955_exon1	74741489	5	26970454	LG_05	67.403	<lmxl>	{-1}	(ll,lm)
GDsnp00373	61784461	5	25134947	LG_05	68.008	<hxxhk>	{00}	(hh,hk,kk)
GDsnp00806	59675460	5	25126012	LG_05	68.033	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25131275_Lg5_00373_MAF20_MDP0000570588_exon2	65652409	5	25131275	LG_05	68.164	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_30331070_Lg5_01751_MAF30_1662486_exon1	58666464	5	30331070	LG_05	68.359	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_33260850_Lg5_RosCOS1238_MAF40_541294_exon1	44773431	5	33260850	LG_05	69.25	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_33263993_Lg5_RosCOS1238_MAF50_1680075_exon1	44683487	5	33263993	LG_05	69.25	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CA_33278360_Lg5_RosCOS1238_MAF50_1638127_exon1	21685387	5	33278360	LG_05	69.25	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_12043975_Lg10_RosCOS2353_MAF10_119939_exon6	25803462	10	12043975	LG_05	70.075	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_36508128_Lg5_00100_MAF20_1632791_exon9	55796507	5	36508128	LG_05	70.921	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_34453757_Lg5_RosCOS2737_MAF20_1684963_exon4	41658402	5	34453757	LG_05	70.942	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_36493426_Lg5_00100_MAF10_1654983_exon1	55649505	5	36493426	LG_05	70.942	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TG_36495464_Lg5_00100_MAF30_MDP0000217948_exon16	55663480	5	36495464	LG_05	70.942	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_36510795_Lg5_00100_MAF20_MDP0000232589_exon4	60784425	5	36510795	LG_05	70.942	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_11852167_Lg7_85261_MAF40_85261_exon1	57640355	7	11852167	LG_05	70.942	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_25747601_Lg9_327827_MAF50_327827_exon2	72681502	9	25747601	LG_05	70.948	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_25749175_Lg9_250343_MAF30_250343_exon1	58626484	9	25749175	LG_05	71.497	<lmxl>	{0}	(ll,lm)
GDsnp01859	57660459	5	27859690	LG_05	71.682	<hxxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_36487489_Lg5_00100_MAF50_MDP0000220692_exon2	16797316	5	36487489	LG_05	71.944	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_27677928_Lg5_01601_MAF30_1623480_exon4	47789405	5	27677928	LG_05	72.04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_31342659_Lg5_01539_MAF40_533208_exon1	45758420	5	31342659	LG_05	72.408	<hxxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_589883_Lg3_RosCOS3033_MAF30_MDP0000488007_exon1	12631417	3	589883	LG_05	73.764	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_648575_Lg3_RosCOS3033_MAF50_181891_exon1	53612337	3	648575	LG_05	74.439	<nnxp>	{-1}	(nn,np)
GDsnp00100	57789376	5	36529703	LG_05	76.577	<hxxhk>	{00}	(hh,hk,kk)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GT_37429382_Lg5_02674_MAF30_475767_exon2	31794445	5	37429382	LG_05	76.641	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_37473253_Lg5_02674_MAF20_488977_exon1	65659501	5	37473253	LG_05	76.768	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_34513161_Lg5_RosCOS2737_MAF10_487971_exon3	23703446	5	34513161	LG_05	78.114	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_37469684_Lg5_02674_MAF40_324963_exon1	28777487	5	37469684	LG_05	87.648	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_36546287_Lg5_00100_MAF40_1662719_exon2	50717469	5	36546287	LG_05	87.65	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_2471400_Lg5_00179_MAF30_MDP0000285776_exon9	52668344	5	2471400	LG_05	87.669	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_361822_Lg6_00347_MAF20_335316_exon2	69768340	6	361822	LG_06	0	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_2553338_Lg6_RosCOS777_MAF40_MDP0000172990_exon2	71729336	6	2553338	LG_06	6.001	<nnxnp>	{-1}	(nn,np)
GDsnp00347	52688369	6	409383	LG_06	10.266	<hkxhk>	{11}	(hh,hk,kk)
GDsnp02819	69755492	6	3286599	LG_06	10.741	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_3891842_Lg6_01747_MAF20_451241_exon1	41606475	6	3891842	LG_06	10.819	<nnxnp>	{-0}	(nn,np)
GDsnp01087	55605447	6	1640609	LG_06	11.288	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_4083944_Lg6_00181_MAF50_59957_exon1	31759459	6	4083944	LG_06	13.396	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_4782504_Lg6_263940_263940_exon2	60743447	6	4782504	LG_06	15.427	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_4782545_Lg6_263940_MAF50_263940_exon2	40765416	6	4782545	LG_06	15.95	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_3942180_Lg6_01747_MAF40_1636047_exon1	41739409	6	3942180	LG_06	16.338	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_5249377_Lg6_00082_MAF20_627308_exon1	42612309	6	5249377	LG_06	17.862	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3922847_Lg6_01747_MAF50_1431_exon2	47752407	6	3922847	LG_06	17.963	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_4081099_Lg6_00181_MAF50_1628494_exon1	21762434	6	4081099	LG_06	17.963	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_4097483_Lg6_00181_MAF40_343474_exon1	49778373	6	4097483	LG_06	17.963	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_4594953_Lg6_00501_MAF40_MDP0000189774_exon3	59785484	6	4594953	LG_06	18.887	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_4993076_Lg6_MDP0000075705_MAF50_MDP0000075705_exon1	51669412	6	4993076	LG_06	18.887	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_5306462_Lg6_RosCOS1410_MAF30_1639402_exon5	54787321	6	5306462	LG_06	18.887	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_5309699_Lg6_RosCOS1410_MAF30_1632016_exon1	70742453	6	5309699	LG_06	18.887	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_5232792_Lg6_00082_MAF50_1649239_exon1	47789425	6	5232792	LG_06	18.893	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_5243425_Lg6_00082_MAF50_1622771_exon1	39743341	6	5243425	LG_06	18.897	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_5261397_Lg6_RosCOS1410_MAF50_2852771_exon1	53781384	6	5261397	LG_06	18.897	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_7877366_Lg6_01954_MAF40_1673771_exon1	18691391	6	7877366	LG_06	18.897	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_5287964_Lg6_RosCOS1410_MAF40_498673_exon1	74738494	6	5287964	LG_06	19.27	<hkxhk>	{11}	(hh,hk,kk)
GDsnp00082	69699328	6	5200956	LG_06	20.558	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_6216549_Lg6_01575_MAF10_1684967_exon2	56654420	6	6216549	LG_06	20.558	<lmxll>	{-1}	(ll,lm)
GDsnp01575	19738508	6	6229601	LG_06	20.558	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_6615652_Lg6_RosCOS1869_MAF40_1618698_exon6	14744338	6	6615652	LG_06	20.558	<lmxll>	{-0}	(ll,lm)
RosBREED_SNP_CT_9329089_Lg14	31757361	14	9329089	LG_06	21.463	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_10716913_Lg6_MDP0000302895_MAF10_MDP0000302895_exon2	54703376	6	10716913	LG_06	21.473	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_35432622_Lg10_RosCOS663_MAF50_1658284_exon6	14733467	10	35432622	LG_06	21.473	<lmxll>	{-0}	(ll,lm)
GDsnp02763	68704416	6	12002985	LG_06	21.481	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_16868372_Lg6_02779_MAF30_1638635_exon2	66625445	6	16868372	LG_06	21.552	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_11841472_Lg11_00037_MAF50_MDP0000176943_exon1	70640474	11	11841472	LG_06	21.989	<hkxhk>	{11}	(hh,hk,kk)
GDsnp02779	45804464	6	16873174	LG_06	22.066	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_9378475_Lg6_02258_MAF10_1637701_exon2	42794416	6	9378475	LG_06	22.069	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_35521993_Lg10_RosCOS663_MAF40_1677514_exon1	45636439	10	35521993	LG_06	23.083	<nnxnp>	{-1}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_18628780_Lg6_00199_MAF50_MDP0000279487_exon2	72781458	6	18628780	LG_06	23.297	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_18710544_Lg6_00199_MAF30_1654313_exon1	22630365	6	18710544	LG_06	23.297	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_14216532_Lg15_00816_MAF30_479223_exon2	25681449	15	14216532	LG_06	23.297	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_19929848_Lg6_00488_MAF20_MDP0000839129_exon1	55780486	6	19929848	LG_06	24.181	<lmxl>	{1-}	(ll,lm)
GDsnp01831	44732363	6	20158004	LG_06	24.181	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_20424525_Lg6_00472_MAF30_1635406_exon1	16751442	6	20424525	LG_06	24.181	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_20446572_Lg6_00472_MAF40_910234_exon1	24793481	6	20446572	LG_06	24.181	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_21693978_Lg6_00142_MAF20_711715_exon2	62659502	6	21693978	LG_06	25.99	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_21727754_Lg6_00142_MAF20_1627841_exon4	35763441	6	21727754	LG_06	26.027	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_21088744_Lg6_155895_MAF20_155895_exon1	16663496	6	21088744	LG_06	26.046	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_14219779_Lg15_00816_MAF10_482713_exon1	37779348	15	14219779	LG_06	27.232	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_CT_22279636_Lg6_02165_MAF30_MDP0000777702_exon2	29783452	6	22279636	LG_06	28.79	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_22247625_Lg6_02165_MAF20_1627766_exon9	32741382	6	22247625	LG_06	29.497	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_5404288_Lg7_324951_MAF30_324951_exon1	29779356	7	5404288	LG_06	30.319	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_TC_23407280_Lg6_01556_MAF20_MDP0000306342_exon1	69664438	6	23407280	LG_06	31.536	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_23422688_Lg6_01556_MAF30_344885_exon3	57780493	6	23422688	LG_06	31.536	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_23453666_Lg6_01502_MAF40_1627896_exon1	73648325	6	23453666	LG_06	32.432	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_23462644_Lg6_01502_MAF20_99517_exon1	14776483	6	23462644	LG_06	32.432	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_16181043_Lg9_RosCOS3080_MAF20_1653925_exon3	58687455	9	16181043	LG_06	33.358	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_16190604_Lg9_RosCOS3080_MAF10_1624067_exon1	70607431	9	16190604	LG_06	33.358	<lmxl>	{1-}	(ll,lm)
GDsnp00094	72717451	6	17589823	LG_06	37.958	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_TG_23449074_Lg6_01502_MAF20_1622876_exon1	21799473	6	23449074	LG_06	48.276	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_GA_16177861_Lg9_RosCOS3080_MAF20_1669257_exon1	52797456	9	16177861	LG_06	50.516	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_CT_25205225_Lg6_258116_MAF10_258116_exon1	25759449	6	25205225	LG_06	61.793	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_TC_26007783_Lg6_01682_MAF40_604254_exon1	17791475	6	26007783	LG_06	68.554	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_AG_25957598_Lg6_01682_MAF20_1661685_exon1	12726488	6	25957598	LG_06	68.571	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_GA_27451132_Lg6_RosCOS1040_MAF30_MDP0000311035_exon3	10649475	6	27451132	LG_06	70.417	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_CT_27779095_Lg6_RosCOS750_MAF20_945201_exon1	20785449	6	27779095	LG_06	72.177	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_TC_27850051_Lg6_RosCOS750_MAF50_1672727_exon1	30691459	6	27850051	LG_06	72.177	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_AG_28848270_Lg6_01574_MAF30_333049_exon1	34685334	6	28848270	LG_06	75.619	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_AG_28855425_Lg6_01574_MAF50_483121_exon1	49773463	6	28855425	LG_06	75.619	<nnxn>	{1-}	(nn,np)
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RosBREEDSNP_SNP_CT_28988729_Lg6_165001_MAF20_165001_exon1	14796410	6	28988729	LG_06	75.619	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_GA_33272703_Lg14_01548_MAF10_1639540_exon5	49739469	14	33272703	LG_06	75.619	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_GT_30080885_Lg6_02138_MAF40_MDP0000151563_exon2	56793403	6	30080885	LG_06	76.229	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_AG_30075128_Lg6_02138_MAF40_1659860_exon4	48690483	6	30075128	LG_06	76.425	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_GA_30104465_Lg6_02138_MAF30_820238_exon1	59634373	6	30104465	LG_06	76.445	<nnxn>	{1-}	(nn,np)
GDsnp02138	52797385	6	30105757	LG_06	77.23	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_GT_30154941_Lg6_02138_MAF30_1650126_exon2	53609382	6	30154941	LG_06	77.23	<nnxn>	{1-}	(nn,np)
RosBREEDSNP_SNP_AG_30289276_Lg6_MDP0000236390_MAF20_MDP0000236390_exon2	66654459	6	30289276	LG_06	77.238	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_AG_30289681_Lg6_MDP0000236390_MAF30_MDP0000236390_exon1	26788421	6	30289681	LG_06	77.249	<nnxn>	{0-}	(nn,np)
RosBREEDSNP_SNP_CT_823290_Lg7_01172_MAF40_1641721_exon6	29709314	7	823290	LG_07	0	<nnxn>	{1-}	(nn,np)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_1804847_Lg7_01433_MAF30_MDP00000650449_exon3	48746412	7	1804847	LG_07	3.461	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_2164889_Lg7_01994_MAF20_587697_exon1	56782498	7	2164889	LG_07	4.436	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2240795_Lg7_01946_MAF10_1661439_exon2	64664487	7	2240795	LG_07	4.436	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_28113349_Lg1_108136_MAF50_108136_exon1	36756451	1	28113349	LG_07	7.065	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_3810018_Lg7_187559_MAF50_187559_exon3	49743370	7	3810018	LG_07	7.065	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3864649_Lg7_RosCOS418_MAF20_MDP00000281359_exon5	54691316	7	3864649	LG_07	7.74	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4130061_Lg7_RosCOS3240_MAF30_1668323_exon2	28666500	7	4130061	LG_07	7.74	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4391386_Lg7_01170_MAF40_138892_exon2	15807496	7	4391386	LG_07	11.18	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_4381600_Lg7_01170_MAF30_MDP00000213321_exon1	59703410	7	4381600	LG_07	11.187	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4407205_Lg7_01170_MAF10_1640275_exon1	69759321	7	4407205	LG_07	12.537	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_5770325_Lg7_00658_MAF20_MDP00000307551_exon1	58768361	7	5770325	LG_07	15.63	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_5776221_Lg7_00658_MAF30_509047_exon1	70665385	7	5776221	LG_07	16.091	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_5246942_Lg1_01826_MAF20_MDP00000153933_exon2	19641329	1	5246942	LG_07	17.53	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_839755_Lg7_01172_MAF50_MDP00000263152_exon1	40661473	7	839755	LG_07	18.502	<lmxl>	{-1}	(ll,lm)
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RosBREEDSNP_SNP_TC_3570969_Lg7_01717_MAF30_144235_exon1	64808444	7	3570969	LG_07	18.957	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_7113399_Lg7_01872_MAF40_411592_exon2	47761418	7	7113399	LG_07	20.611	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2303403_Lg16_00719_MAF30_1629301_exon14	67697415	16	2303403	LG_07	20.636	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1802488_Lg7_01433_MAF20_1656688_exon5	67698357	7	1802488	LG_07	21.752	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TG_2176203_Lg7_01994_MAF20_MDP00000243087_exon1	57650354	7	2176203	LG_07	21.752	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_2244430_Lg7_01946_MAF30_1661455_exon1	58659338	7	2244430	LG_07	21.752	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_2824849_Lg7_00802_MAF50_MDP00000804626_exon1	59714407	7	2824849	LG_07	21.752	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_8004468_Lg7_02619_MAF40_MDP00000766223_exon2	52633499	7	8004468	LG_07	22.593	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_4377413_Lg7_01170_MAF20_1647395_exon1	58778355	7	4377413	LG_07	23.303	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_2301322_Lg16_00719_MAF20_1655216_exon1	60719384	16	2301322	LG_07	23.317	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_4180170_Lg7_RosCOS3240_MAF50_MDP00000127900_exon4	59798477	7	4180170	LG_07	23.331	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_7988246_Lg7_02619_MAF40_257792_exon1	11653487	7	7988246	LG_07	24.166	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1191603_Lg7_01997_MAF10_1630190_exon1	63715387	7	1191603	LG_07	24.318	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_35134996_Lg5_62137_MAF20_62137_exon1	15659335	5	35134996	LG_07	25.138	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_5831303_Lg7_00658_MAF10_981215_exon1	24754304	7	5831303	LG_07	25.144	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AC_8520200_Lg7_01780_MAF30_525134_exon4	51692455	7	8520200	LG_07	26.714	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8529100_Lg7_01780_MAF20_1643257_exon1	19769435	7	8529100	LG_07	26.714	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7992834_Lg7_02619_MAF50_825086_exon2	58636332	7	7992834	LG_07	27.589	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_7106208_Lg7_01872_MAF20_MDP00000229645_exon1	55718397	7	7106208	LG_07	27.865	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_8026567_Lg7_02619_MAF10_MDP00000322530_exon2	64694419	7	8026567	LG_07	27.865	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_8158759_Lg7_263337_MAF20_263337_exon4	11720433	7	8158759	LG_07	27.865	<lmxl>	{-1}	(ll,lm)
GDsnp01780	21778408	7	8540486	LG_07	27.865	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_7265453_Lg7_snpEBI06582_MAF30_470278_exon1	27750359	7	7265453	LG_07	27.887	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_9298084_Lg7_RosCOS2471_MAF40_MDP00000130967_exon1	53741315	7	9298084	LG_07	28.755	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_22024068_Lg5_RosCOS3072_MAF30_MDP00000753788_exon2	46754442	5	22024068	LG_07	29.641	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_11012131_Lg7_01882_MAF30_MDP00000138110_exon3	22768444	7	11012131	LG_07	29.641	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_11014276_Lg7_01882_MAF30_MDP00000138110_exon10	12732394	7	11014276	LG_07	29.641	<lmxl>	{-1}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp01882	7	11050754	LG_07	29.641	<lmxl>	{0-}	(ll,lm)
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RosBREEDSNP_SNP_GA_19500458_Lg7_00871_MAF20_MDP0000625344_exon4	7	19500458	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
GDsnp00871	7	19500629	LG_07	30.402	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_21298099_Lg7_02600_MAF30_1621358_exon2	7	21298099	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_21308179_Lg7_02600_MAF20_MDP0000217912_exon1	7	21308179	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21310787_Lg7_02600_MAF20_MDP0000217912_exon7	7	21310787	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21316226_Lg7_02600_MAF10_1659961_exon2	7	21316226	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22933123_Lg7_RosCOS1514_MAF20_1619688_exon8	7	22933123	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_22968706_Lg7_RosCOS1514_MAF10_MDP0000446270_exon1	7	22968706	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_23836260_Lg7_328020_MAF20_328020_exon3	7	23836260	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_42973735_Lg15_RosCOS1842_MAF50_MDP0000013737_exon3	15	42973735	LG_07	30.402	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_21096889_Lg7_MDP0000194603_MAF20_MDP0000194603_exon9	7	21096889	LG_07	31.573	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_21096895_Lg7_MDP0000194603_MAF30_MDP0000194603_exon9	7	21096895	LG_07	31.573	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_21319195_Lg7_02600_MAF50_145089_exon2	7	21319195	LG_07	31.573	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_21324274_Lg7_02600_MAF40_1643274_exon2	7	21324274	LG_07	31.573	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_21327381_Lg7_02600_MAF40_1619074_exon1	7	21327381	LG_07	31.573	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_22935327_Lg7_RosCOS1514_MAF30_231895_exon1	7	22935327	LG_07	31.864	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_25161760_Lg5_00373_MAF40_46352_exon1	5	25161760	LG_07	32.434	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_16997122_Lg1_MDP0000595715_MAF10_MDP0000595715_exon1	1	16997122	LG_07	33.468	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_22953808_Lg7_RosCOS1514_MAF10_346982_exon3	7	22953808	LG_07	34.555	<nnxnp>	{-1}	(nn,np)
GDsnp02600	7	27758481	LG_07	34.685	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25209129_Lg7_00699_MAF50_257331_exon3	7	25209129	LG_07	38.571	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_25190375_Lg7_00699_MAF30_MDP0000285463_exon1	7	25190375	LG_07	39.314	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_22540597_Lg1_RosCOS1157_MAF50_MDP0000295917_exon1	1	22540597	LG_07	43.458	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_22570796_Lg1_RosCOS1157_MAF40_1644689_exon1	1	22570796	LG_07	43.458	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_22565017_Lg1_RosCOS1157_MAF20_601265_exon1	1	22565017	LG_07	43.539	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22550553_Lg1_RosCOS1157_MAF10_MDP0000199241_exon1	1	22550553	LG_07	44.129	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_22864266_Lg1_MdExp7_MAF50_1639944_exon2	1	22864266	LG_07	48.942	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_22862141_Lg1_MdExp7_MAF30_1625535_exon1	1	22862141	LG_07	49.388	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_2919674_Lg4_244093_244093_exon1	4	2919674	LG_07	54.311	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_30446117_Lg1_00782_MAF10_679939_exon1	1	30446117	LG_07	67.063	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_266256_Lg8_00301_MAF20_1674145_exon1	8	266256	LG_08	0	<nnxnp>	{-0}	(nn,np)
RosBREED_SNP_GA_30021_Lg8	8	30021	LG_08	0.615	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_25035111_Lg12_02228_MAF50_579916_exon1	12	25035111	LG_08	1.501	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_718350_Lg8_01670_MAF10_1633492_exon1	8	718350	LG_08	5.06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_1323911_Lg8_00487_MAF40_1687140_exon1	8	1323911	LG_08	7.845	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1316702_Lg8_00487_MAF30_MDP0000392194_exon1	8	1316702	LG_08	8.033	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_282703_Lg8_00301_MAF10_516988_exon1	8	282703	LG_08	9.678	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_629081_Lg8_00175_MAF20_1682291_exon2	8	629081	LG_08	9.678	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_252738_Lg8_00301_MAF30_1634556_exon4	8	252738	LG_08	9.684	<lmxl>	{0-}	(ll,lm)
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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00419	8	1615449	LG_08	10.625	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1632544_Lg8_00419_MAF40_MDP0000270476_exon5	8	17689432	LG_08	10.625	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_29493560_Lg8_02575_MAF20_138927_exon2	8	24665430	LG_08	15.281	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_5166014_Lg8_01378_MAF30_1645550_exon1	8	60710460	LG_08	21.623	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_5173996_Lg8_01378_MAF40_526644_exon2	8	22803416	LG_08	21.623	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8456044_Lg8_01550_MAF50_1659733_exon3	8	59634495	LG_08	22.555	<nnxnp>	{-0}	(nn,np)
GDsnp00215	8	29705452	LG_08	26.496	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_10562520_Lg8_snpC0066276_MAF50_MDP00000751527_exon3	8	33766446	LG_08	32.635	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_8933286_Lg8_01625_MAF30_1653734_exon1	8	10755501	LG_08	35.136	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_16509379_Lg8_324685_MAF40_324685_exon1	8	63775459	LG_08	50.884	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16577884_Lg8_02022_MAF40_1640897_exon5	8	43758381	LG_08	51.512	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17364174_Lg8_01370_MAF20_MDP0000195444_exon17	8	64679310	LG_08	52.359	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17392486_Lg8_01370_MAF30_1660200_exon1	8	44601342	LG_08	52.378	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17359704_Lg8_01370_MAF50_MDP0000284300_exon4	8	36626381	LG_08	52.395	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_17401414_Lg8_01370_MAF40_MDP0000376895_exon1	8	68711411	LG_08	52.395	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_18192194_Lg8_02689_MAF50_MDP0000284531_exon10	8	73612429	LG_08	54.034	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19609667_Lg8_00862_MAF30_268224_exon1	8	39794404	LG_08	54.741	<nnxnp>	{-1}	(nn,np)
GDsnp01768	8	66612386	LG_08	55.051	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_20065241_Lg8_00311_MAF20_1688636_exon2	8	69687427	LG_08	55.872	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_20088635_Lg8_00311_MAF30_473110_exon1	8	28694318	LG_08	55.872	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_21571716_Lg8_02685_MAF20_1664096_exon1	8	42806491	LG_08	55.872	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_21581037_Lg8_02685_MAF30_MDP0000202383_exon1	8	57609374	LG_08	55.872	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_15882944_Lg12_138007_exon1	12	37700485	LG_08	56.851	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_23228275_Lg8_00975_MAF40_17265_exon1	8	15703388	LG_08	58.019	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_15240237_Lg8_00354_MAF40_359397_exon1	8	43730382	LG_08	60.259	<lmxll>	{-1}	(ll,lm)
GDsnp01479	8	36809339	LG_08	60.868	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22580590_Lg8_01479_MAF50_MDP0000308808_exon1	8	24767404	LG_08	60.881	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_23754916_Lg8_00157_MAF20_157405_exon1	8	17648494	LG_08	62.768	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25196746_Lg8_01598_MAF50_526504_exon4	8	22736323	LG_08	62.802	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_17343145_Lg8_01370_MAF20_MDP0000769686_exon3	8	22775459	LG_08	64.843	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_2030123_Lg3_RosCOS1698_MAF50_1684987_exon3	3	52682429	LG_08	64.873	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_17357684_Lg8_01370_MAF30_394869_exon5	8	55719503	LG_08	64.9	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_17361806_Lg8_01370_MAF10_MDP0000220614_exon3	8	46729340	LG_08	64.9	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_23224503_Lg8_00975_MAF10_767505_exon1	8	59606360	LG_08	65.814	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_23750084_Lg8_00157_MAF40_MDP0000135062_exon1	8	1741301	LG_08	65.814	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_25179171_Lg8_01598_MAF40_MDP0000119283_exon4	8	18740309	LG_08	65.814	<lmxll>	{-1}	(ll,lm)
GDsnp01598	8	51760378	LG_08	65.814	<lmxll>	{-1}	(ll,lm)
GDsnp00311	8	21756397	LG_08	66.26	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_28263232_Lg8_00636_MAF20_1651668_exon1	8	32679466	LG_08	67.461	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_27300439_Lg8_328026_MAF40_328026_exon1	8	42790450	LG_08	68.244	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_27300417_Lg8_328026_MAF40_328026_exon1	8	45798416	LG_08	68.327	<hkxhk>	{01}	(hh,hk,kk)
Pear_Bartlett_SNP_TC_548_5147574	5147574	548	LG_08	68.447	<lmxll>	{-1}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_28160723_Lg8_00293_MAF20_1625146_exon4	52695505	8	28160723	LG_08	69.532	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_28265359_Lg8_00636_MAF50_MDP0000715379_exon1	65730433	8	28265359	LG_08	69.532	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_31310980_Lg11_72762_72762_exon1	31684451	11	31310980	LG_08	70.152	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_25270564_Lg13_MDP0000748262_MAF30_MDP0000748262_exon1	28673431	13	25270564	LG_08	70.177	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_32227451_Lg5_RosCOS2881_MAF40_1654780_exon1	65753509	5	32227451	LG_08	71.254	<hkxhk>	{01}	(hh,hk,kk)
GDsnp01764	57609417	8	30178572	LG_08	71.922	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_30212661_Lg8_01764_MAF30_1666066_exon1	45788478	8	30212661	LG_08	71.922	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_30391205_Lg8_00342_MAF10_MDP000089538_exon1	30656445	8	30391205	LG_08	71.922	<lmxll>	{1-}	(ll,lm)
GDsnp00342	11780357	8	30440760	LG_08	71.922	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_30479542_Lg8_00342_MAF30_570403_exon2	13742301	8	30479542	LG_08	72.826	<lmxll>	{0-}	(ll,lm)
GDsnp00293	42655457	8	28146149	LG_08	74.572	<lmxll>	{0-}	(ll,lm)
GDsnp01576	56726499	8	31168759	LG_08	74.572	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_32812193_Lg8_01182_MAF30_MDP0000647918_exon1	68723478	8	32812193	LG_08	76.226	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_32814468_Lg8_01182_MAF50_170823_exon1	72621431	8	32814468	LG_08	76.226	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_32820549_Lg8_01182_MAF10_1630387_exon2	57743385	8	32820549	LG_08	76.226	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_32856152_Lg8_01182_MAF20_528574_exon1	56694376	8	32856152	LG_08	76.226	<lmxll>	{1-}	(ll,lm)
Pear_Bartlett_SNP_CT_454_5147082		5105773	454	LG_08	76.226	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_27845733_Lg9_02482_MAF50_MDP0000184435_exon1	19755450	9	27845733	LG_08	77.121	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_27849559_Lg9_02482_MAF30_175649_exon1	15653478	9	27849559	LG_08	77.121	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_35058728_Lg8_00299_MAF20_1651802_exon1	43756488	8	35058728	LG_08	77.957	<lmxll>	{0-}	(ll,lm)
GDsnp02575	15753379	8	29527318	LG_08	83.734	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29562018_Lg8_02575_MAF40_1619664_exon3	72702392	8	29562018	LG_08	83.734	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30403968_Lg8_00342_MAF30_1619977_exon6	53779306	8	30403968	LG_08	87.923	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_30420390_Lg8_00342_MAF20_444762_exon1	11803450	8	30420390	LG_08	87.923	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_31137343_Lg8_01576_MAF20_1645315_exon2	43738473	8	31137343	LG_08	93.754	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31145617_Lg8_01576_MAF50_410454_exon1	13797501	8	31145617	LG_08	93.754	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_498570_Lg9_01891_MAF20_1629474_exon4	15694474	9	498570	LG_09	0	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1433030_Lg9_01339_MAF30_MDP0000316472_exon1	26793409	9	1433030	LG_09	0.021	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_1536173_Lg9_62719_62719_exon1	47726486	9	1536173	LG_09	2.188	<nnxnp>	{-1}	(nn,np)
GDsnp01339	52745378	9	1454354	LG_09	2.212	<lmxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_1502793_Lg9_01339_MAF40_1648141_exon3	64698309	9	1502793	LG_09	2.713	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1273803_Lg9_02013_MAF20_MDP0000312439_exon4	72656326	9	1273803	LG_09	2.761	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6486826_Lg16_01866_MAF20_1661948_exon2	70623409	16	6486826	LG_09	5.613	<hkxhk>	{11}	(hh,hk,kk)
GDsnp02134	32727389	9	23621381	LG_09	7.692	<nnxnp>	{-1}	(nn,np)
GDsnp00679	47790352	9	3042144	LG_09	8.429	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_3818449_Lg9_01524_MAF50_MDP0000305191_exon1	57665365	9	3818449	LG_09	11.407	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31598641_Lg12_00641_MAF40_54410_exon1	36766355	12	31598641	LG_09	11.407	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_3788429_Lg9_00605_MAF40_382876_exon1	47672478	9	3788429	LG_09	12.68	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_3797355_Lg9_00605_MAF40_359797_exon2	41705436	9	3797355	LG_09	12.68	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_4739364_Lg9_RosCOS3253_MAF40_MDP0000595471_exon1	6586375	9	4739364	LG_09	15.163	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_4685551_Lg9_RosCOS3253_MAF30_MDP0000321404_exon7	57661330	9	4685551	LG_09	15.932	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5399131_Lg9_00514_MAF30_1663095_exon2	58648464	9	5399131	LG_09	16.96	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_4699317_Lg9_RosCOS3253_MAF50_1669813_exon1	44810493	9	4699317	LG_09	17.605	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_4461663_Lg9_RosCOS1285_MAF30_1687591_exon3	39681377	9	4461663	LG_09	19.375	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_4429905_Lg9_RosCOS1285_MAF40_1640159_exon7	54654326	9	4429905	LG_09	19.959	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_5969202_Lg9_01603_MAF20_583681_exon4	48774327	9	5969202	LG_09	20.064	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5966501_Lg9_01603_MAF30_26840_exon1	10795444	9	5966501	LG_09	20.111	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_4673470_Lg9_RosCOS3253_MAF30_1678232_exon1	10796417	9	4673470	LG_09	21.298	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6024891_Lg9_01603_MAF40_1683715_exon1	39805425	9	6024891	LG_09	22.08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_4757607_Lg9_RosCOS3253_MAF40_1655086_exon1	15766425	9	4757607	LG_09	22.154	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_4764340_Lg9_RosCOS3253_MAF10_1652159_exon1	40778364	9	4764340	LG_09	22.154	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_7605137_Lg9_00893_MAF20_1636210_exon1	54624365	9	7605137	LG_09	24.457	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13654828_Lg5_00978_MAF10_MDP0000178227_exon1	27790306	5	13654828	LG_09	25.063	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5387010_Lg9_00514_MAF40_377304_exon1	14663476	9	5387010	LG_09	25.063	<lmxl>	{0-}	(ll,lm)
GDsnp00337	48731430	9	8277127	LG_09	26.151	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_6761696_Lg9_00280_MAF20_1625718_exon1	51742375	9	6761696	LG_09	27.537	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_5973848_Lg9_01603_MAF30_1675553_exon1	27750438	9	5973848	LG_09	29.053	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5981805_Lg9_01603_MAF50_1683899_exon3	31625438	9	5981805	LG_09	29.053	<lmxl>	{0-}	(ll,lm)
GDsnp00893	74604473	9	7643901	LG_09	29.497	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_6778759_Lg9_00280_MAF40_MDP0000764434_exon1	51772340	9	6778759	LG_09	31.922	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6782368_Lg9_00280_MAF30_1632894_exon1	72723317	9	6782368	LG_09	31.922	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_7220033_Lg9_01706_MAF40_54414_exon1	30671452	9	7220033	LG_09	32.86	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_7211083_Lg9_01706_MAF40_MDP000017114_exon2	28747303	9	7211083	LG_09	32.882	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_7255390_Lg9_01706_MAF50_MDP0000322282_exon8	56672323	9	7255390	LG_09	33.804	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_7640974_Lg9_00893_MAF20_1669942_exon2	45698459	9	7640974	LG_09	33.804	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_7685092_Lg9_01858_MAF10_326877_exon1	27745450	9	7685092	LG_09	34.753	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_7727491_Lg9_01858_MAF40_1671555_exon1	59808499	9	7727491	LG_09	35.775	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_8265232_Lg9_00337_MAF20_27248_exon1	55634305	9	8265232	LG_09	38.708	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_8236405_Lg9_00337_MAF40_207976_exon1	53784468	9	8236405	LG_09	38.756	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_8273556_Lg9_00337_MAF20_374425_exon1	44663496	9	8273556	LG_09	38.756	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_10476886_Lg9_MDP0000222000_MDP0000222000_exon1	69679335	9	10476886	LG_09	40.769	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_10390776_Lg17_01044_MAF20_1622449_exon2	40723369	17	10390776	LG_09	40.769	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_11719235_Lg9_01755_MAF20_45574_exon1	69791385	9	11719235	LG_09	41.802	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_11729185_Lg9_01755_MAF40_508139_exon1	55625457	9	11729185	LG_09	41.802	<lmxl>	{0-}	(ll,lm)
GDsnp00947	58716444	9	11135949	LG_09	41.902	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_12886110_Lg9_00331_MAF10_505681_exon2	70787426	9	12886110	LG_09	47.269	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_14241533_Lg9_00958_MAF30_1654980_exon3	22673470	9	14241533	LG_09	48.096	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_14350830_Lg9_02046_MAF20_MDP0000159004_exon2	49729362	9	14350830	LG_09	48.096	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_18226904_Lg9_00109_MAF40_1670050_exon1	65701464	9	18226904	LG_09	50.656	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_18224270_Lg9_00109_MAF30_682493_exon1	38697402	9	18224270	LG_09	50.898	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_18520824_Lg9_328022_MAF40_328022_exon1	34728330	9	18520824	LG_09	52.736	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_18239523_Lg9_00109_MAF30_1625354_exon9	35704466	9	18239523	LG_09	52.96	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_18243159_Lg9_00109_MAF20_221824_exon1	71645393	9	18243159	LG_09	52.96	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_34565017_Lg13_MDP0000128682_MAF30_MDP0000128682_exon1	45662305	13	34565017	LG_09	53.165	<nnxnp>	{-0}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GT_33056483_Lg9_01200_MAF50_MDP0000254312_exon19	55647407	9	33056483	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_33065704_Lg9_01200_MAF20_MDP0000312752_exon1	63612338	9	33065704	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33089957_Lg9_01200_MAF10_1643288_exon4	22779487	9	33089957	LG_09	55.001	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_33180045_Lg9_01293_MAF50_MDP0000168471_exon1	69782475	9	33180045	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33182405_Lg9_01293_MAF20_MDP0000186755_exon2	56679497	9	33182405	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33185982_Lg9_01293_MAF10_MDP0000507749_exon3	71802364	9	33185982	LG_09	55.001	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_33219450_Lg9_00332_MAF40_743609_exon1	18742508	9	33219450	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33227831_Lg9_00332_MAF40_MDP0000175442_exon2	13773329	9	33227831	LG_09	55.001	<lmxl>	{1-}	(ll,lm)
GDsnp02482	35751386	9	27881557	LG_09	55.081	<nnxnp>	{-0}	(nn,np)
GDsnp00467	49731405	9	29815380	LG_09	55.122	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32531545_Lg9_01066_MAF30_1639980_exon1	58653305	9	32531545	LG_09	55.405	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_32578156_Lg9_01066_MAF10_MDP0000226580_exon2	57675485	9	32578156	LG_09	55.405	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_32549950_Lg9_01066_MAF30_MDP0000275261_exon10	71675356	9	32549950	LG_09	55.418	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_30227604_Lg9_MDP0000137221_MAF30_MDP0000137221_exon1	12634395	9	30227604	LG_09	55.753	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_32297817_Lg9_00659_MAF40_520045_exon1	73649472	9	32297817	LG_09	55.835	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_32329275_Lg9_00659_MAF20_178008_exon1	65783316	9	32329275	LG_09	55.835	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_35934024_Lg9_00860_MAF50_MDP0000121139_exon5	23682490	9	35934024	LG_09	56.048	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_31685318_Lg9_00206_MAF20_150466_exon1	42690334	9	31685318	LG_09	56.108	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_31860120_Lg9_9573_MAF40_9573_exon1	28809300	9	31860120	LG_09	56.235	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_29778441_Lg9_00467_MAF40_MDP0000245153_exon5	60758388	9	29778441	LG_09	56.34	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_29824342_Lg9_00467_MAF50_1670978_exon1	52704472	9	29824342	LG_09	56.34	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_35857597_Lg9_00860_MAF30_1682680_exon3	58664396	9	35857597	LG_09	56.402	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_29703618_Lg9_02437_MAF10_1653967_exon1	62742330	9	29703618	LG_09	56.459	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_35913773_Lg9_00860_MAF20_MDP0000132641_exon2	69709454	9	35913773	LG_09	56.67	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_35144416_Lg2_86472_MAF20_86472_exon1	55804393	2	35144416	LG_09	56.718	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_29807663_Lg9_00467_MAF30_MDP0000294547_exon4	23736504	9	29807663	LG_09	56.734	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_35885123_Lg9_00860_MAF40_MDP0000267148_exon1	42637492	9	35885123	LG_09	56.775	<lmxl>	{1-}	(ll,lm)
GDsnp02437	58780453	9	29748531	LG_09	56.927	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_24160721_Lg9_00053_MAF40_MDP0000384633_exon2	27671509	9	24160721	LG_09	57.444	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_14845083_Lg1_01500_MAF30_1624704_exon3	53792405	1	14845083	LG_09	57.459	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_25675248_Lg1_00087_MAF20_MDP0000250276_exon1	48711465	1	25675248	LG_09	57.459	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_21618606_Lg9_02230_MAF50_MDP0000320823_exon3	29696431	9	21618606	LG_09	57.459	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_4428309_Lg16_182011_exon1	52626305	16	4428309	LG_09	57.667	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_20564976_Lg9_02451_MAF30_MDP0000266844_exon5	63693411	9	20564976	LG_09	57.763	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_19977586_Lg9_02100_MAF40_MDP0000137341_exon4	14638434	9	19977586	LG_09	58.143	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_33188075_Lg13_02487_MAF40_MDP0000158474_exon1	65648317	13	33188075	LG_09	58.39	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_33192423_Lg13_02487_MAF20_1641985_exon2	35680336	13	33192423	LG_09	58.39	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_32878663_Lg13_02890_MAF40_1651728_exon2	16800310	13	32878663	LG_09	58.396	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_25678674_Lg1_00087_MAF20_MDP0000397231_exon1	65708412	1	25678674	LG_09	58.736	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_25688049_Lg1_00087_MAF30_1632262_exon1	70690474	1	25688049	LG_09	58.736	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_25741771_Lg1_00087_MAF50_MDP0000240636_exon1	71689339	1	25741771	LG_09	58.736	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_35144180_Lg2_86472_86472_exon2	31733358	2	35144180	LG_09	58.736	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GT_21992669_Lg3_02644_MAF30_MDP0000450695_exon2	3	21992669	LG_09	58.736	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_TG_13612293_Lg5_00978_MAF30_MDP0000427354_exon3	5	13612293	LG_09	58.736	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GT_21216802_Lg9	9	21216802	LG_09	58.736	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_21583930_Lg9_02230_MAF20_MDP0000233239_exon5	9	21583930	LG_09	58.736	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AG_21614543_Lg9_02230_MAF30_MDP0000651477_exon1	9	21614543	LG_09	58.736	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_24193344_Lg9_00053_MAF20_MDP0000253632_exon25	9	24193344	LG_09	58.736	<nnnp>	{-0}	(nn.np)
GDsnp00053	9	24208807	LG_09	58.736	<nnnp>	{-1}	(nn.np)
RosBREEDSNP_SNP_CA_25690200_Lg1_00087_MAF30_1632262_exon3	1	25690200	LG_09	58.739	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_21570393_Lg9_02230_MAF30_1625063_exon9	9	21570393	LG_09	58.739	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GT_24188449_Lg9_00053_MAF20_1629721_exon5	9	24188449	LG_09	58.739	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_34417501_Lg13_MDP0000243533_MAF30_MDP0000243533_exon2	13	34417501	LG_09	59.17	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_19974933_Lg9_02100_MAF20_449660_exon1	9	19974933	LG_09	59.363	<nnnp>	{-0}	(nn.np)
GDsnp02100	9	20013404	LG_09	59.363	<nnnp>	{-1}	(nn.np)
RosBREEDSNP_SNP_AG_32862929_Lg13_02890_MAF10_MDP0000451570_exon4	13	32862929	LG_09	59.96	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_33217975_Lg13_02487_MAF40_394887_exon1	13	33217975	LG_09	59.96	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CA_19536792_Lg9_268341_MAF20_268341_exon1	9	19536792	LG_09	59.972	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AG_33270813_Lg13_02487_MAF50_1618604_exon3	13	33270813	LG_09	60.762	<nnnp>	{-0}	(nn.np)
GDsnp00206	9	31733974	LG_09	63.666	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_TC_18277441_Lg9_00109_MAF20_MDP0000197208_exon10	9	18277441	LG_09	84.211	<nnnp>	{-0}	(nn.np)
GDsnp01789	10	337598	LG_10	0	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_18564112_Lg5_00323_MAF50_307503_exon1	5	18564112	LG_10	0.854	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_2553386_Lg10_00839_MAF40_MDP0000424666_exon2	10	2553386	LG_10	1.248	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GT_2479664_Lg10_01909_MAF40_257666_exon1	10	2479664	LG_10	1.674	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_30192525_Lg8_01764_MAF40_MDP0000209681_exon4	8	30192525	LG_10	1.949	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AC_2440066_Lg10_01909_MAF30_411914_exon1	10	2440066	LG_10	2.024	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_TC_1282648_Lg10_RosCOS2296_MAF30_MDP0000226508_exon1	10	1282648	LG_10	2.121	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_TC_867947_Lg10_00106_MAF40_546402_exon1	10	867947	LG_10	2.585	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_377816_Lg10_01789_MAF50_MDP0000257837_exon3	10	377816	LG_10	2.598	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_4034839_Lg10_01810_MAF40_460310_exon1	10	4034839	LG_10	9.359	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_4041727_Lg10_01810_MAF50_1646123_exon1	10	4041727	LG_10	9.359	<nnnp>	{-0}	(nn.np)
GDsnp01810	10	4043640	LG_10	9.617	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_7118008_Lg10_02051_MAF10_MDP0000280646_exon1	10	7118008	LG_10	20.775	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AC_10732590_Lg10_01867_MAF10_229384_exon1	10	10732590	LG_10	28.268	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_12053580_Lg10_RosCOS2353_MAF20_1671141_exon4	10	12053580	LG_10	32.29	<nnnp>	{-1}	(nn.np)
RosBREEDSNP_SNP_AC_12048247_Lg10_RosCOS2353_MAF20_1651936_exon1	10	12048247	LG_10	32.341	<nnnp>	{-1}	(nn.np)
RosBREEDSNP_SNP_GA_11061321_Lg12_02115_MAF20_MDP0000257734_exon1	12	11061321	LG_10	33.202	<nnnp>	{-1}	(nn.np)
RosBREEDSNP_SNP_AG_10300805_Lg12_02814_MAF40_MDP0000273159_exon4	12	10300805	LG_10	34.374	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_GA_13716782_Lg14_MDP0000567775_MAF50_MDP0000567775_exon5	14	13716782	LG_10	35.586	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_TC_28447378_Lg11_02800_MAF20_MDP0000568007_exon1	11	28447378	LG_10	35.641	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_CT_21301195_Lg7_02600_MAF10_20543_exon1	7	21301195	LG_10	35.651	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AG_25242473_Lg15_RosCOS588_MAF50_MDP0000306115_exon8	15	25242473	LG_10	35.651	<nnnp>	{-0}	(nn.np)
RosBREEDSNP_SNP_AG_13746522_Lg10_snpEG631376_MAF50_MDP0000525059_exon1	10	13746522	LG_10	36.486	<nnnp>	{-0}	(nn.np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_13748677_Lg10_snpEG631376_MAF50_MDP0000525059_exon1	31797446	10	13748677	LG_10	36.486	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_14009069_Lg14_CXE5_MAF40_192841_exon1	59633399	14	14009069	LG_10	38.546	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_14012847_Lg14_CXE5_MAF40_1659491_exon4	56653317	14	14012847	LG_10	38.562	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_536122_Lg9_01891_MAF50_432400_exon1	71605338	9	536122	LG_10	38.986	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_38151714_Lg2_MDP0000020317_MAF10_MDP0000020317_exon6	59636397	2	38151714	LG_10	39.406	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_2498716_Lg10_01909_MAF20_320920_exon1	10684318	10	2498716	LG_10	41.376	<lmxl>	{-0}	(ll,lm)
GDsnp00839	70789426	10	2600272	LG_10	41.376	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_8557916_Lg10_00260_MAF50_1627495_exon2	37740396	10	8557916	LG_10	41.671	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_16562159_Lg8_02022_MAF10_MDP0000489996_exon1	71700379	8	16562159	LG_10	42.283	<lmxl>	{-0}	(ll,lm)
GDsnp01909	23625311	10	2477825	LG_10	42.283	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_3294683_Lg10_01947_MAF20_MDP0000226451_exon18	58660481	10	3294683	LG_10	42.283	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_4032707_Lg10_01810_MAF30_483396_exon2	46726399	10	4032707	LG_10	42.283	<lmxl>	{-0}	(ll,lm)
GDsnp02051	19799311	10	7164549	LG_10	43.111	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_13033111_Lg10_RosCOS724_MAF40_MDP0000193868_exon3	46732421	10	13033111	LG_10	43.876	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_13019481_Lg10_RosCOS724_MAF20_1621359_exon1	45692376	10	13019481	LG_10	43.914	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_13071892_Lg10_RosCOS724_MAF50_MDP0000285181_exon18	20724390	10	13071892	LG_10	43.914	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_25254893_Lg15_RosCOS588_MAF10_1628860_exon8	74641417	15	25254893	LG_10	43.914	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_4983104_Lg17_145834_MAF50_145834_exon1	13609505	17	4983104	LG_10	44.362	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_16680919_Lg10_01710_MAF30_MDP0000226923_exon1	65693375	10	16680919	LG_10	46.992	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_16726719_Lg10_01710_MAF40_1666563_exon2	39686467	10	16726719	LG_10	46.992	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_17036268_Lg10_02009_MAF30_1683116_exon1	31673482	10	17036268	LG_10	46.992	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_17894779_Lg10_02252_MAF50_1673029_exon1	40788427	10	17894779	LG_10	48.729	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_17914122_Lg10_02252_MAF40_1699028_exon6	48650336	10	17914122	LG_10	48.729	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18494279_Lg10_01832_MAF40_MDP0000545759_exon1	59783429	10	18494279	LG_10	48.729	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_18478773_Lg10_01832_MAF20_873421_exon1	51624473	10	18478773	LG_10	48.761	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_14684226_Lg10_01267_MAF10_2640_exon1	62642341	10	14684226	LG_10	49.629	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_16997826_Lg10_02009_MAF10_3542465_exon1	61665312	10	16997826	LG_10	50.582	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_7705858_Lg9_01858_MAF30_MDP0000294257_exon4	28745302	9	7705858	LG_10	50.599	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_16714632_Lg10_01710_MAF30_715511_exon1	57771433	10	16714632	LG_10	50.599	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_17040479_Lg10_02009_MAF20_487699_exon2	14700436	10	17040479	LG_10	50.599	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_17046031_Lg10_02009_MAF40_MDP0000142019_exon2	51728382	10	17046031	LG_10	50.599	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_17911896_Lg10_02252_MAF30_MDP0000125644_exon1	61659509	10	17911896	LG_10	50.599	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_19519947_Lg10_02183_MAF10_MDP0000235804_exon3	67746504	10	19519947	LG_10	53.496	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_20058117_Lg10_00869_MAF40_1652486_exon1	71803459	10	20058117	LG_10	55.668	<nnxp>	{-0}	(nn,np)
GDsnp00869	71600347	10	20058217	LG_10	55.668	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_20833228_Lg10_PG_MAF50_184244_exon1	55746491	10	20833228	LG_10	55.668	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_3090142_Lg15_01814_MAF30_1651710_exon1	69775437	15	3090142	LG_10	56.459	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_22513868_Lg10_RosCOS139_MAF30_1647136_exon1	57762443	10	22513868	LG_10	56.527	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_22571534_Lg10_RosCOS139_MAF50_1647758_exon3	50624496	10	22571534	LG_10	57	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3093315_Lg15_01814_MAF40_579747_exon1	27776403	15	3093315	LG_10	58.524	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_22536388_Lg10_RosCOS139_MAF20_MDP0000298812_exon1	59719482	10	22536388	LG_10	58.529	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_23285470_Lg10_RosCOS1786_MAF30_1646669_exon4	70664398	10	23285470	LG_10	59.526	<lmxl>	{-0}	(ll,lm)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AC_23287620_Lg10_RosCOS1786_MAF40_1683394_exon1	32801507	10	23287620	LG_10	59.526	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_23617796_Lg10_AT9_MAF40_MDP0000253114_exon1	53759477	10	23617796	LG_10	59.758	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_23963166_Lg10_RosCOS2910_MAF50_1675871_exon1	14790307	10	23963166	LG_10	60.692	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_23958720_Lg10_RosCOS2910_MAF10_1686249_exon1	61626329	10	23958720	LG_10	64.692	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_24273907_Lg10_RosCOS3104_MAF50_1653415_exon2	21726427	10	24273907	LG_10	64.692	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_24294786_Lg10_RosCOS3104_MAF30_1641181_exon2	33737302	10	24294786	LG_10	64.692	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_29048592_Lg10_01570_MAF50_1660917_exon1	18665440	10	29048592	LG_10	67.661	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2576522_Lg10_00839_MAF10_463248_exon1	54701465	10	2576522	LG_10	68.706	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_26616826_Lg10_00812_MAF30_408812_exon1	36742447	10	26616826	LG_10	69.042	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_26653496_Lg10_00812_MAF40_MDP000085859_exon1	29792483	10	26653496	LG_10	69.692	<lmxl>	{0-}	(ll,lm)
GDsp00812	66803332	10	26660407	LG_10	69.762	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_28131897_Lg10_68102_MAF40_68102_exon1	36746489	10	28131897	LG_10	73.61	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_28354787_Lg10_148145_MAF30_148145_exon2	11702409	10	28354787	LG_10	74.597	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_29018338_Lg10_01570_MAF40_1642636_exon2	62679435	10	29018338	LG_10	74.597	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_36033314_Lg10_186429_MAF40_186429_exon1	20695433	10	36033314	LG_10	74.597	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_29020445_Lg10_01570_MAF40_MDP0000131641_exon2	73784462	10	29020445	LG_10	75.544	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_29213640_Lg10_138979_MAF20_138979_exon2	73633489	10	29213640	LG_10	75.544	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_29213692_Lg10_138979_MAF30_138979_exon2	62801494	10	29213692	LG_10	75.544	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_29324063_Lg10_MDP0000880912_MAF30_MDP0000880912_exon1	50769448	10	29324063	LG_10	75.544	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_30223751_Lg10_00734_MAF50_1646703_exon1	52711342	10	30223751	LG_10	80.477	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_31279293_Lg10_01908_MAF40_689898_exon1	38684484	10	31279293	LG_10	81.541	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_31238010_Lg10_01908_MAF20_MDP0000222736_exon5	61605436	10	31238010	LG_10	82.241	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_31272912_Lg10_01908_MAF50_MDP0000263060_exon1	67759446	10	31272912	LG_10	82.253	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_31320811_Lg10_01961_MAF50_MDP0000256011_exon1	47744461	10	31320811	LG_10	82.753	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_30396941_Lg10_01299_MAF30_519689_exon1	59753469	10	30396941	LG_10	82.869	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_31285569_Lg10_01961_MAF20_MDP0000130173_exon4	59609435	10	31285569	LG_10	84.561	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31331375_Lg10_01961_MAF50_1619986_exon1	73692342	10	31331375	LG_10	84.561	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_31676157_Lg10_00099_MAF30_407257_exon4	60796437	10	31676157	LG_10	86.46	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_32380998_Lg10_RosCOS2362_MAF20_880009_exon2	21672472	10	32380998	LG_10	86.863	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_32372997_Lg10_RosCOS2362_MAF20_1643940_exon1	67669350	10	32372997	LG_10	87.444	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_32378216_Lg10_RosCOS2362_MAF30_461155_exon1	36726429	10	32378216	LG_10	90.638	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32391514_Lg10_RosCOS2362_MAF10_1619851_exon3	67608426	10	32391514	LG_10	90.638	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32402084_Lg10_RosCOS2362_MAF40_MDP0000383515_exon5	32679503	10	32402084	LG_10	90.638	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_33501094_Lg10_01683_MAF50_MDP0000305859_exon5	66673456	10	33501094	LG_10	95.723	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_33520271_Lg10_01683_MAF30_MDP0000305861_exon12	37668452	10	33520271	LG_10	95.723	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_34911292_Lg10_00258_MAF40_MDP0000550024_exon6	18636487	10	34911292	LG_10	95.723	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_27687938_Lg3_00607_MAF30_605396_exon1	61758382	3	27687938	LG_10	97.984	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_27691074_Lg3_00607_MAF50_380398_exon1	11800342	3	27691074	LG_10	97.984	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_36091067_Lg10_RosCOS2135_MAF40_474692_exon1	29734307	10	36091067	LG_10	98.559	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_36148204_Lg10_RosCOS2135_MAF10_1665533_exon3	67803442	10	36148204	LG_10	99.493	<lmxl>	{0-}	(ll,lm)
GDsp01761	68775347	10	36607604	LG_10	100.33	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_36560697_Lg10_01761_MAF10_1664399_exon1	29685477	10	36560697	LG_10	100.366	<lmxl>	{1-}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_36606927_Lg10_01761_MAF10_MDP00000221905_exon6	26607382	10	36606927	LG_10	100.366	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_36783038_Lg10_MDP0000136226_MAF50_MDP0000136226_exon4	20710324	10	36783038	LG_10	101.253	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_36848994_Lg10_00405_MAF20_MDP0000293774_exon3	25804416	10	36848994	LG_10	101.283	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_36883478_Lg10_00405_MAF30_281824_exon1	16762447	10	36883478	LG_10	101.996	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_36985238_Lg10_00604_MAF20_394414_exon1	27768416	10	36985238	LG_10	103.024	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_37006565_Lg10_00604_MAF40_1660572_exon2	16730442	10	37006565	LG_10	103.024	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_495547_Lg11_01480_MAF30_435739_exon1	60797472	11	495547	LG_11	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_30952644_Lg15_RosCOS444_MAF50_1641741_exon4	34615465	15	30952644	LG_11	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30956956_Lg15_RosCOS444_MAF40_1621872_exon1	34642509	15	30956956	LG_11	0	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_26943295_Lg14_02079_MAF50_160202_exon1	74731379	14	26943295	LG_11	1.668	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_557285_Lg11_01480_MAF50_1638467_exon1	72702338	11	557285	LG_11	1.778	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_9244650_Lg13_01742_MAF10_767610_exon1	14810352	13	9244650	LG_11	4.749	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_30962954_Lg15_RosCOS444_MAF40_MDP0000485280_exon1	12793416	15	30962954	LG_11	5.716	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_12188459_Lg11_00240_MAF10_MDP0000713484_exon1	24685490	11	12188459	LG_11	7.301	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_5944780_Lg11_MDP0000163230_MAF20_MDP0000163230_exon1	28767415	11	5944780	LG_11	8.445	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6534066_Lg11_00621_MAF50_860447_exon1	44779301	11	6534066	LG_11	9.187	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_6688015_Lg11_01788_MAF40_61995_exon7	45737368	11	6688015	LG_11	9.187	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_5482687_Lg11_01713_MAF40_MDP0000265419_exon1	11657475	11	5482687	LG_11	9.439	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_6704249_Lg11_01788_MAF20_521415_exon3	51634440	11	6704249	LG_11	10.966	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_716431_Lg3_RosCOS2149_MAF20_1637331_exon3	38793337	3	716431	LG_11	11.278	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_5154472_Lg11_00418_MAF30_186915_exon1	16701440	11	5154472	LG_11	11.372	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_4937206_Lg11_MDP0000389025_MAF10_MDP0000389025_exon1	52715458	11	4937206	LG_11	11.404	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_5075367_Lg11_RosCOS2981_MAF50_1677461_exon1	45718494	11	5075367	LG_11	11.404	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_5133231_Lg11_00418_MAF20_58344_exon1	23695372	11	5133231	LG_11	11.404	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6697510_Lg11_01788_MAF30_1668595_exon1	64701359	11	5495238	LG_11	13.262	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_6496114_Lg11_00621_MAF40_MDP0000172291_exon7	29654452	11	6697510	LG_11	13.595	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_6484441_Lg11_00621_MAF20_1668684_exon1	40759397	11	6496114	LG_11	14.162	<lmxl>	{0-}	(ll,lm)
GDsnp00735	58780348	11	6484441	LG_11	14.177	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_8427560_Lg11_00185_MAF20_MDP0000185943_exon7	21782332	11	8720693	LG_11	14.289	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_8687657_Lg11_00735_MAF30_842844_exon1	43756435	11	7161866	LG_11	16.044	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_8716987_Lg11_00735_MAF10_1618847_exon1	73707347	11	8445216	LG_11	16.652	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_9965260_Lg11_RosCOS3333_MAF30_MDP0000320465_exon1	18771496	11	6532369	LG_11	17.885	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_9976495_Lg11_RosCOS3333_MAF20_1653958_exon1	58694406	11	8427560	LG_11	18.199	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_11309307_Lg11_00377_MAF20_1662030_exon1	22660484	11	8687657	LG_11	18.199	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_12352575_Lg11_00441_MAF30_1646884_exon1	25752459	11	8716987	LG_11	18.199	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9965260_Lg11_RosCOS3333_MAF30_MDP0000320465_exon1	61765483	11	9965260	LG_11	22.751	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_9976495_Lg11_RosCOS3333_MAF20_1653958_exon1	47749312	11	9976495	LG_11	23.3	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_11309307_Lg11_00377_MAF20_1662030_exon1	63671413	11	11309307	LG_11	25.363	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_12352575_Lg11_00441_MAF30_1646884_exon1	46763457	11	12352575	LG_11	27.962	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_11831569_Lg11_00037_MAF40_1656871_exon1	32653508	11	11831569	LG_11	28.874	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_11306023_Lg11_00377_MAF20_MDP0000181606_exon1	31723477	11	11306023	LG_11	29.252	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_11601607_Lg11_02309_MAF20_458582_exon2	71619371	11	11601607	LG_11	29.9	<lmxl>	{1-}	(ll,lm)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp02309	11	11615576	LG_11	29.9	<lmxl>	{1-}	(ll,lm)
GDsnp02465	11	12947663	LG_11	29.957	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14850427_Lg11_RosCOS224_MAF40_MDP0000195336_exon3	11	14850427	LG_11	32.916	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_12898690_Lg11_02465_MAF50_MDP0000524742_exon1	11	12898690	LG_11	35.117	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_12328377_Lg11_00441_MAF50_373309_exon3	11	12328377	LG_11	35.144	<lmxl>	{-1}	(ll,lm)
Pear_Bartlett_SNP_TC_471_5062178	5062178	471	LG_11	35.144	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_13746528_Lg11_RosCOS2909_MAF50_1658545_exon1	11	13746528	LG_11	35.606	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23268845_Lg5_RosCOS1210_MAF30_885821_exon1	5	23268845	LG_11	37.513	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_14864469_Lg11_RosCOS224_MAF20_1637382_exon1	11	14864469	LG_11	38.086	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_16621686_Lg7_MDP0000882156_MAF20_MDP0000882156_exon3	7	16621686	LG_11	38.299	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_23881186_Lg11_10010_MAF40_MDP0000208862_exon3	11	23881186	LG_11	39.006	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_13653336_Lg11_RosCOS2909_MAF20_MDP0000193176_exon4	11	13653336	LG_11	39.179	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_16672448_Lg11_01640_MAF20_1661258_exon1	11	16672448	LG_11	39.607	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_27126226_Lg13_MDP0000716623_MAF50_MDP0000716623_exon1	13	27126226	LG_11	40.016	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_27108153_Lg13_MDP0000236565_MAF20_MDP0000236565_exon1	13	27108153	LG_11	40.045	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_23247031_Lg5_RosCOS1210_MAF10_788937_exon1	5	23247031	LG_11	40.085	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_19068652_Lg11_GD_SNP01857_MAF50_1631874_exon2	11	19068652	LG_11	40.085	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_25967775_Lg13_MDP0000127457_MAF20_MDP0000127457_exon5	13	25967775	LG_11	40.085	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_26252739_Lg13_02452_MAF30_MDP0000212353_exon6	13	26252739	LG_11	40.085	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_27108273_Lg13_MDP0000236565_MDP0000236565_exon1	13	27108273	LG_11	40.085	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_27108315_Lg13_MDP0000236565_MAF20_MDP0000236565_exon1	13	27108315	LG_11	40.085	<lmxl>	{-1}	(ll,lm)
GDsnp01187	11	20557520	LG_11	40.086	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TG_29128375_Lg2_226032_226032_exon2	2	29128375	LG_11	40.786	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_24562661_Lg11_02407_MAF30_913956_exon1	11	24562661	LG_11	40.786	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_26020598_Lg11_01797_MAF20_218458_exon2	11	26020598	LG_11	42.387	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_26099970_Lg11_01797_MAF40_MDP0000288746_exon1	11	26099970	LG_11	42.721	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_26810795_Lg11_01361_MAF20_MDP0000180811_exon3	11	26810795	LG_11	43.763	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_28699805_Lg11_01705_MAF20_1640642_exon3	11	28699805	LG_11	44.674	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_29809045_Lg11_00662_MAF20_1633056_exon3	11	29809045	LG_11	44.679	<lmxl>	{-0}	(ll,lm)
GDsnp01361	11	26828729	LG_11	44.972	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_30582252_Lg11_02838_MAF50_MDP0000317343_exon1	11	30582252	LG_11	45.548	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_30574281_Lg11_02838_MAF40_286253_exon1	11	30574281	LG_11	45.566	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_22015836_Lg4_MDP0000157871_MDP0000157871_exon1	4	22015836	LG_11	46.401	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_22016027_Lg4_MDP0000157871_MAF30_MDP0000157871_exon1	4	22016027	LG_11	46.401	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_26942761_Lg11_4114_MAF40_4114_exon1	11	26942761	LG_11	47.257	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26829691_Lg11_01361_MAF50_1663355_exon1	11	26829691	LG_11	47.293	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_29786847_Lg11_00662_MAF40_186556_exon1	11	29786847	LG_11	47.771	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_30084427_Lg11_02351_MAF40_1670755_exon1	11	30084427	LG_11	48.186	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_22004861_Lg4_01965_MAF50_1678194_exon1	4	22004861	LG_11	48.953	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_32553307_Lg11_00647_MAF40_1683980_exon4	11	32553307	LG_11	50.033	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_33426856_Lg11_02576_MAF20_118175_exon1	11	33426856	LG_11	50.945	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_33465079_Lg11_02576_MAF40_1632551_exon3	11	33465079	LG_11	50.953	<lmxl>	{-1}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_34210655_Lg11_02910_MAF40_MDP0000288220_exon1	18749473	11	34210655	LG_11	50.971	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_33333488_Lg11_01951_MAF20_1662644_exon1	74750420	1	33333488	LG_11	51.021	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_34229286_Lg11_02910_MAF50_1683154_exon3	33647448	11	34229286	LG_11	51.021	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_29832087_Lg11_00662_MAF30_1642163_exon1	60637483	11	29832087	LG_11	51.101	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_30610341_Lg11_02838_MAF10_MDP0000127896_exon3	63630427	11	30610341	LG_11	52.426	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22007324_Lg4_01965_MAF50_636863_exon1	70710472	4	22007324	LG_11	52.584	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30066535_Lg11_02351_MAF50_1627361_exon3	64632324	11	30066535	LG_11	52.642	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_35840087_Lg11_00795_MAF30_1638089_exon2	45780411	11	35840087	LG_11	53.869	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_35936616_Lg11_RosCOS372_MAF50_826662_exon1	12786399	11	35936616	LG_11	53.869	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_36011885_Lg11_RosCOS372_MAF40_459727_exon2	25799401	11	36011885	LG_11	53.869	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_36938301_Lg11_RosCOS1511_MAF10_475601_exon1	14776421	11	36938301	LG_11	54.866	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_36946479_Lg11_RosCOS1511_MAF30_263380_exon1	52784506	11	36946479	LG_11	54.866	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_36949843_Lg11_RosCOS1511_MAF40_848539_exon1	67670416	11	36949843	LG_11	54.866	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_3311328_Lg6_02819_MAF20_MDP0000161610_exon1	59667390	6	3311328	LG_11	54.93	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_8797126_Lg17_01842_MAF10_MDP0000822021_exon4	47769433	17	8797126	LG_11	61.413	<lmxl>	{0-}	(ll,lm)
GDsnp00182	61795505	11	40016712	LG_11	62.791	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_39990406_Lg11_00182_MAF30_MDP0000322000_exon2	50696440	11	39990406	LG_11	63.242	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_38742272_Lg11_01465_MAF50_1637810_exon2	39602493	11	38742272	LG_11	67.845	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_38347479_Lg11_224792_MAF30_224792_exon1	45614485	11	38347479	LG_11	75.354	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_38694306_Lg11_01465_MAF40_MDP0000164488_exon2	37697455	11	38694306	LG_11	76.154	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_38732054_Lg11_01465_MAF30_1632780_exon2	66654388	11	38732054	LG_11	76.154	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_39149329_Lg11_00646_MAF30_257012_exon2	48748427	11	39149329	LG_11	76.922	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_21208413_Lg12_RosCOS1969_MAF40_682553_exon1	74755346	12	21208413	LG_11	76.922	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39190659_Lg11_00646_MAF40_1634484_exon1	70622464	11	39190659	LG_11	77.748	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39914254_Lg11_237065_MAF50_237065_exon1	45600401	11	39914254	LG_11	81.173	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39914390_Lg11_237065_MAF50_237065_exon1	65765331	11	39914390	LG_11	81.173	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_40016890_Lg11_00182_MAF50_MDP0000370712_exon1	43725444	11	40016890	LG_11	81.173	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_40045235_Lg11_00182_MAF50_512766_exon1	73636338	11	40045235	LG_11	81.173	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_40056015_Lg11_00182_MAF20_MDP0000151539_exon1	32804449	11	40056015	LG_11	81.173	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_39998759_Lg11_00182_MAF40_MDP0000440570_exon2	19745427	11	39998759	LG_11	81.187	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_494465_Lg12_00173_MAF20_1666098_exon1	54681350	12	494465	LG_12	0	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1211722_Lg12_RosCOS3293_MAF20_1680883_exon1	73680469	12	1211722	LG_12	0.916	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_502092_Lg12_00173_MAF50_1644261_exon7	18794406	12	502092	LG_12	2.949	<lmxl>	{1-}	(ll,lm)
GDsnp00173	26637475	12	495813	LG_12	3	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_500084_Lg12_00173_MAF40_1659794_exon4	52738329	12	500084	LG_12	3	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_1803604_Lg12_00116_MAF30_1640687_exon8	35617491	12	1803604	LG_12	3.589	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1801327_Lg12_00116_MAF10_514173_exon1	11801455	12	1801327	LG_12	3.623	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1834083_Lg12_00116_MAF10_1653707_exon3	55781452	12	1834083	LG_12	3.623	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_1193551_Lg12_RosCOS3293_MAF50_756728_exon3	20655480	12	1193551	LG_12	3.925	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_1195935_Lg12_RosCOS3293_MAF30_1655383_exon1	53709383	12	1195935	LG_12	3.94	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_2341962_Lg12_262602_MAF40_262602_exon1	52622345	12	2341962	LG_12	5.279	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_10438643_Lg1_RosCOS3195_MAF50_MDP00000253600_exon1	50649481	1	10438643	LG_12	5.342	<nnxnp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AC_10476695_Lg1_RosCOS3195_MAF10_1682584_exon7	27701417	1	10476695	LG_12	5.342	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2343296_Lg12_262602_262602_exon2	47780324	12	2343296	LG_12	5.342	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_1820617_Lg12_00116_MAF30_522042_exon1	40793406	12	1820617	LG_12	5.748	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_1818084_Lg12_00116_MAF40_156614_exon1	30647466	12	1818084	LG_12	5.758	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_1475357_Lg12_319216_319216_exon2	35695483	12	1475357	LG_12	5.888	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_2024247_Lg2_AAT1_MAF50_1670831_exon1	54801382	2	2024247	LG_12	6.478	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_2970938_Lg12_RosCOS1934_MAF30_1681178_exon3	16771445	12	2970938	LG_12	7.339	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2978136_Lg12_01615_MAF40_714673_exon1	62766395	12	2978136	LG_12	7.339	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1799179_Lg12_00116_MAF20_898942_exon1	66664396	12	1799179	LG_12	8.545	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_2980590_Lg12_01615_MAF50_1650253_exon1	20730358	12	2980590	LG_12	9.973	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_4304933_Lg12_01690_MAF30_MDP0000294146_exon4	43653445	12	4304933	LG_12	12.905	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3784455_Lg12_00430_MAF10_264279_exon1	72743471	12	3784455	LG_12	12.924	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_4336568_Lg12_01690_MAF20_1687172_exon3	31764390	12	4336568	LG_12	12.924	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2956505_Lg12_RosCOS1934_MAF30_MDP0000283764_exon13	21637343	12	2956505	LG_12	13.694	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_3033227_Lg12_01615_MAF10_MDP0000275151_exon25	10791411	12	3033227	LG_12	15.187	<lmxl>	{0-}	(ll,lm)
GDsnp01391	61735358	12	3499401	LG_12	15.187	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_3506169_Lg12_01391_MAF50_491101_exon1	16790391	12	3506169	LG_12	15.187	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_3445217_Lg12_324348_MAF40_324348_exon1	46631439	12	3445217	LG_12	15.234	<lmxl>	{1-}	(ll,lm)
Pear_Bartlett_SNP_GA_467_5144762	5142823	12	467	LG_12	16.04	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_4334480_Lg12_01690_MAF20_769350_exon1	43795416	12	4334480	LG_12	16.671	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_5173229_Lg12_MDP0000221924_MAF30_MDP0000221924_exon2	14730379	12	5173229	LG_12	16.9	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4704776_Lg12_01907_MAF50_152803_exon2	53770480	12	4704776	LG_12	18.564	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_5173770_Lg12_MDP0000221924_MAF50_MDP0000221924_exon4	72766403	12	5173770	LG_12	18.7	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_7044670_Lg12_159023_MAF40_159023_exon1	16796378	12	7044670	LG_12	19.807	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_22147680_Lg4_01026_MAF40_1625428_exon1	44772329	4	22147680	LG_12	22.14	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9333311_Lg12_02053_MAF30_MDP0000321559_exon2	57664410	12	9333311	LG_12	22.14	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_8799394_Lg12_02857_MAF40_MDP0000135997_exon9	15656303	12	8799394	LG_12	22.194	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_8810680_Lg12_02857_MAF40_MDP0000064909_exon1	70629509	12	8810680	LG_12	22.194	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9295252_Lg12_02053_MAF30_688884_exon1	32774360	12	9295252	LG_12	22.548	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_22157867_Lg4_01026_MAF20_1659390_exon1	11791479	4	22157867	LG_12	22.612	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_22167988_Lg4_01026_MAF30_MDP0000290772_exon4	27699466	4	22167988	LG_12	22.612	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_8802561_Lg12_02857_MAF20_1673259_exon1	47767492	12	8802561	LG_12	23.301	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_8805420_Lg12_02857_MAF30_MDP0000305826_exon16	65801457	12	8805420	LG_12	23.777	<nnxp>	{-0}	(nn,np)
GDsnp02857	18788473	12	8845002	LG_12	23.782	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6959369_Lg15_snpDT001928_MAF40_MDP0000184571_exon3	21727406	15	6959369	LG_12	23.782	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_9308316_Lg12_02053_MAF10_626028_exon1	51732488	12	9308316	LG_12	23.803	<nnxp>	{-0}	(nn,np)
GDsnp02053	45775416	12	9294227	LG_12	24.517	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_9274031_Lg12_02053_MAF20_1662678_exon5	31771369	12	9274031	LG_12	24.64	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_16369231_Lg12_01501_MAF40_713285_exon1	63691330	12	16369231	LG_12	25.762	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_16371830_Lg12_01501_MAF50_566278_exon1	66694484	12	16371830	LG_12	25.762	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_14746316_Lg12_00318_MAF20_22577_exon1	69703314	12	14746316	LG_12	26.172	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_15159267_Lg12_MDP0000134241_MAF20_MDP0000134241_exon2	54709394	12	15159267	LG_12	26.333	<nnxp>	{-1}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_16317377_Lg12_01501_MAF20_MDP0000263613_exon3	59745466	12	16317377	LG_12	26.419	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_17350965_Lg12_01607_MAF10_425520_exon1	35779509	12	17350965	LG_12	26.419	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_19247345_Lg12_01555_MAF40_480653_exon1	23775457	12	19247345	LG_12	26.419	<nnxp>	{-0}	(nn,np)
GDsnp02115	72701334	12	11086764	LG_12	27.72	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_19224299_Lg12_01555_MAF30_478053_exon1	20744350	12	19224299	LG_12	28.253	<hkxhk>	{00}	(hh,hk,kk)
GDsnp01555	50752440	12	19216791	LG_12	28.425	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_21248954_Lg12_RosCOS1969_MAF20_1627732_exon7	14708477	12	21248954	LG_12	30.329	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_19310678_Lg12_01357_MAF10_1659313_exon1	30801425	12	19310678	LG_12	30.465	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_21264640_Lg12_RosCOS1969_MAF50_1660800_exon1	72724452	12	21264640	LG_12	31.868	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_21322878_Lg12_01426_MAF40_MDP0000636042_exon2	40807487	12	21322878	LG_12	32.287	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21401673_Lg12_01426_MAF50_1637091_exon1	12765374	12	21401673	LG_12	32.726	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_21387181_Lg12_01426_MAF40_1680072_exon2	71674335	12	21387181	LG_12	33.261	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_22654900_Lg12_01150_MAF30_MDP0000151005_exon6	45678473	12	22654900	LG_12	33.293	<lmxll>	{-0}	(ll,lm)
GDsnp00314	13777459	12	14468646	LG_12	34.167	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_22652840_Lg12_01150_MAF40_713737_exon1	33659454	12	22652840	LG_12	35.113	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_22722118_Lg12_01150_MAF20_MDP0000282387_exon3	52781388	12	22722118	LG_12	35.113	<nnxp>	{-0}	(nn,np)
GDsnp01798	36762353	12	24013563	LG_12	35.919	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_23280662_Lg12_155506_155506_exon1	56702313	12	23280662	LG_12	36.09	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_23385635_Lg12_RosCOS3647_MAF20_MDP0000138764_exon2	48797393	12	23385635	LG_12	36.09	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_23387995_Lg12_RosCOS3647_MAF40_600732_exon1	31706441	12	23387995	LG_12	36.09	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23397899_Lg12_RosCOS3647_MAF20_1648369_exon3	61680408	12	23397899	LG_12	36.277	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_23562759_Lg12_108927_MAF10_108927_exon1	21698437	12	23562759	LG_12	36.277	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_27155494_Lg12_00883_MAF20_1680192_exon2	29620405	12	27155494	LG_12	36.995	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_6907918_Lg17_01927_MAF30_MDP0000453369_exon1	57662316	17	6907918	LG_12	36.995	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_29040874_Lg12_00334_MAF20_1639988_exon1	2728499	12	29040874	LG_12	39.922	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29116035_Lg12_00334_MAF50_402210_exon2	71751357	12	29116035	LG_12	40.071	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_34251015_Lg1_01678_MAF30_MDP0000189607_exon2	66688421	1	34251015	LG_12	40.674	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_29053998_Lg12_00334_MAF20_MDP0000199776_exon3	52617301	12	29053998	LG_12	40.741	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_29070012_Lg12_00334_MAF30_MDP0000163756_exon2	18754392	12	29070012	LG_12	40.741	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_30657538_Lg12_00714_MAF20_MDP0000300196_exon1	32606434	12	30657538	LG_12	44.117	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_30679125_Lg12_00714_MAF30_1620539_exon3	59658400	12	30679125	LG_12	44.13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_30691702_Lg12_00714_MAF40_8855_exon1	17694436	12	30691702	LG_12	44.957	<nnxp>	{-0}	(nn,np)
GDsnp01426	55696422	12	21355802	LG_12	45.916	<hkxhk>	{11}	(hh,hk,kk)
GDsnp01759	54644479	12	31179141	LG_12	46.824	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_31180930_Lg12_01759_MAF20_MDP0000864181_exon1	48734361	12	31180930	LG_12	46.856	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_32114913_Lg12_00762_MAF10_1662400_exon1	52675347	12	32114913	LG_12	48.914	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_32146694_Lg12_00762_MAF40_MDP0000197092_exon1	36677451	12	32146694	LG_12	48.914	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_32163753_Lg12_00762_MAF10_736021_exon1	13727322	12	32163753	LG_12	49.339	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_32467148_Lg12_00362_MAF30_MDP0000200335_exon11	23778371	12	32467148	LG_12	53.693	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32469819_Lg12_00362_MAF40_45140_exon1	52624328	12	32469819	LG_12	53.693	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_32489536_Lg12_00362_MAF40_151627_exon1	22605329	12	32489536	LG_12	53.693	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_32472396_Lg12_00362_MAF10_MDP0000200336_exon8	54771351	12	32472396	LG_12	53.7	<hkxhk>	{00}	(hh,hk,kk)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TG_32494035_Lg12_00362_MAF50_MDP0000200340_exon2	24745326	12	32494035	LG_12	53.701	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_33117888_Lg12_135549_MAF20_135549_exon1	57651336	12	33117888	LG_12	55.413	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_33383602_Lg12_02848_MAF30_MDP0000230470_exon1	13764458	12	33383602	LG_12	55.413	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_33687206_Lg12_02008_MAF40_287310_exon1	68713329	12	33687206	LG_12	57.553	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_33692967_Lg12_02008_MAF20_MDP0000291899_exon2	69675455	12	33692967	LG_12	60.595	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_33563721_Lg12_MDP0000140143_MAF20_MDP0000140143_exon2	70705386	12	33563721	LG_12	60.608	<lmxl>	{-0}	(ll,lm)
GDsnp01874	41742468	12	34848760	LG_12	65.471	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_23897773_Lg4_00681_MAF30_1630036_exon2	32694457	4	23897773	LG_12	66.334	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_34804790_Lg12_01874_MAF30_MDP0000322136_exon1	65663365	12	34804790	LG_12	66.335	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_34947963_Lg12_01647_MAF40_517970_exon1	39672451	12	34947963	LG_12	67.461	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_35103565_Lg12_01665_MAF30_1636547_exon1	34654476	12	35103565	LG_12	68.306	<hkxhk>	{00}	(hh,hk,kk)
GDsnp01665	19747379	12	35132678	LG_12	68.34	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_35420388_Lg12_01793_MAF10_1619944_exon6	22766496	12	35420388	LG_12	69.037	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_35699547_Lg12_00338_MAF20_MDP0000509268_exon1	57696486	12	35699547	LG_12	69.922	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_35393262_Lg12_01793_MAF40_MDP0000288367_exon4	31765477	12	35393262	LG_12	70.088	<nnxp>	{-0}	(nn,np)
GDsnp01793	69781460	12	35425746	LG_12	70.177	<nnxp>	{-0}	(nn,np)
GDsnp00915	16765349	12	31093576	LG_12	71.999	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_35649702_Lg12_01855_MAF40_530326_exon1	63788462	12	35649702	LG_12	71.999	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_35721635_Lg12_00338_MAF30_987792_exon1	67620332	12	35721635	LG_12	71.999	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_35724634_Lg12_00338_MAF40_1672836_exon2	42710441	12	35724634	LG_12	71.999	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_35835646_Lg12_MDP0000375826_MDP0000375826_exon1	67681441	12	35835646	LG_12	72.34	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_35906824_Lg12_325708_MAF30_325708_exon1	30728409	12	35906824	LG_12	73.007	<nnxp>	{-0}	(nn,np)
MdFT1	34781417	12	36130288	LG_12	73.531	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30699442_Lg12_00714_MAF10_1655952_exon3	21777356	12	30699442	LG_12	79.691	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31223042_Lg12_01759_MAF30_1659775_exon1	57625376	12	31223042	LG_12	81.108	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_329179_Lg13_00368_MAF50_1635065_exon16	59733387	13	329179	LG_13	0	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_256845_Lg13_MDP0000187560_MAF40_MDP0000187560_exon4	61789488	13	256845	LG_13	0.784	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_371869_Lg13_00368_MAF40_577826_exon3	12759358	13	371869	LG_13	2.072	<lmxl>	{-1}	(ll,lm)
GDsnp00368	73792318	13	366899	LG_13	2.261	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_602461_Lg13_01579_MAF40_1652644_exon1	57681382	13	602461	LG_13	2.261	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_570740_Lg13_01917_MAF50_1670670_exon1	54755391	13	570740	LG_13	2.985	<hkxhk>	{10}	(hh,hk,kk)
GDsnp01917	70625471	13	611888	LG_13	2.985	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_875526_Lg13_02018_MAF50_903475_exon1	70733499	13	875526	LG_13	3.611	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_895608_Lg13_02018_MAF40_MDP0000302626_exon1	49719384	13	895608	LG_13	4.483	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_880764_Lg13_02018_MAF10_489361_exon1	36768502	13	880764	LG_13	4.833	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1140009_Lg13_00279_MAF50_933324_exon1	59724484	13	1140009	LG_13	6.51	<nnxp>	{-0}	(nn,np)
GDsnp01579	66687420	13	646325	LG_13	7.523	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_2194655_Lg13_00098_MAF30_MDP0000188704_exon3	17702377	13	2194655	LG_13	9.462	<nnxp>	{-0}	(nn,np)
GDsnp00098	30714401	13	2208243	LG_13	10.005	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_2811025_Lg13_00195_MAF40_657508_exon1	61784448	13	2811025	LG_13	13.623	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_2852846_Lg13_00195_MAF30_407880_exon1	26673498	13	2852846	LG_13	14.192	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2813296_Lg13_00195_MAF50_133527_exon1	27770321	13	2813296	LG_13	14.547	<hkxhk>	{01}	(hh,hk,kk)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_2826288_Lg13_00195_MAF20_1623053_exon1	54601430	13	2826288	LG_13	14.831	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_3796261_Lg13_00980_MAF20_1672084_exon1	58781302	13	3796261	LG_13	18.191	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_3850600_Lg13_00565_MAF30_1674510_exon2	74733435	13	3850600	LG_13	18.191	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_3770859_Lg13_00980_MAF30_22837_exon1	67717453	13	3770859	LG_13	18.417	<hkxhk>	{01}	(hh,hk,kk)
GDsnp00565	67704333	13	3869073	LG_13	19.058	<hkxhk>	{10}	(hh,hk,kk)
GDsnp00980	57609313	13	3787503	LG_13	19.153	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_3799687_Lg13_00980_MAF40_2296446_exon1	62699373	13	3799687	LG_13	19.959	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_3813153_Lg13_00980_MAF30_8934444_exon1	29766413	13	3813153	LG_13	19.959	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_3853770_Lg13_00565_MAF20_208768_exon2	17655509	13	3853770	LG_13	19.959	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_27033824_Lg15_02084_MAF40_MDP0000198805_exon5	61800491	15	27033824	LG_13	19.959	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_4574491_Lg13_RosCOS841_MAF20_1660629_exon1	13727408	13	4574491	LG_13	20.098	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_4566253_Lg13_RosCOS841_MAF10_1668737_exon1	25659468	13	4566253	LG_13	20.32	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_4580429_Lg13_RosCOS841_MAF30_951071_exon1	55773314	13	4580429	LG_13	20.32	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_16977450_Lg9_01648_MAF40_MDP0000583951_exon2	31795469	9	16977450	LG_13	20.692	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_4632195_Lg13_RosCOS841_MAF40_1661136_exon1	56627382	13	4632195	LG_13	20.732	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_4597171_Lg13_RosCOS841_MAF10_MDP0000286449_exon1	58646406	13	4597171	LG_13	20.76	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_4952306_Lg13_02336_MAF40_1656834_exon1	74658304	13	4952306	LG_13	20.932	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_4578168_Lg13_RosCOS841_MAF20_522560_exon1	55712339	13	4578168	LG_13	20.933	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_4721259_Lg13_106533_MAF40_106533_exon1	45737408	13	4721259	LG_13	21.115	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_4985814_Lg13_02336_MAF50_MDP0000281784_exon1	64748491	13	4985814	LG_13	21.115	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_4948282_Lg13_02336_MAF40_522995_exon1	19754409	13	4948282	LG_13	21.642	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_4993103_Lg13_02336_MAF50_1659833_exon6	15738370	13	4993103	LG_13	21.655	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_4938074_Lg13_02336_MAF10_MDP0000739574_exon1	67604448	13	4938074	LG_13	22.857	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_5654946_Lg13_RosCOS1918_MAF30_MDP0000190335_exon1	32789379	13	5654946	LG_13	25.134	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_5611802_Lg13_RosCOS1918_MAF40_668899_exon1	16796505	13	5611802	LG_13	27.163	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_5637395_Lg13_RosCOS1918_MAF20_276613_exon1	56699303	13	5637395	LG_13	29.943	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_6005626_Lg13_RosCOS2511_MAF40_MDP0000085956_exon1	65790351	13	6005626	LG_13	30.919	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_6017316_Lg13_RosCOS2511_MAF50_MDP00000834158_exon9	63731488	13	6017316	LG_13	30.919	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_6009220_Lg13_RosCOS2511_MAF20_1678475_exon1	48771314	13	6009220	LG_13	31.1	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_7608807_Lg13_02124_MAF40_1660721_exon2	15792401	13	7608807	LG_13	31.37	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6306433_Lg13_226059_MAF30_226059_exon2	32676431	13	6306433	LG_13	32.834	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_6361679_Lg13_155673_MAF30_155673_exon2	40679481	13	6361679	LG_13	34.607	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_6361691_Lg13_155673_MAF30_155673_exon2	73643397	13	6361691	LG_13	34.773	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_6451261_Lg13_65890_MAF20_65890_exon1	27790487	13	6451261	LG_13	37.06	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_6451182_Lg13_65890_MAF30_65890_exon1	23612408	13	6451182	LG_13	37.115	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_8641735_Lg13_RosCOS2067_MAF40_764854_exon1	52654454	13	8641735	LG_13	37.199	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8644507_Lg13_RosCOS2067_MAF50_680433_exon1	35706489	13	8644507	LG_13	37.199	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_8622383_Lg13_RosCOS2067_MAF30_1632184_exon1	46728337	13	8622383	LG_13	37.209	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_6926009_Lg13_166939_MAF30_166939_exon1	37770399	13	6926009	LG_13	38.031	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_10651693_Lg13_00140_MAF40_MDP0000692529_exon1	52738434	13	10651693	LG_13	39.143	<nnxnp>	{-1}	(nn,np)
GDsnp00140	62631496	13	10683506	LG_13	39.221	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_7138956_Lg13_00128_MAF50_MDP0000193959_exon4	47689501	13	7138956	LG_13	39.9	<lmxll>	{-0}	(ll,lm)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AC_7144285_Lg13_00128_MAF30_MDP0000846055_exon4	37616339	13	7144285	LG_13	39.9	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_7141897_Lg13_00128_MAF50_MDP0000846055_exon1	36789492	13	7141897	LG_13	39.94	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_10705345_Lg13_00140_MAF50_171969_exon1	58769488	13	10705345	LG_13	40.256	<mnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7165677_Lg13_00128_MAF20_1662884_exon1	69732349	13	7165677	LG_13	40.817	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_7172710_Lg13_00128_MAF20_956_exon1	17771397	13	7172710	LG_13	41.712	<lmxl>	{-1}	(ll,lm)
GDsnp02124	27759320	13	7637826	LG_13	41.769	<lmxl>	{0-}	(ll,lm)
GDsnp01776	59734476	13	14420871	LG_13	44.349	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_14428980_Lg13_01776_MAF40_MDP00000313626_exon1	32771466	13	14428980	LG_13	44.349	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_10684342_Lg13_00140_MAF50_1642956_exon1	54677379	13	10684342	LG_13	49.174	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_12127305_Lg13_RosCOS3331_MAF40_1650208_exon1	63714377	13	12127305	LG_13	49.563	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_10714013_Lg13_00140_MAF40_188556_exon2	46692364	13	10714013	LG_13	49.923	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_16737064_Lg13_00890_MAF40_MDP00000715848_exon1	24796510	13	16737064	LG_13	52.656	<mnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_15693091_Lg13_snpMailDI_MAF40_MDP00000218060_exon1	56732335	13	15693091	LG_13	53.327	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_14440697_Lg13_01776_MAF20_1680494_exon1	55619462	13	14440697	LG_13	54.211	<lmxl>	{-1}	(ll,lm)
GDsnp01704	11733382	13	13024301	LG_13	54.363	<lmxl>	{-1}	(ll,lm)
GDsnp00943	42616432	13	14367519	LG_13	55.607	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_16725454_Lg13_00890_MAF40_147718_exon1	18751422	13	16725454	LG_13	56.43	<hkxhk>	{00}	(hh,hk,kk)
GDsnp00890	50808475	13	16703847	LG_13	56.441	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_16710748_Lg13_00890_MAF10_MDP00000150776_exon8	38780356	13	16710748	LG_13	58.881	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_20366909_Lg13_02063_MAF40_244507_exon2	10712330	13	20366909	LG_13	59.079	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_16712808_Lg13_00890_MAF20_MDP00000150776_exon2	32800357	13	16712808	LG_13	59.214	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21429305_Lg13_119422_MAF20_119422_exon1	58683414	13	21429305	LG_13	60.255	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_21716536_Lg13_02069_MAF40_MDP0000262190_exon1	48670461	13	21716536	LG_13	61	<mnxnp>	{-1}	(nn,np)
GDsnp01334	3736377	13	19763407	LG_13	62.194	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_20353369_Lg13_02063_MAF50_160796_exon1	63661356	13	20353369	LG_13	62.301	<hkxhk>	{01}	(hh,hk,kk)
GDsnp00902	43742312	13	14591615	LG_13	63.282	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_21675582_Lg13_02069_MAF50_MDP00000210939_exon2	55692368	13	21675582	LG_13	63.613	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_31085738_Lg13_01316_MAF40_302615_exon1	73758432	13	31085738	LG_13	66.7	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_38238894_Lg13_27726_MAF10_27726_exon1	70725311	13	38238894	LG_13	66.974	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_23472396_Lg2_RosCOS2680_MAF20_1662624_exon2	60675405	2	23472396	LG_13	67.357	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_23507487_Lg2_02155_MAF20_MDP0000432826_exon1	29789406	2	23507487	LG_13	67.618	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_23529831_Lg2_02155_MAF30_1642317_exon3	18789444	2	23529831	LG_13	67.618	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_31089065_Lg13_01316_MAF30_44308_exon1	56631321	13	31089065	LG_13	67.618	<lmxl>	{-1}	(ll,lm)
GDsnp02890	67716398	13	32867920	LG_13	67.618	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_34974132_Lg13_01899_MAF20_1651016_exon3	37686473	13	34974132	LG_13	67.618	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_39662008_Lg13	74647440	13	39662008	LG_13	67.618	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_32900177_Lg8_01182_MAF40_1620881_exon1	20659452	8	32900177	LG_13	67.963	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_37669371_Lg13_188167_MAF10_18167_exon10	64678459	13	37669371	LG_13	68.367	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_23527388_Lg2_02155_MAF40_MDP00000138525_exon11	36660452	2	23527388	LG_13	68.693	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_38238865_Lg13_27726_27726_exon1	36720436	13	38238865	LG_13	69.942	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23469119_Lg2_RosCOS2680_MAF30_137329_exon2	66638343	2	23469119	LG_13	71.25	<mnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_23515102_Lg2_02155_MAF20_696941_exon3	14756344	2	23515102	LG_13	71.25	<mnxnp>	{-1}	(nn,np)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_2130966_Lg14_01846_MAF10_1638997_exon2	72789407	14	2130966	LG_14	0	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2138918_Lg14_01846_MAF30_506172_exon1	65788481	14	2138918	LG_14	0.835	<nnnp>	{-1}	(nn,np)
GDsnp01888	23738319	14	232566	LG_14	6.285	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_612490_Lg14_AT2_MAF50_MDP0000793769_exon1	69728463	14	612490	LG_14	6.335	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_1184953_Lg14_00163_MAF30_MDP0000195374_exon1	35690426	14	1184953	LG_14	7.579	<hkxhk>	{00}	(hh,hk,kk)
GDsnp00025	37623491	14	621619	LG_14	10.317	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_735528_Lg14_01902_MAF50_1631360_exon1	31661435	14	735528	LG_14	11.466	<nnnp>	{-0}	(nn,np)
MdTF1	73621451	4	10240760	LG_14	14.096	<lmxl>	{0}	(ll,lm)
GDsnp01846	39746459	14	2122629	LG_14	14.624	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_741541_Lg14_01902_MAF40_1634998_exon5	43709338	14	741541	LG_14	15.643	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_3598110_Lg14_01767_MAF20_1678273_exon2	53736509	14	3598110	LG_14	15.994	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_4949471_Lg14_00248_MAF20_MDP0000016565_exon1	10758328	14	4949471	LG_14	17.415	<lmxl>	{0}	(ll,lm)
GDsnp00010	47795502	14	6103854	LG_14	17.415	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_6432371_Lg14_01401_MAF20_1687172_exon3	55775487	14	6432371	LG_14	17.415	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_6473268_Lg14_01401_MAF30_1657233_exon1	67692364	14	6473268	LG_14	17.415	<lmxl>	{-1}	(ll,lm)
GDsnp01767	38757476	14	3582383	LG_14	17.606	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_68260_Lg5_252545_MAF50_252545_exon1	61710392	5	68260	LG_14	19.079	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_8303678_Lg14_RosCOS266_MAF50_MDP0000259123_exon9	25704374	14	8303678	LG_14	19.088	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GT_6130026_Lg14_02706_MAF30_1663732_exon1	34725416	14	6130026	LG_14	19.434	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_6135950_Lg14_02706_MAF30_MDP0000320229_exon1	32675421	14	6135950	LG_14	19.461	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_6394163_Lg14_01401_MAF50_MDP0000302540_exon2	12668401	14	6394163	LG_14	19.461	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_16037262_Lg14_20974_MAF20_20974_exon1	22643477	14	16037262	LG_14	20.626	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_9119037_Lg14_01650_MAF50_MDP0000183819_exon7	74629315	14	9119037	LG_14	20.769	<lmxl>	{0}	(ll,lm)
GDsnp02426	51706465	14	18418991	LG_14	20.784	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_9138727_Lg14_01650_MAF20_1667746_exon1	56612353	14	9138727	LG_14	21.611	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AC_12582508_Lg14_00170_MAF40_248387_exon1	25714425	14	12582508	LG_14	22.45	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_CT_9382541_Lg6_02258_MAF10_MDP0000474161_exon2	14702478	6	9382541	LG_14	22.655	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32019527_Lg1_325484_MAF30_325484_exon2	66781466	1	32019527	LG_14	24.143	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_21880406_Lg14_02366_MAF10_1629238_exon2	23806368	14	21880406	LG_14	24.143	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_20380789_Lg14_02363_MAF20_887187_exon2	22638470	14	20380789	LG_14	24.17	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_GA_21013914_Lg14_MDP0000302772_MAF20_MDP0000302772_exon8	45703483	14	21013914	LG_14	24.17	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_TC_21893245_Lg14_02366_MAF10_1664397_exon1	41653395	14	21893245	LG_14	24.17	<lmxl>	{0}	(ll,lm)
RosBREEDSNP_SNP_AG_12453621_Lg14_02638_MAF40_MDP0000311542_exon1	63642436	14	12453621	LG_14	26.594	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_12456572_Lg14_02638_MAF40_MDP0000311542_exon2	45770510	14	12456572	LG_14	26.6	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22379821_Lg14_CH03g04_MAF10_134656_exon1	32690445	14	22379821	LG_14	29.98	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_16175296_Lg4_00321_MAF40_1649301_exon1	62809438	4	16175296	LG_14	30.818	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_22384593_Lg14_CH03g04_MAF40_531173_exon1	40753388	14	22384593	LG_14	30.818	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_23448287_Lg14_00062_MAF20_1683927_exon1	56777354	14	23448287	LG_14	33.789	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_23446212_Lg14_00062_MAF30_1685833_exon2	29778354	14	23446212	LG_14	33.822	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_23439790_Lg14_02039_MAF10_253599_exon1	44668502	14	23439790	LG_14	33.954	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23852990_Lg14_MDP0000258032_MAF30_MDP0000258032_exon12	71766500	14	23852990	LG_14	34.829	<lmxl>	{-1}	(ll,lm)
GDsnp02673	63611390	14	24825400	LG_14	34.829	<lmxl>	{-1}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CA_24046950_Lg14_01531_MAF20_1658676_exon2	20768377	14	24046950	LG_14	36.558	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_23859882_Lg14_327428_MAF20_327428_exon1	69792478	14	23859882	LG_14	36.776	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_26895027_Lg14_02079_MAF10_MDP0000268960_exon1	10800475	14	26895027	LG_14	43.24	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_26884307_Lg14_02079_MAF30_1686152_exon1	43648484	14	26884307	LG_14	45.578	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_27509563_Lg14_01213_MAF20_1639558_exon3	29741324	14	27509563	LG_14	46.267	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27497747_Lg14_01213_MAF50_1683959_exon3	59612510	14	27497747	LG_14	46.545	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_29465265_Lg14_01811_MAF50_1664953_exon1	27776508	14	29465265	LG_14	54.693	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_29619098_Lg14_00171_MAF30_1677423_exon1	35731378	14	29619098	LG_14	57.3	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_29528073_Lg14_01811_MAF50_159748_exon1	31780424	14	29528073	LG_14	59.862	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_30481224_Lg14_RosCOS2457_MAF30_122969_exon1	36602440	14	30481224	LG_14	66.252	<lmxl>	{-1}	(ll,lm)
GDsnp00213	66782356	14	31704082	LG_14	67.113	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_31661119_Lg14_00213_MAF30_1627290_exon1	68742371	14	31661119	LG_14	68.027	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_31889669_Lg14_MDP0000224810_MAF50_MDP0000224810_exon1	73725494	14	31889669	LG_14	68.871	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_31997923_Lg14_02021_MAF30_1669726_exon1	16715482	14	31997923	LG_14	68.873	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_31708508_Lg14_00213_MAF30_1682653_exon1	74737456	14	31708508	LG_14	68.875	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TG_31951359_Lg14_02021_MAF50_MDP0000230868_exon1	35648431	14	31951359	LG_14	68.875	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_31688397_Lg14_00213_MAF50_1643105_exon3	37750482	14	31688397	LG_14	69.14	<nnnp>	{-1}	(nn,np)
GDsnp02021	73760372	14	31966037	LG_14	69.414	<hkxhk>	{11}	(hh,hk,kk)
GDsnp02079	62695339	14	26916442	LG_14	71.38	<hkxhk>	{10}	(hh,hk,kk)
MdMF7b	17638333	14	33087452	LG_14	72.854	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_32996485_Lg14_01639_MAF10_MDP0000573842_exon2	71733315	14	32996485	LG_14	73.056	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_33060196_Lg14_00023_MAF10_513701_exon1	16736332	14	33060196	LG_14	73.056	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_33259280_Lg14_01548_MAF40_1667656_exon1	23805403	14	33259280	LG_14	73.056	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_33262180_Lg14_01548_MAF30_1685177_exon3	73611345	14	33262180	LG_14	73.056	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_33281793_Lg14_01548_MAF50_MDP0000903428_exon2	23791379	14	33281793	LG_14	73.116	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_33044188_Lg14_01639_MAF50_MDP0000254541_exon2	48809349	14	33044188	LG_14	73.449	<hkxhk>	{11}	(hh,hk,kk)
GDsnp01213	20650502	14	27528556	LG_14	74.724	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_33279650_Lg14_01548_MAF20_972972_exon1	69677316	14	33279650	LG_14	76.901	<nnnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_1511146_Lg15_00717_MAF30_MDP0000252438_exon1	72715397	15	1511146	LG_15	-0.314	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1857875_Lg15_RosCOS2766_MAF50_1661741_exon1	38806342	15	1857875	LG_15	-0.06	<nnnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_32748739_Lg1_RosCOS2753_MAF10_520680_exon1	36601460	1	32748739	LG_15	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_32769443_Lg1_RosCOS2753_MAF30_MDP0000220174_exon1	15736372	1	32769443	LG_15	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_32779405_Lg1_RosCOS2753_MAF30_1629797_exon1	43648412	1	32779405	LG_15	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_33325153_Lg1_01951_MAF10_132337_exon1	69633482	1	33325153	LG_15	1.319	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_988661_Lg15_00694_MAF30_1637851_exon1	38795473	15	988661	LG_15	3.903	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_1070334_Lg15_01009_MAF40_1649909_exon1	60774467	15	1070334	LG_15	4.023	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_976750_Lg15_00694_MAF50_598335_exon1	60697425	15	976750	LG_15	4.061	<lmxl>	{-1}	(ll,lm)
GDsnp00694	65795361	15	986893	LG_15	4.061	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_1098793_Lg15_01009_MAF30_84788_exon1	53613474	15	1098793	LG_15	4.061	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_1539502_Lg15_00717_MAF40_1679106_exon1	55655444	15	1539502	LG_15	4.934	<hkxhk>	{00}	(hh,hk,kk)
GDsnp01009	31631430	15	1112604	LG_15	5.052	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_1872379_Lg15_RosCOS2766_MAF20_646072_exon1	24775374	15	1872379	LG_15	5.322	<hkxhk>	{00}	(hh,hk,kk)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00842	15	255237	LG_15	5.972	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_3046222_Lg15_01814_MAF20_480291_exon1	15	3046222	LG_15	6.55	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2337559_Lg15_325776_MAF50_325776_exon3	15	2337559	LG_15	6.915	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_2558984_Lg15_02844_MAF40_1625529_exon6	15	2558984	LG_15	6.996	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_1516126_Lg15_00717_MAF40_530377_exon1	15	1516126	LG_15	7.25	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_33384748_Lg3_MDP0000126553_MAF20_MDP0000126553_exon18	3	33384748	LG_15	7.893	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_4037337_Lg15_snpEB134400_MAF40_134949_exon6	15	4037337	LG_15	8.289	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_3034625_Lg15_MDP0000136905_MAF40_MDP0000136905_exon4	15	3034625	LG_15	8.714	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_3558718_Lg15_01047_MAF40_674936_exon1	15	3558718	LG_15	9.227	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_3556145_Lg15_01047_MAF20_1684295_exon6	15	3556145	LG_15	9.245	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3870711_Lg15_01827_MAF20_1637811_exon3	15	3870711	LG_15	9.309	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_4212845_Lg15_00330_MAF10_151886_exon1	15	4212845	LG_15	10.63	<nnxnp>	{-0}	(nn,np)
GDsnp01047	15	3567836	LG_15	11.591	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_4941303_Lg15_RosCOS2117_MAF20_MDP0000782534_exon10	15	4941303	LG_15	12.447	<nnxnp>	{-1}	(nn,np)
GDsnp00330	15	4232114	LG_15	14.427	<hkxhk>	{01}	(hh,hk,kk)
GDsnp01185	15	5725967	LG_15	15.948	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_5727221_Lg15_01185_MAF30_1632908_exon1	15	5727221	LG_15	16.88	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_5944490_Lg15_CXE2_MAF50_226553_exon1	15	5944490	LG_15	17.769	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_4914320_Lg15_RosCOS2117_MAF20_1669694_exon1	15	4914320	LG_15	18.017	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_5934756_Lg15_CXE2_MAF30_1627139_exon12	15	5934756	LG_15	18.017	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_5937629_Lg15_CXE2_MAF20_1674901_exon1	15	5937629	LG_15	18.017	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_5767560_Lg15_01185_MAF20_MDP0000205199_exon3	15	5767560	LG_15	18.042	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_5955080_Lg15_CXE2_MAF20_MDP0000524927_exon1	15	5955080	LG_15	18.134	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_5967251_Lg15_CXE2_MAF50_1676088_exon1	15	5967251	LG_15	18.485	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_5978333_Lg15_CXE2_MAF40_MDP0000178261_exon3	15	5978333	LG_15	18.606	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GT_5972769_Lg15_CXE2_MAF40_MDP0000280145_exon2	15	5972769	LG_15	18.787	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6548475_Lg15_00076_MAF40_1672512_exon1	15	6548475	LG_15	24.083	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_6893289_Lg15_snpDT001928_MAF30_1622091_exon1	15	6893289	LG_15	24.464	<nnxnp>	{-1}	(nn,np)
GDsnp00076	15	6584581	LG_15	24.819	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_6558174_Lg15_00076_MAF40_498323_exon4	15	6558174	LG_15	25.65	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_6589830_Lg15_00076_MAF50_1635697_exon1	15	6589830	LG_15	25.657	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_6636944_Lg15_MDP0000156137_MAF40_MDP0000156137_exon1	15	6636944	LG_15	26.185	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_7273686_Lg15_00274_MAF20_876795_exon1	15	7273686	LG_15	26.585	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_7254175_Lg15_00274_MAF40_1678650_exon1	15	7254175	LG_15	26.766	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_6602013_Lg15_00076_MAF30_285792_exon1	15	6602013	LG_15	27.067	<lmxll>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TG_6579785_Lg15_00076_MAF30_1661433_exon6	15	6579785	LG_15	27.254	<lmxll>	{-0}	(ll,lm)
Pear_Bartlett_SNP_TC_529_5105762	5105762	529	LG_15	27.254	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_7749743_Lg15_01488_MAF50_1645527_exon3	15	7749743	LG_15	28.292	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7261398_Lg15_00274_MAF50_213486_exon1	15	7261398	LG_15	28.564	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_8229724_Lg15_00796_MAF50_614785_exon1	15	8229724	LG_15	30.718	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_8101776_Lg15_00389_MAF30_263729_exon1	15	8101776	LG_15	31.528	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_8718910_Lg15_00396_MAF20_MDP0000290709_exon1	15	8718910	LG_15	32.172	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_8098075_Lg15_00389_MAF50_509799_exon1	26616504	15	8098075	LG_15	32.688	<hkxhk>	{01}	(hh,hk,kk)
GDsnp00894	11661498	15	8967412	LG_15	35.484	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_9838626_Lg15_01989_MAF50_MDP0000157854_exon1	73711499	15	9838626	LG_15	36.287	<nnxnp>	{-1}	(nn,np)
GDsnp00543	46795499	15	10405669	LG_15	36.287	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11074629_Lg15_02869_MAF20_1624288_exon2	31626453	15	11074629	LG_15	37.498	<hkxhk>	{11}	(hh,hk,kk)
GDsnp01989	72603380	15	9838783	LG_15	38.316	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_12099465_Lg15_166295_MAF20_166295_exon4	56624377	15	12099465	LG_15	38.528	<nnxnp>	{-1}	(nn,np)
GDsnp00397	15639445	15	12189325	LG_15	38.54	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_12562594_Lg15_01146_MAF10_MDP0000451698_exon2	69783391	15	12562594	LG_15	43.326	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_11859098_Lg15_MDP000320360_MAF40_MDP0000320360_exon2	38729355	15	11859098	LG_15	44.925	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_15046874_Lg15_02003_MAF50_369521_exon2	44668403	15	15046874	LG_15	45.061	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_15075316_Lg15_02003_MAF10_1620656_exon6	57749409	15	15075316	LG_15	46.994	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_13707071_Lg15_01587_MAF10_1623976_exon1	66609376	15	13707071	LG_15	47.72	<lmxll>	{-1}	(ll,lm)
GDsnp01587	19786330	15	13723142	LG_15	47.767	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_15772962_Lg15_00273_MAF20_MDP0000297167_exon8	22738378	15	15772962	LG_15	48.077	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_24064868_Lg14_01531_MAF20_MDP0000199415_exon1	39707446	14	24064868	LG_15	48.099	<hkxhk>	{11}	(hh,hk,kk)
GDsnp00273	11674462	15	15804912	LG_15	48.099	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_16523119_Lg15_01229_MAF40_1639858_exon3	34735402	15	16523119	LG_15	49.493	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_16479542_Lg15_01229_MAF30_1651717_exon1	57651423	15	16479542	LG_15	49.675	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_17591764_Lg15_RosCOS2945_MAF30_271176_exon2	74665394	15	17591764	LG_15	49.675	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_17589314_Lg15_RosCOS2945_MAF50_1626426_exon1	63658362	15	17589314	LG_15	51.098	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_17586388_Lg15_RosCOS2945_MAF50_1674931_exon1	33686476	15	17586388	LG_15	51.43	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_17219891_Lg15_MDP0000876321_MAF40_MDP0000876321_exon9	59704461	15	17219891	LG_15	52.591	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_13752663_Lg5_01505_MAF20_1624285_exon5	52664363	5	13752663	LG_15	54.957	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TG_15015583_Lg10_00015_MAF10_1639295_exon2	62621339	10	15015583	LG_15	54.957	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_7474525_Lg14_RosCOS621_MAF10_531521_exon3	27636449	14	7474525	LG_15	54.957	<lmxll>	{-1}	(ll,lm)
GDsnp00357	58708362	15	41033536	LG_15	54.957	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_41915787_Lg15_229871_229871_exon1	55747435	15	41915787	LG_15	54.957	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_29932064_Lg15_RosCOS1232_MAF30_449810_exon2	47783492	15	29932064	LG_15	55.213	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_36517806_Lg5_00100_MAF40_MDP0000147560_exon1	30711421	5	36517806	LG_15	55.405	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_11971703_Lg6_02763_MAF30_MDP0000491271_exon1	24764495	6	11971703	LG_15	55.405	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_27352264_Lg15_133284_133284_exon1	25798368	15	27352264	LG_15	55.405	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_27882182_Lg15_00208_MAF30_MDP0000138089_exon7	54690426	15	27882182	LG_15	55.405	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_28687459_Lg15_02592_MAF30_1662248_exon6	66807345	15	28687459	LG_15	55.437	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_8352409_Lg13_84982_MAF10_84982_exon1	22649477	13	8352409	LG_15	55.456	<lmxll>	{0-}	(ll,lm)
GDsnp01850	34759337	15	26321647	LG_15	55.747	<lmxll>	{0-}	(ll,lm)
GDsnp02313	42774421	15	21492288	LG_15	56.051	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_19360134_Lg15_01518_MAF30_1668162_exon4	60622441	15	19360134	LG_15	56.265	<lmxll>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_19352650_Lg15_01518_MAF10_397548_exon2	44764339	15	19352650	LG_15	56.477	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_18324149_Lg15_RosCOS1184_MAF20_MDP0000309557_exon1	26672462	15	18324149	LG_15	56.494	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_19062612_Lg15_00615_MAF20_1628480_exon1	67779394	15	19062612	LG_15	56.494	<lmxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_19064661_Lg15_00615_MAF20_869484_exon1	70716363	15	19064661	LG_15	56.494	<lmxll>	{0-}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_2313874_Lg9_02134_MAF50_MDP0000218391_exon1	67803378	9	2313874	LG_15	57.112	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_28803709_Lg8_MDP0000319749_MAF20_MDP0000319749_exon4	55617504	8	28803709	LG_15	59.481	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_45049266_Lg15_ACS_MAF20_463384_exon1	59774357	15	45049266	LG_15	59.726	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_45920803_Lg15_RosCOS1627_MAF50_1679367_exon1	30762330	15	45920803	LG_15	59.962	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_44333089_Lg15_01687_MAF40_1633787_exon2	72648431	15	44333089	LG_15	61.008	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_45915221_Lg15_RosCOS1627_MAF10_1652456_exon3	40806433	15	45915221	LG_15	61.008	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_20367259_Lg15_02080_MAF10_746443_exon1	35785372	15	20367259	LG_15	61.528	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_45923143_Lg15_RosCOS1627_MAF40_707751_exon1	63785312	15	45923143	LG_15	62.115	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_45932116_Lg15_RosCOS1627_MAF40_MDP0000759612_exon1	25765403	15	45932116	LG_15	62.115	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_45952228_Lg15_RosCOS1627_MAF20_MDP0000149372_exon2	73805329	15	45952228	LG_15	62.147	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_21450577_Lg15_02313_MAF20_1679943_exon2	52636488	15	21450577	LG_15	62.951	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_21453078_Lg15_02313_MAF10_MDP0000217511_exon7	19781509	15	21453078	LG_15	62.968	<hkxhk>	{10}	(hh,hk,kk)
GDsnp01813	54801438	15	22140074	LG_15	63.487	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_51307294_Lg15_00236_MAF40_MDP0000216120_exon4	47723303	15	51307294	LG_15	65.695	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_49891950_Lg15_00525_MAF40_1652653_exon1	10724406	15	49891950	LG_15	65.816	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_51280174_Lg15_00236_MAF10_602999_exon1	42741441	15	51280174	LG_15	65.816	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_50033143_Lg15_01778_MAF30_MDP0000309283_exon14	67610509	15	50033143	LG_15	65.901	<lmxl>	{0-}	(ll,lm)
GDsnp00079	43773300	15	50075110	LG_15	65.901	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_50088799_Lg15_00079_MAF20_474486_exon1	56627325	15	50088799	LG_15	65.901	<lmxl>	{0-}	(ll,lm)
GDsnp01392	43794324	15	55371893	LG_15	66.736	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_44682057_Lg15_01805_MAF50_1633889_exon3	37779303	15	44682057	LG_15	67.111	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_55611251_Lg15_327586_MAF20_327586_exon1	66708439	15	55611251	LG_15	68.573	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_20348625_Lg15_02080_MAF10_MDP0000571121_exon1	55649425	15	20348625	LG_15	69.743	<nnxnp>	{-0}	(nn,np)
GDsnp02080	69763498	15	20378055	LG_15	69.799	<nnxnp>	{-0}	(nn,np)
GDsnp00525	30788405	15	49897101	LG_15	70.08	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21320047_Lg15_MDP0000677258_MAF50_MDP0000677258_exon1	38757347	15	21320047	LG_15	72.045	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_15165069_Lg1_MDP0000171153_MAF40_MDP0000171153_exon2	52618434	1	15165069	LG_15	72.054	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21317002_Lg15_MDP0000677258_MDP0000677258_exon4	53787441	15	21317002	LG_15	72.054	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_54456004_Lg15_01774_MAF50_1665083_exon4	70770312	15	54456004	LG_15	72.283	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_22117026_Lg15_01813_MAF50_MDP0000270324_exon3	13780484	15	22117026	LG_15	72.788	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_22112531_Lg15_01813_MAF50_MDP0000313840_exon1	69701439	15	22112531	LG_15	72.857	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23523902_Lg15_00038_MAF10_524070_exon1	47685477	15	23523902	LG_15	74.142	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_26289434_Lg15_01850_MAF20_479535_exon1	34670394	15	26289434	LG_15	76.677	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27052178_Lg15_02084_MAF50_MDP0000276022_exon5	65631441	15	27052178	LG_15	76.677	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_27079169_Lg15_02084_MAF50_193810_exon2	11688310	15	27079169	LG_15	76.677	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8839952_Lg9_00400_MAF50_MDP0000498282_exon1	55785460	9	8839952	LG_15	82.145	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_33322460_Lg1_01951_MAF10_1639343_exon1	31738486	1	33322460	LG_15	82.189	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_29926704_Lg15_RosCOS1232_MAF50_MDP0000283141_exon1	22731483	15	29926704	LG_15	82.703	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_21316696_Lg15_MDP0000148030_MDP0000148030_exon1	47624441	15	21316696	LG_15	86.015	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_33663997_Lg15_01897_MAF20_1618900_exon1	58719487	15	33663997	LG_15	89.564	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_46671744_Lg15_01752_MAF30_MDP0000209210_exon1	27789302	15	46671744	LG_15	91.236	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_7544343_Lg14_RosCOS621_MAF40_MDP0000320239_exon3	14760393	14	7544343	LG_15	93.452	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_41031897_Lg15_00357_MAF30_265938_exon1	18802336	15	41031897	LG_15	93.452	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_44674746_Lg15_01805_MAF50_MDP0000262289_exon13	26661433	15	44674746	LG_15	97.684	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_44703827_Lg15_01805_MAF40_MDP0000418839_exon1	56800358	15	44703827	LG_15	97.684	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_45058256_Lg15_ACS_MAF50_MDP0000318443_exon5	55636371	15	45058256	LG_15	97.684	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_44666551_Lg15_01805_MAF20_MDP0000771563_exon1	69701355	15	44666551	LG_15	97.733	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_49929629_Lg15_00525_MAF20_MDP0000284330_exon1	59787344	15	49929629	LG_15	106.298	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_51295332_Lg15_00236_MAF20_MDP0000216269_exon2	52782311	15	51295332	LG_15	107.244	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_7401256_Lg16_RosCOS1166_MAF30_1620272_exon4	37774396	16	7401256	LG_16	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AC_7424678_Lg16_RosCOS1166_MAF20_812638_exon1	62805404	16	7424678	LG_16	0	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_1773279_Lg10_RosCOS3613_MAF20_1674870_exon1	53750455	10	1773279	LG_16	1.693	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_1782356_Lg10_RosCOS3613_MAF30_17174_exon1	64701376	10	1782356	LG_16	1.693	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GT_1784388_Lg10_RosCOS3613_MAF30_1620734_exon1	17753365	10	1784388	LG_16	1.693	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_1816885_Lg10_RosCOS3613_MAF40_1626256_exon4	74611335	10	1816885	LG_16	1.693	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TG_7404596_Lg16_RosCOS1166_MAF40_110937_exon3	62614306	16	7404596	LG_16	2.754	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_1891144_Lg16_00047_MAF10_MDP0000259303_exon2	33790364	16	1891144	LG_16	4.279	<lmxl>	{-0}	(ll,lm)
RosBREED_SNP_AC_2593090_Lg16	34809397	16	2593090	LG_16	7.593	<hkxhk>	{00}	(hh,hk,kk)
RosBREED_SNP_TC_3303558_Lg16	44725330	16	3303558	LG_16	9.116	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_7417624_Lg16_RosCOS1166_MAF30_1632728_exon1	70805327	16	7417624	LG_16	9.349	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_3139639_Lg16_01116_MAF10_MDP0000241821_exon3	64759401	16	3139639	LG_16	9.382	<lmxl>	{-1}	(ll,lm)
RosBREED_SNP_AC_3334689_Lg16	32793397	16	3334689	LG_16	9.382	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_3384428_Lg16_00353_MAF50_1674008_exon2	31694362	16	3384428	LG_16	9.382	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_3456566_Lg16_00353_MAF20_463076_exon1	34765402	16	3456566	LG_16	9.382	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_3461705_Lg16_00353_MAF40_166779_exon2	20787468	16	3461705	LG_16	9.382	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_3855345_Lg16_01627_MAF30_1677837_exon1	28798471	16	3855345	LG_16	13.676	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TG_3937877_Lg16_01179_MAF20_1634068_exon4	65645377	16	3937877	LG_16	15.436	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_1225178_Lg16_01588_MAF30_278806_exon1	60667309	16	1225178	LG_16	15.46	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1187517_Lg16_01588_MAF10_545103_exon1	43647445	16	1187517	LG_16	15.471	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1210107_Lg16_01588_MAF10_521001_exon1	38778454	16	1210107	LG_16	15.471	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1216243_Lg16_01588_MAF20_468133_exon1	53600314	16	1216243	LG_16	15.471	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_1301926_Lg16_01600_MAF50_1683802_exon2	73698348	16	1301926	LG_16	15.471	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_1452699_Lg16_MDP0000303483_MAF50_MDP0000303483_exon2	22787316	16	1452699	LG_16	15.471	<nnxp>	{-1}	(nn,np)
GDsnp01588	37801390	16	1220909	LG_16	15.488	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1540624_Lg16_LAR1_MAF40_1618769_exon2	49634505	16	1540624	LG_16	17.147	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_1578941_Lg16_01734_MAF20_90585_exon1	60643336	16	1578941	LG_16	17.98	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_1614876_Lg16_01734_MAF40_975544_exon1	36804366	16	1614876	LG_16	17.98	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1617869_Lg16_01734_MAF20_248174_exon1	68620459	16	1617869	LG_16	17.98	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_1669091_Lg16_01734_MAF50_193795_exon1	37694428	16	1669091	LG_16	18.788	<nnxp>	{-1}	(nn,np)
RosBREED_SNP_TC_3297840_Lg16	53748353	16	3297840	LG_16	27.461	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3299822_Lg16_MDP0000423596_MAF40_MDP0000423596_exon3	38736453	16	3299822	LG_16	28.259	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4766937_Lg16_MDP0000616079_MDP0000616079_exon1	54775317	16	4766937	LG_16	28.843	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_5359885_Lg16_00030_MAF30_1649198_exon1	60642440	16	5359885	LG_16	33.002	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_5601568_Lg16_SquamosaTF_MAF50_1632712_exon1	22730453	16	5601568	LG_16	35.688	<lmxl>	{-0}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp01003	63757498	16	6056891	LG_16	41.28	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_6054018_Lg16_01003_MAF30_1630610_exon2	16772328	16	6054018	LG_16	41.484	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6540945_Lg16_01866_MAF40_1623887_exon4	46733525	16	6540945	LG_16	47.852	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_6705025_Lg16_01173_MAF30_519649_exon1	45782336	16	6705025	LG_16	50.321	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CA_17569426_Lg13_00390_MAF20_59089_exon1	51707465	13	17569426	LG_16	56.692	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_6742332_Lg2_01549_MAF30_553488_exon3	73608394	2	6742332	LG_16	60.038	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_23903552_Lg1_RosCOS1602_MAF20_MDP0000235263_exon4	46781348	1	23903552	LG_16	60.045	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_6755598_Lg2_01549_MAF30_842423_exon1	42804473	2	6755598	LG_16	60.048	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_668296_Lg8_00175_MAF50_82344_exon1	32793454	8	668296	LG_16	60.049	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_23899418_Lg1_RosCOS1602_MAF20_MDP0000283296_exon1	50677448	1	23899418	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_23907081_Lg1_RosCOS1602_MAF40_MDP0000265342_exon2	30755464	1	23907081	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6725392_Lg2_01549_MAF20_1671501_exon1	52699420	2	6725392	LG_16	60.051	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_6731200_Lg2_01549_MAF20_MDP0000135135_exon12	12760462	2	6731200	LG_16	60.051	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_13795873_Lg5_01505_MAF50_MDP0000210085_exon3	39716476	5	13795873	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_23851900_Lg5_MDP0000225209_MAF10_MDP0000225209_exon1	41724417	5	23851900	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_2562438_Lg6_RosCOS777_MAF20_450925_exon1	18764451	6	2562438	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_5459680_Lg11_01713_MAF50_MDP0000254457_exon1	34662352	11	5459680	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_22619889_Lg13_RosCOS1496_MAF10_MDP0000141219_exon2	29782302	13	22619889	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9571523_Lg16_229389_MAF50_229389_exon3	33692502	16	9571523	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_9947521_Lg16_00879_MAF10_1648971_exon1	52724386	16	9947521	LG_16	60.051	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_9988815_Lg16_00879_MAF30_1629147_exon1	66689447	16	9988815	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_16093732_Lg16_02783_MAF20_1625626_exon1	37716358	16	16093732	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
GDsnp02664	16668436	16	16184819	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_18500686_Lg16_134900_134900_exon3	62770497	16	18500686	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_20224906_Lg16_00626_MAF40_514275_exon1	69628396	16	20224906	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_20428802_Lg16_01237_MAF50_1678971_exon1	23622470	16	20428802	LG_16	60.051	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_15461670_Lg16_02207_MAF10_1624116_exon5	21608451	16	15461670	LG_16	60.83	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_12854227_Lg16_02087_MAF10_450395_exon2	12747300	16	12854227	LG_16	60.833	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_12835413_Lg16_02087_MAF30_349795_exon1	13719442	16	12835413	LG_16	60.834	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_12306773_Lg16_01244_MAF20_1660747_exon1	10708474	16	12306773	LG_16	61.608	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_12329007_Lg16_01244_MAF30_328549_exon1	24652431	16	12329007	LG_16	61.608	<lmxl>	{1-}	(ll,lm)
GDsnp01244	36739416	16	12354528	LG_16	61.608	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_12362737_Lg16_01244_MAF40_MDP0000252150_exon5	14614454	16	12362737	LG_16	61.608	<lmxl>	{1-}	(ll,lm)
RosBREED_SNP_AG_12002621_Lg16	64669364	16	12002621	LG_16	61.797	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_8363529_Lg16_RosCOS1090_MAF30_1630062_exon2	54612489	16	8363529	LG_16	62.128	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14189280_Lg13_MDP0000180408_MAF30_MDP0000180408_exon3	71797364	13	14189280	LG_16	62.161	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14191222_Lg13_MDP0000180408_MAF30_MDP0000180408_exon7	10664497	13	14191222	LG_16	62.161	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_8342463_Lg16_RosCOS1090_MAF50_MDP0000149147_exon5	44629364	16	8342463	LG_16	62.194	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_9113098_Lg16_01730_MAF30_112027_exon1	11699312	16	9113098	LG_16	62.38	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_14334614_Lg13_00943_MAF20_421678_exon2	69730341	13	14334614	LG_16	63.202	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_7638675_Lg4_5050_5050_exon1	72688364	4	7638675	LG_16	66.176	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_14143772_Lg16_01624_MAF20_910261_exon1	22686417	16	14143772	LG_16	68.223	<nnxp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_15458275_Lg16_02207_MAF10_1629914_exon1	52600320	16	15458275	LG_16	73.118	<nnxp>	{-0}	(nn,np)
GDsnp02207	16759315	16	15443593	LG_16	83.17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_20469396_Lg16_01237_MAF10_431506_exon2	74702465	16	20469396	LG_16	84.099	<nnxp>	{-0}	(nn,np)
Pear_Bartlett_SNP_AG_162_5088916		5095848	162	LG_16	87.868	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_312936_Lg17_01974_MAF20_216975_exon1	60744330	17	312936	LG_17	0	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_363262_Lg17_01974_MAF30_1638015_exon9	59656415	17	363262	LG_17	0.001	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_49174_Lg17_00091_MAF20_1640662_exon1	32680402	17	49174	LG_17	0.04	<nnxp>	{-0}	(nn,np)
GDsnp00091	62623395	17	50303	LG_17	0.04	<nnxp>	{-1}	(nn,np)
GDsnp01974	24779447	17	338336	LG_17	0.04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_357921_Lg17_01974_MAF40_MDP0000156410_exon2	37690488	17	357921	LG_17	0.04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_415618_Lg17_MDP0000441376_MAF30_MDP0000441376_exon1	61652334	17	415618	LG_17	0.04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_772407_Lg17_RosCOS659_MAF20_1675105_exon1	35806382	17	772407	LG_17	0.917	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_13618_Lg17_00091_MAF30_MDP0000791232_exon8	74620329	17	13618	LG_17	3.102	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_71128_Lg17_00091_MAF40_1678954_exon1	26786495	17	71128	LG_17	5.509	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_1314921_Lg17_00864_MAF20_88118_exon1	50643434	17	1314921	LG_17	6.61	<nnxp>	{-0}	(nn,np)
GDsnp01205	28609434	17	1619944	LG_17	7.429	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1621844_Lg17_01205_MAF40_967370_exon1	54649369	17	1621844	LG_17	7.429	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1640875_Lg17_01205_MAF30_1658589_exon1	24784500	17	1640875	LG_17	7.429	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2602945_Lg17_00210_MAF20_1665505_exon1	14734434	17	2602945	LG_17	8.02	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_2032345_Lg17_00290_MAF20_155971_exon2	46786332	17	2032345	LG_17	8.592	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_2034824_Lg17_00290_MAF50_95622_exon1	40633480	17	2034824	LG_17	8.592	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_1618224_Lg17_01205_MAF50_1686981_exon1	22675432	17	1618224	LG_17	8.821	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_1318292_Lg17_00864_MAF30_1643044_exon1	65713432	17	1318292	LG_17	8.876	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_1337720_Lg17_00864_MAF40_961431_exon1	72732506	17	1337720	LG_17	8.895	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_TC_2414010_Lg17_MDP0000291802_MAF20_MDP0000291802_exon9	66736380	17	2414010	LG_17	9.06	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_2608050_Lg17_00210_MAF20_1622747_exon1	13774400	17	2608050	LG_17	9.06	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2622909_Lg17_00210_MAF30_MDP0000206391_exon2	36758504	17	2622909	LG_17	9.06	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2741553_Lg17_00508_MAF30_1637847_exon1	11810349	17	2741553	LG_17	9.06	<nnxp>	{-1}	(nn,np)
GDsnp01241	59701418	17	1126775	LG_17	9.265	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GT_1114546_Lg17_01241_MAF10_MDP0000283052_exon2	60773556	17	1114546	LG_17	9.29	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_1120411_Lg17_01241_MAF30_1645198_exon1	69732421	17	1120411	LG_17	9.29	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_1159401_Lg17_01241_MAF30_362748_exon1	14766326	17	1159401	LG_17	9.29	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CT_2378561_Lg17_MDP0000193812_MAF30_MDP0000193812_exon4	35615430	17	2378561	LG_17	9.726	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_819070_Lg17_RosCOS659_MAF50_341005_exon1	74731401	17	819070	LG_17	10.615	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_AG_413069_Lg17_MDP0000441376_MDP0000441376_exon2	53662389	17	413069	LG_17	10.886	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_3113587_Lg17_01584_MAF20_25029_exon1	36736506	17	3113587	LG_17	10.98	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3153316_Lg17_01584_MAF40_1620853_exon1	19791380	17	3153316	LG_17	10.999	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3503210_Lg17_02049_MAF50_478011_exon1	73766373	17	3503210	LG_17	10.999	<nnxp>	{-1}	(nn,np)
GDsnp02049	52626434	17	3527079	LG_17	10.999	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3529973_Lg17_02049_MAF10_MDP0000321089_exon5	54712472	17	3529973	LG_17	10.999	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_2716255_Lg17_00508_MAF20_MDP0000252195_exon11	74767465	17	2716255	LG_17	13.315	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_2732314_Lg17_00508_MAF40_1664530_exon3	58774375	17	2732314	LG_17	13.315	<lmxl>	{-1}	(ll,lm)

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Supplementary Table 1. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_2073815_Lg17_00290_MAF40_1664750_exon2	24600400	17	2073815	LG_17	13.805	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5689554_Lg17_00606_MAF40_333837_exon1	27790319	17	5689554	LG_17	18.554	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5737459_Lg17_00606_MAF20_896868_exon1	53657428	17	5737459	LG_17	18.565	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_5713144_Lg17_00606_MAF30_1631410_exon1	22676501	17	5713144	LG_17	18.583	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5943747_Lg17_00515_MAF40_1664712_exon1	44623439	17	5943747	LG_17	19.524	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5951435_Lg17_00515_MAF20_MDP0000945267_exon1	11745384	17	5951435	LG_17	19.524	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_6947667_Lg17_01927_MAF10_1688280_exon3	31726378	17	6947667	LG_17	24.364	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7363032_Lg17_02512_MAF20_251336_exon1	12731391	17	7363032	LG_17	24.364	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7402862_Lg17_02512_MAF50_416025_exon1	16751301	17	7402862	LG_17	24.364	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4152973_Lg17_RosCOS742_MAF50_MDP0000376617_exon1	45633454	17	4152973	LG_17	24.546	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_CA_4881457_Lg17_02703_MAF10_1675869_exon1	29754404	17	4881457	LG_17	25.413	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_4893547_Lg17_02703_MAF50_763008_exon1	47660400	17	4893547	LG_17	25.52	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_GA_8257224_Lg17_RosCOS653_MAF40_1620736_exon6	47727489	17	8257224	LG_17	26.401	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_8655852_Lg17_00039_MAF30_264652_exon2	42782504	17	8655852	LG_17	27.991	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8827345_Lg17_01842_MAF30_MDP0000891106_exon4	56616482	17	8827345	LG_17	29.109	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6940495_Lg17_01927_MAF40_54537_exon1	30675463	17	6940495	LG_17	29.562	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_5757117_Lg17_00606_MAF20_462428_exon1	20759482	17	5757117	LG_17	29.929	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_9390133_Lg17_01042_MAF40_MDP0000206358_exon1	12806410	17	9390133	LG_17	32.651	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6635552_Lg17_01542_MAF20_468933_exon1	48803321	17	6635552	LG_17	33.772	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_8801195_Lg17_01842_MAF40_161772_exon2	62722433	17	8801195	LG_17	35.242	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_10376441_Lg17_01044_MAF20_1628527_exon2	25809334	17	10376441	LG_17	36.493	<nnxp>	{-1}	(nn,np)
GDsnp01044	10662446	17	10425943	LG_17	36.493	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8234228_Lg17_RosCOS653_MAF10_1688197_exon3	14742446	17	8234228	LG_17	37.097	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_10872135_Lg17_00918_MAF20_MDP0000232773_exon6	43726343	17	10872135	LG_17	37.567	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8844305_Lg17_01842_MAF20_MDP0000445291_exon1	27702476	17	8844305	LG_17	37.979	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_8829961_Lg17_01842_MAF20_MDP0000891106_exon1	29742451	17	8829961	LG_17	38.004	<lmxl>	{-0}	(ll,lm)
GDsnp01042	56795320	17	9412439	LG_17	38.952	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_9375491_Lg17_01042_MAF20_406982_exon1	60761494	17	9375491	LG_17	39.928	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_9381674_Lg17_01042_MAF30_36521_exon1	37797500	17	9381674	LG_17	39.928	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AC_10935478_Lg17_00918_MAF40_MDP0000500222_exon1	46612452	17	10935478	LG_17	40.743	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_12549633_Lg17_02172_MAF50_MDP0000261954_exon1	29758351	17	12549633	LG_17	42.682	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_12093889_Lg17_00682_MAF40_514292_exon2	51737356	17	12093889	LG_17	42.695	<nnxp>	{-0}	(nn,np)
GDsnp02172	62650399	17	12546690	LG_17	42.695	<nnxp>	{-1}	(nn,np)
GDsnp01800	22637345	17	11980471	LG_17	44.341	<hkxhk>	{01}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_11956032_Lg17_01800_MAF20_413520_exon1	58673311	17	11956032	LG_17	44.59	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_11958448_Lg17_01800_MAF30_98616_exon1	38611467	17	11958448	LG_17	44.59	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CT_11993319_Lg17_01800_MAF10_948841_exon1	36749316	17	11993319	LG_17	44.607	<lmxl>	{-1}	(ll,lm)
RosBREEDSNP_SNP_TC_12031565_Lg17_00682_MAF20_1630270_exon2	64618481	17	12031565	LG_17	44.607	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_CA_12059188_Lg17_00682_MAF10_MDP0000137984_exon6	62621325	17	12059188	LG_17	44.607	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_12621135_Lg17_01904_MAF30_MDP0000287687_exon2	37732313	17	12621135	LG_17	45.471	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_GA_12538126_Lg17_02172_MAF30_MDP0000219437_exon2	50706449	17	12538126	LG_17	45.481	<lmxl>	{-0}	(ll,lm)
RosBREEDSNP_SNP_AG_12614663_Lg17_01904_MAF10_1685619_exon6	13673424	17	12614663	LG_17	45.481	<lmxl>	{-0}	(ll,lm)

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Single nucleotide polymorphism name	Chup address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TG_12623183_Lg17_01904_MAF20_MDP0000287687_exon1	15704485	17	12623183	LG_17	45.481	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_12943589_Lg17_151039_MAF10_151039_exon1	61601455	17	12943589	LG_17	46.398	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_12762801_Lg17_MDP0000242009_MDP0000242009_exon2	26619502	17	12762801	LG_17	46.531	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_CT_17291565_Lg17_01964_MAF10_1624693_exon1	72802343	17	17291565	LG_17	48.023	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17325549_Lg17_01964_MAF30_1648331_exon4	19691403	17	17325549	LG_17	48.023	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_17294445_Lg17_01964_MAF10_1662340_exon9	71736353	17	17294445	LG_17	48.028	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_17320126_Lg17_01964_MAF30_232619_exon1	70701475	17	17320126	LG_17	48.03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17296923_Lg17_01964_MAF20_1662340_exon1	73770436	17	17296923	LG_17	48.05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16469678_Lg17_01438_MAF20_1628243_exon3	50690496	17	16469678	LG_17	48.122	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_22179385_Lg17_RosCOS2704_MAF20_MDP0000890639_exon1	22752336	17	22179385	LG_17	48.122	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_16484227_Lg17_01438_MAF30_MDP0000136549_exon5	44777389	17	16484227	LG_17	48.13	<lmxl>	{0-}	(ll,lm)
GDsnp00358	11646454	17	14251952	LG_17	48.889	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_15782830_Lg17_RosCOS2834_MAF40_MDP0000499284_exon1	53679314	17	15782830	LG_17	49.192	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_15738068_Lg17_RosCOS2834_MAF20_MDP0000268544_exon2	69701470	17	15738068	LG_17	49.272	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_15760100_Lg17_RosCOS2834_MAF50_422175_exon1	39685307	17	15760100	LG_17	49.272	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_15764597_Lg17_RosCOS2834_MAF40_267186_exon2	21689509	17	15764597	LG_17	49.272	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_18771987_Lg17_00235_MAF20_779717_exon2	66801390	17	18771987	LG_17	55.313	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_TG_19990934_Lg17_01298_MAF40_MDP0000320209_exon3	54748447	17	19990934	LG_17	55.501	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AC_20010409_Lg17_01298_MAF10_1664099_exon1	13725408	17	20010409	LG_17	55.501	<hkxhk>	{10}	(hh,hk,kk)
RosBREEDSNP_SNP_AG_20028330_Lg17_01298_MAF50_1664885_exon1	74704361	17	20028330	LG_17	55.501	<hkxhk>	{01}	(hh,hk,kk)
GDsnp00423	30794457	17	21235661	LG_17	55.922	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_20078487_Lg17_01298_MAF50_1623446_exon6	66662466	17	20078487	LG_17	56.178	<nnxnp>	{-1}	(nn,np)
GDsnp01525	54664459	17	21052798	LG_17	57.808	<hkxhk>	{00}	(hh,hk,kk)
RosBREEDSNP_SNP_TC_22747566_Lg17_00798_MAF40_884658_exon1	51608505	17	22747566	LG_17	58.484	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22794175_Lg17_00798_MAF20_476896_exon1	38808326	17	22794175	LG_17	58.488	<lmxl>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_23182572_Lg17_02534_MAF40_1660008_exon1	14808443	17	23182572	LG_17	58.488	<lmxl>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_21759969_Lg17_RosCOS2078_MAF30_549398_exon1	68810365	17	21759969	LG_17	58.949	<hkxhk>	{11}	(hh,hk,kk)
RosBREEDSNP_SNP_GA_21049709_Lg17_01525_MAF10_159640_exon1	19810390	17	21049709	LG_17	60.011	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21052311_Lg17_01525_MAF10_373383_exon2	58658466	17	21052311	LG_17	60.054	<nnxnp>	{-0}	(nn,np)
GDsnp02534	52703492	17	23184647	LG_17	64.729	<nnxnp>	{-0}	(nn,np)
GDsnp00341	18649394	17	24851043	LG_17	66.333	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_26487167_Lg17_MDP0000161181_MAF20_MDP0000161181_exon4	72679462	17	26487167	LG_17	69.423	<hkxhk>	{01}	(hh,hk,kk)
GDsnp01467	55746417	17	25489178	LG_17	70.596	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_26486132_Lg17_MDP0000161181_MAF20_MDP0000161181_exon3	69679307	17	26486132	LG_17	73.635	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26486285_Lg17_MDP0000161181_MAF20_MDP0000161181_exon3	36737473	17	26486285	LG_17	73.635	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_26487122_Lg17_MDP0000161181_MAF20_MDP0000161181_exon4	43684477	17	26487122	LG_17	73.635	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26778435_Lg17_snpEB140474_MAF30_1685014_exon3	32669510	17	26778435	LG_17	74.311	<nnxnp>	{-1}	(nn,np)

Supplementary Table 2. Genetic map of apple rootstock cross G.935 developed with the RosBREED Infinium single nucleotide polymorphism (SNP) chip. SNP name, chip address, physical location [chromosome and position in base pairs (bp)] are according to Chagne et al. 2012. Mapped linkage group (LG), position in centi-Morgans (cM), segregation type, marker phase and classification are outputs from JoinMap 4.1 (Kryazma, Wageningen, The Netherlands) mapping software.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_20598176_Lg11_01187_MAF10_561225_exon1	5176494	11	20598176	0	LG01	<lnxll>	{1-}	(l,l,m)
GDsnp01826	41755482	1	5262520	0.004	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_4746500_Lg1_MDP0000213515_MAF40_MDP0000213515_exon1	57799336	1	4746500	0.03	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_5237634_Lg1_01826_MAF20_1669688_exon1	42711408	1	5237634	0.03	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_8776668_Lg1_02428_MAF20_157084_exon1	33754369	1	8776668	0.03	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_18735096_Lg4_00148_MAF20_MDP0000252585_exon1	63741324	4	18735096	0.03	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_20579317_Lg11_01187_MAF10_1674826_exon2	42795367	11	20579317	0.03	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_3466990_Lg12_01391_MAF10_1661773_exon1	40779442	12	3466990	0.03	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_9490105_Lg1_02580_MAF40_282950_exon1	25795437	1	9490105	0.772	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_11457267_Lg1_01815_MAF20_MDP0000120020_exon9	24786398	1	11457267	0.9	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_11485470_Lg1_01815_MAF20_864893_exon1	61631362	1	11485470	0.9	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_14148062_Lg1_01058_MAF10_1670627_exon2	62756380	1	14148062	9.075	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_14662213_Lg1_RosCOS1779_MAF30_MDP0000321450_exon1	58632375	1	14662213	9.109	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_20947388_Lg4_00686_MAF50_MDP0000716924_exon1	58734391	4	20947388	9.732	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_14699213_Lg1_RosCOS1779_MAF50_MDP0000321447_exon9	65707415	1	14699213	9.963	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_11829738_Lg8_MDP0000234975_MDP0000234975_exon1	16707479	8	11829738	9.963	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_14708397_Lg1_RosCOS1779_MAF40_343966_exon1	19713462	1	14708397	9.966	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_17236158_Lg1_RosCOS3372_MAF30_45786_exon1	54772384	1	17236158	10.002	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_17912183_Lg1_00440_MAF40_1634418_exon1	39775364	1	17912183	11.75	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_17921038_Lg1_00440_MAF50_527792_exon4	15791458	1	17921038	11.75	LG01	<lnxll>	{0-}	(l,l,m)
GDsnp01783	67630329	1	18093626	11.75	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_18084371_Lg1_01783_MAF20_1683854_exon4	49602437	1	18084371	11.761	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GT_18056530_Lg1_01783_MAF30_1629293_exon3	51640501	1	18056530	11.765	LG01	<lnxll>	{0-}	(l,l,m)
GDsnp02731	55664444	1	18836933	14.499	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_20951649_Lg1_02302_MAF50_MDP0000470227_exon1	54628460	1	20951649	17.375	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_19399012_Lg11_01878_MAF30_MDP0000215073_exon3	21810423	11	19399012	17.375	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_35787897_Lg1_241489_MAF30_241489_exon1	10792367	1	35787897	26.061	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_26262680_Lg1_00674_MAF40_1669479_exon3	30670495	1	26262680	27.958	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_27060614_Lg1_01693_MAF40_1665698_exon2	41743302	1	27060614	34.279	LG01	<lnxll>	{1-}	(l,l,m)
GDsnp01693	72620371	1	27104702	34.279	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AC_30192576_Lg1_CXE4_MAF20_1677085_exon1	46667499	1	30192576	39.49	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_31945251_Lg1_RosCOS2794_MAF40_1665084_exon1	27680463	1	31945251	45.577	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_33651725_Lg1_01371_MAF30_328158_exon1	46701303	1	33651725	46.54	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_33707916_Lg1_01371_MAF10_1658573_exon3	23798330	1	33707916	46.54	LG01	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_35202609_Lg1_00495_MAF50_361322_exon1	21796446	1	35202609	57.103	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_35621874_Lg1_MDP0000950316_MAF20_MDP0000950316_exon17	67772458	1	35621874	58.009	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_30208839_Lg8_01764_MAF10_MDP0000273337_exon1	53667471	8	30208839	58.009	LG01	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_35428600_Lg1_02092_MAF40_1632735_exon1	64684313	1	35428600	79.177	LG01	<lnxll>	{1-}	(l,l,m)
snpCO903605	51810358	2	1582965	0	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_1966785_Lg2_AAT1_MAF30_262653_exon1	11717484	2	1966785	0.345	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_2425858_Lg2_01565_MAF50_1673213_exon1	18748487	2	2425858	0.922	LG02	<lnxll>	{0-}	(l,l,m)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_2504650_Lg2_00959_MAF30_MDP0000305192_exon3	2	2504650	1.856	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_2607533_Lg2_226032_MAF30_226032_exon1	2	2607533	1.856	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_3307093_Lg2_RosCOS1998_MAF50_MDP0000222416_exon8	2	3307093	4.677	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_3463154_Lg2_01641_MAF30_MDP0000943030_exon1	2	3463154	6.489	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_3753597_Lg2_127385_127385_exon2	2	3753597	8.053	LG02	<lnxll>	{0-}	(ll,lm)
GDsnp01476	2	4053400	9.55	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4194273_Lg2_00203_MAF30_436930_exon1	2	4194273	10.5	LG02	<lnxll>	{0-}	(ll,lm)
GDsnp00203	2	4208469	10.5	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4215730_Lg2_00203_MAF30_1629274_exon2	2	4215730	10.5	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4445083_Lg2_RosCOS2816_MAF50_1649480_exon3	2	4445083	13.288	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4554201_Lg2_MDP0000519575_MAF20_MDP0000519575_exon1	2	4554201	17.091	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_4554235_Lg2_MDP0000519575_MAF20_MDP0000519575_exon1	2	4554235	17.19	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_5929140_Lg2_01663_MAF30_MDP0000144357_exon3	2	5929140	19.017	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5868090_Lg2_01663_MAF40_265196_exon1	2	5868090	19.095	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6261234_Lg2_00308_MAF40_MDP0000292425_exon4	2	6261234	21.921	LG02	<lnxll>	{0-}	(ll,lm)
GDsnp00308	2	6305841	21.925	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6266265_Lg2_00308_MAF40_1675094_exon1	2	6266265	21.927	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_6290792_Lg2_00308_MAF20_596831_exon1	2	6290792	21.927	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6306962_Lg2_00308_MAF50_1623248_exon5	2	6306962	21.927	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_6473341_Lg2_01162_MAF40_1639321_exon2	2	6473341	23.637	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_6477411_Lg2_01162_MAF20_147931_exon1	2	6477411	23.751	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_6522059_Lg2_01162_MAF50_MDP0000125143_exon6	2	6522059	25.641	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_7255188_Lg2_00505_MAF50_571945_exon1	2	7255188	28.187	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_7302620_Lg2_RosCOS718_MAF20_1672533_exon2	2	7302620	28.418	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_7276626_Lg2_00505_MAF20_1623305_exon9	2	7276626	28.476	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_7279497_Lg2_00505_MAF20_MDP000086637_exon4	2	7279497	28.476	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_8922212_Lg2_00407_MAF40_779714_exon1	2	8922212	29.369	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_8931588_Lg2_00407_MAF20_1644091_exon1	2	8931588	29.411	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_8936738_Lg2_00407_MAF50_483435_exon1	2	8936738	29.411	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_10654569_Lg2_01223_MAF40_MDP0000265378_exon1	2	10654569	29.411	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_10700420_Lg2_01223_MAF30_693524_exon1	2	10700420	29.411	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_11409481_Lg2_00159_MAF20_MDP0000320576_exon13	2	11409481	37.67	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_11505111_Lg2_01005_MAF40_1655071_exon2	2	11505111	37.67	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_14503620_Lg2_00002_MAF50_180022_exon1	2	14503620	44.327	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_14524819_Lg2_00002_MAF20_493559_exon1	2	14524819	44.343	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_18843281_Lg2_02651_MAF20_1673395_exon1	2	18843281	50.591	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_18785188_Lg2_02076_MAF10_MDP0000141906_exon1	2	18785188	50.662	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_23924101_Lg2_327954_327954_exon1	2	23924101	53.405	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_24744626_Lg2_00833_MAF50_MDP0000263007_exon1	2	24744626	53.464	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_32112556_Lg2_00022_MAF20_1651674_exon1	2	32112556	53.97	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_30314379_Lg2_01251_MAF50_MDP0000246555_exon1	2	30314379	54.232	LG02	<lnxll>	{0-}	(ll,lm)
GDsnp00092	2	26385906	54.335	LG02	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_30846147_Lg2_261916_261916_exon2	2	30846147	54.335	LG02	<lnxll>	{0-}	(ll,lm)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_24821574_Lg2_00833_MAF40_MDP0000316384_exon1	2	24821574	54.444	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_32152313_Lg2_00022_MAF30_13530_exon1	2	32152313	55.211	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_33013805_Lg2_02223_MAF40_MDP0000310234_exon6	2	33013805	57.099	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_36478711_Lg2_00669_MAF10_MDP0000164775_exon2	2	36478711	61.512	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_36195544_Lg2_00914_MAF30_MDP0000491083_exon10	2	36195544	62.949	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_36217156_Lg2_00914_MAF50_266158_exon1	2	36217156	62.986	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_39497984_Lg2_00167_MAF50_1631668_exon6	2	39497984	67.551	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_39526012_Lg2_00167_MAF50_1641137_exon4	2	39526012	67.551	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_40079809_Lg2_02535_MAF50_1678854_exon4	2	40079809	67.551	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_39558990_Lg2_00167_MAF30_MDP0000471340_exon1	2	39558990	68.341	LG02	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_1142062_Lg3_00866_MAF50_MDP0000268101_exon2	3	1142062	0	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_690435_Lg3_RosCOS2149_MAF40_1683552_exon3	3	690435	0.093	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AC_693011_Lg3_RosCOS2149_MAF50_30133_exon2	3	693011	0.093	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_725753_Lg3_RosCOS2149_MAF50_464828_exon1	3	725753	0.093	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AC_17378070_Lg6_RosCOS414_MAF50_1662541_exon2	6	17378070	0.093	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_2627039_Lg3_02300_MAF20_MDP0000206447_exon4	3	2627039	1.001	LG03	<lnxll>	{0-}	(l,l,m)
GDsnp00124	3	3863841	6.82	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_5923532_Lg3_01263_MAF30_1677920_exon1	3	5923532	13.792	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_6242616_Lg3_00073_MAF30_1679536_exon2	3	6242616	14.84	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_6561113_Lg3_01921_MAF40_962276_exon1	3	6561113	14.84	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_7146440_Lg3_01493_MAF20_MDP0000315272_exon4	3	7146440	15.771	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_7157009_Lg3_01493_MAF20_1685346_exon2	3	7157009	15.796	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_8503130_Lg3_RosCOS3572_MAF40_6179_exon1	3	8503130	18.575	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_9104035_Lg3_RosCOS449_MAF40_MDP0000739342_exon1	3	9104035	18.638	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_9121744_Lg3_RosCOS449_MAF10_491206_exon2	3	9121744	19.596	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_9464559_Lg3_02195_MAF10_1626126_exon1	3	9464559	19.596	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_9532664_Lg3_02195_MAF50_MDP000060806_exon1	3	9532664	20.563	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_9544220_Lg3_02195_MAF50_1685314_exon2	3	9544220	20.563	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_9966749_Lg3_01990_MAF10_266458_exon1	3	9966749	21.542	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_10518958_Lg3_00194_MAF10_109422_exon1	3	10518958	26.018	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_28402636_Lg15_RosCOS3315_MAF20_467121_exon1	15	28402636	27.708	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_11552808_Lg3_02220_MAF20_MDP0000197315_exon2	3	11552808	29.822	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_11949117_Lg3_01885_MAF20_1678957_exon1	3	11949117	30.825	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_11994788_Lg3_01885_MAF30_511837_exon1	3	11994788	30.825	LG03	<lnxll>	{1-}	(l,l,m)
GDsnp01124	3	14444935	39.201	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_14445035_Lg3_01124_MAF50_530134_exon1	3	14445035	39.212	LG03	<lnxll>	{1-}	(l,l,m)
GDsnp02804	3	18982239	43.905	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_18396097_Lg3_02690_MAF30_MDP0000659822_exon2	3	18396097	43.911	LG03	<lnxll>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_18978889_Lg3_02804_MAF50_501695_exon2	3	18978889	43.911	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_23257985_Lg3_snpEB148130_MAF40_MDP0000171430_exon1	3	23257985	43.911	LG03	<lnxll>	{0-}	(l,l,m)
snpEB148130	3	23307024	43.911	LG03	<lnxll>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_23354406_Lg3_00663_MAF30_396803_exon1	3	23354406	43.911	LG03	<lnxll>	{1-}	(l,l,m)
GDsnp01728	3	24142722	43.911	LG03	<lnxll>	{0-}	(l,l,m)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CA_24158738_Lg3_01728_MAF30_MDP00000161781_exon1	3	24158738	43.911	LG03	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_24169409_Lg3_01728_MAF20_MDP00000142667_exon1	3	24169409	43.911	LG03	<lnxll>	{0-}	{(l,l,m)}
GDsnp02644	3	22040001	43.934	LG03	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_GT_25471087_Lg3_00278_MAF20_267651_exon1	3	25471087	45.693	LG03	<lnxll>	{1-}	{(l,l,m)}
GDsnp00278	3	25513271	47.486	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_CA_25875765_Lg3_01642_MAF30_616296_exon1	3	25875765	47.486	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_25896512_Lg3_01642_MAF30_MDP00000239694_exon1	3	25896512	47.486	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_25900349_Lg3_01642_MAF50_1642190_exon4	3	25900349	47.486	LG03	<lnxll>	{1-}	{(l,l,m)}
GDsnp01969	3	29651033	48.522	LG03	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_29881269_Lg3_01604_MAF20_705158_exon1	3	29881269	49.272	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_CT_29953702_Lg3_01937_MAF20_411765_exon1	3	29953702	49.272	LG03	<lnxll>	{1-}	{(l,l,m)}
GDsnp01937	3	29957246	49.272	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_34439805_Lg3_02030_MAF50_1676194_exon1	3	34439805	55.822	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_34442034_Lg3_02030_MAF40_MDP00000149890_exon2	3	34442034	55.822	LG03	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_CT_36483536_Lg3_RosCOS1799_MAF40_107803_exon1	3	36483536	57.729	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_TG_37069303_Lg3_00664_MAF40_MDP00000320472_exon4	3	37069303	61.571	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_37087735_Lg3_00664_MAF40_83350_exon1	3	37087735	62.544	LG03	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_CA_16809725_Lg9_MDP00000300208_MAF40_MDP00000300208_exon1	9	16809725	0	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_17012386_Lg9_01648_MAF50_53337_exon1	9	17012386	0.891	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_17039375_Lg9_01648_MAF50_MDP00000272132_exon5	9	17039375	0.891	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_CA_15407371_Lg9_Hi01e10_MAF10_MDP00000617956_exon1	9	15407371	8.185	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_CT_9792492_Lg15_01989_MAF20_MDP00000264506_exon4	15	9792492	20.806	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_13457909_Lg6_146323_MAF40_146323_exon1	6	13457909	25.752	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AC_5104584_Lg2_00077_MAF40_1653806_exon1	2	5104584	26.618	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_5884301_Lg4_02263_MAF50_749161_exon1	4	5884301	26.618	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_CT_8716037_Lg4_02646_MAF20_476635_exon2	4	8716037	26.618	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_5892500_Lg4_02263_MAF50_MDP00000232101_exon5	4	5892500	26.645	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_5915458_Lg4_02263_MAF30_1619610_exon2	4	5915458	26.645	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AC_5920541_Lg4_02263_MAF20_1618391_exon2	4	5920541	26.645	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_7227340_Lg4_00363_MAF20_499164_exon1	4	7227340	26.645	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_8708313_Lg4_02646_MAF40_162157_exon1	4	8708313	26.645	LG04	<lnxll>	{1-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_8718175_Lg4_02646_MAF30_1661104_exon4	4	8718175	26.645	LG04	<lnxll>	{1-}	{(l,l,m)}
GDsnp01886	4	10814523	26.645	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AC_12296545_Lg4_01353_MAF40_1651204_exon1	4	12296545	27.506	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AC_13312189_Lg4_RosCOS3641_MAF20_110683_exon1	4	13312189	29.347	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_13341945_Lg4_RosCOS3641_MAF40_1621447_exon6	4	13341945	29.347	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_14061369_Lg4_01929_MAF20_668064_exon1	4	14061369	32.218	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_TC_14081728_Lg4_01929_MAF30_MDP00000828295_exon1	4	14081728	32.218	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_14084215_Lg4_01929_MAF20_MDP00000254943_exon6	4	14084215	32.218	LG04	<lnxll>	{0-}	{(l,l,m)}
GDsnp01095	4	14234570	33.188	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_AG_14559093_Lg4_01292_MAF20_1652080_exon1	4	14559093	38.293	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_CA_14580745_Lg4_01292_MAF10_1659652_exon1	4	14580745	38.293	LG04	<lnxll>	{0-}	{(l,l,m)}
RosBREEDSNP_SNP_GA_16134794_Lg4_00321_MAF30_264514_exon1	4	16134794	41.378	LG04	<lnxll>	{0-}	{(l,l,m)}

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00321	4	62649469	16160833	46.354	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_CT_18330692_Lg4	4	72716341	18330692	47.292	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_GA_18418044_Lg4_00619_MAF30_MDP00000312342_exon1	4	41726353	18418044	47.292	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_CT_18541730_Lg4_02277_MAF10_MDP0000294856_exon1	4	71805429	18541730	47.292	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_18544856_Lg4_02277_MAF40_790526_exon1	4	22637488	18544856	47.292	LG04	<lmxl>	{0-}
GDsnp00324	4	38733329	18806147	47.292	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_AG_19480551_Lg4_00881_MAF50_1636549_exon1	4	49667461	19480551	48.218	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_GT_19738916_Lg4_01481_MAF10_1635038_exon2	4	57786507	19738916	48.218	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_AG_19748645_Lg4_01481_MAF10_1675186_exon1	4	73650452	19748645	48.222	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_TC_20463993_Lg4_01773_MAF30_98103_exon1	4	74687483	20463993	50.061	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_20512923_Lg4_01773_MAF30_MDP0000205358_exon1	4	70703486	20512923	50.061	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_AG_20963489_Lg4_00686_MAF10_1682093_exon6	4	67810367	20963489	50.088	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GT_21424923_Lg4_01558_MAF30_MDP0000270110_exon15	4	38794359	21424923	50.978	LG04	<lmxl>	{0-}
GDsnp01558	4	20794346	21460136	50.978	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_21176452_Lg4_01236_MAF30_MDP0000663534_exon4	4	43737507	21176452	50.995	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_16979237_Lg3_00921_MAF50_133104_exon1	3	39741494	16979237	52.823	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_CT_22205875_Lg4_01026_MAF50_1685729_exon4	4	59660320	22205875	52.823	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_AG_23359599_Lg4_01567_MAF20_347484_exon1	4	12752367	23359599	56.522	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_CT_23383939_Lg4_01567_MAF10_1664500_exon1	4	61806454	23383939	56.522	LG04	<lmxl>	{0-}
GDsnp01026	4	43761464	22193695	57.435	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_AC_23733006_Lg4_00388_MAF10_1669799_exon2	4	30627450	23733006	57.435	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_23737329_Lg4_00388_MAF20_MDP0000295593_exon9	4	25734461	23737329	58.345	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_CT_23751350_Lg4_00388_MAF50_1621108_exon2	4	52673465	23751350	58.345	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_CT_23839160_Lg4_00681_MAF10_MDP0000198074_exon2	4	62667454	23839160	59.26	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_AG_34831911_Lg12_01874_MAF10_1649255_exon1	12	58607402	34831911	59.26	LG04	<lmxl>	{1-}
RosBREEDSNP_SNP_AG_23872020_Lg4_00681_MAF20_1637093_exon1	4	17788463	23872020	60.176	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_24262161_Lg4_00283_MAF30_176010_exon5	4	74618379	24262161	64.914	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_CT_25034592_Lg4_00136_MAF10_1687814_exon1	4	66645430	25034592	65.875	LG04	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_1216653_Lg5_01956_MAF20_1658001_exon2	5	19757405	1216653	0	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_1218831_Lg5_01956_MAF30_1629562_exon8	5	53644420	1218831	0	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_GA_4178848_Lg5_01566_MAF50_1687376_exon1	5	52806343	4178848	4.491	LG05	<lmxl>	{1-}
RosBREEDSNP_SNP_GA_4197027_Lg5_01566_MAF10_1659241_exon1	5	15729462	4197027	4.491	LG05	<lmxl>	{1-}
RosBREEDSNP_SNP_GA_4277208_Lg5_01623_MAF40_291927_exon1	5	72770326	4277208	5.377	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_AG_6022284_Lg5_139135_MAF20_139135_exon1	5	63797399	6022284	7.065	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_5725342_Lg5_00264_MAF20_353640_exon1	5	39616498	5725342	7.382	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_7087864_Lg5_01151_MAF20_480759_exon1	5	66788487	7087864	12.323	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_TC_7089884_Lg5_01151_MAF10_1634546_exon3	5	67710344	7089884	12.323	LG05	<lmxl>	{0-}
GDsnp01896	5	47610439	9269756	15.562	LG05	<lmxl>	{1-}
RosBREEDSNP_SNP_TC_9472015_Lg5_01781_MAF20_51436_exon1	5	46864693	9472015	16.036	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_AC_10327041_Lg5_01651_MAF10_1667691_exon1	5	28747492	10327041	18.856	LG05	<lmxl>	{0-}
RosBREEDSNP_SNP_AG_11445563_Lg5_RosCOS1953_MAF50_MDP0000204582_exon4	5	71750462	11445563	20.81	LG05	<lmxl>	{1-}
RosBREEDSNP_SNP_GT_11479429_Lg5_RosCOS1953_MAF50_517811_exon4	5	74773453	11479429	20.81	LG05	<lmxl>	{1-}
RosBREEDSNP_SNP_TC_15472298_Lg5_01616_MAF30_1682170_exon2	5	31642462	15472298	26.701	LG05	<lmxl>	{0-}

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_20331733_Lg5_RosCOS452_MAF40_1624630_exon1	5	20331733	45.842	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_25133972_Lg5_00373_MAF30_1683155_exon6	5	25133972	55.549	LG05	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AC_26970454_Lg5_02729_MAF30_1664955_exon1	5	26970454	57.301	LG05	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_30331070_Lg5_01751_MAF30_1662486_exon1	5	30331070	58.152	LG05	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GA_33260850_Lg5_RosCOS1238_MAF40_541294_exon1	5	33260850	58.987	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_33263993_Lg5_RosCOS1238_MAF50_1680075_exon1	5	33263993	58.987	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CA_33278360_Lg5_RosCOS1238_MAF50_1638127_exon1	5	33278360	58.987	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_12043975_Lg10_RosCOS2353_MAF10_119939_exon6	10	12043975	59.817	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_36508128_Lg5_00100_MAF20_1632791_exon9	5	36508128	60.623	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GA_34453757_Lg5_RosCOS2737_MAF20_1684963_exon4	5	34453757	60.641	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_36493426_Lg5_00100_MAF10_1654983_exon1	5	36493426	60.641	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TG_36495464_Lg5_00100_MAF30_MDP0000217948_exon16	5	36495464	60.641	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_36510795_Lg5_00100_MAF20_MDP0000232589_exon4	5	36510795	60.641	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_11852167_Lg7_85261_MAF40_85261_exon1	7	11852167	60.641	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_25747601_Lg9_327827_MAF50_327827_exon2	9	25747601	60.651	LG05	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_25749175_Lg9_250343_MAF30_250343_exon1	9	25749175	61.302	LG05	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_36487489_Lg5_00100_MAF50_MDP0000220692_exon2	5	36487489	61.566	LG05	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_3922847_Lg6_01747_MAF50_1431_exon2	6	3922847	0	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GT_4081099_Lg6_00181_MAF50_1628494_exon1	6	4081099	0	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_4097483_Lg6_00181_MAF40_343474_exon1	6	4097483	0	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_4594953_Lg6_00501_MAF40_MDP0000189774_exon3	6	4594953	0.859	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_4993076_Lg6_MDP0000075705_MAF50_MDP0000075705_exon1	6	4993076	0.859	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GT_5306462_Lg6_RosCOS1410_MAF30_1639402_exon5	6	5306462	0.859	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GA_5309699_Lg6_RosCOS1410_MAF30_1632016_exon1	6	5309699	0.859	LG06	<lnxll>	{0-}	{0-}
GDsnp00082	6	5200956	2.564	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GA_6216549_Lg6_01575_MAF10_1684967_exon2	6	6216549	2.564	LG06	<lnxll>	{1-}	{1-}
GDsnp01575	6	6229601	2.564	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AC_6615652_Lg6_RosCOS1869_MAF40_1618698_exon6	6	6615652	2.564	LG06	<lnxll>	{0-}	{0-}
RosBREED_SNP_CT_9329089_Lg14	14	9329089	3.401	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_10716913_Lg6_MDP0000302895_MAF10_MDP0000302895_exon2	6	10716913	3.41	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_35432622_Lg10_RosCOS663_MAF50_1658284_exon6	10	35432622	3.41	LG06	<lnxll>	{0-}	{0-}
GDsnp02763	6	12002985	3.416	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_16868372_Lg6_02779_MAF30_1638635_exon2	6	16868372	3.485	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_18628780_Lg6_00199_MAF50_MDP0000279487_exon2	6	18628780	5.109	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_18710544_Lg6_00199_MAF30_1654313_exon1	6	18710544	5.109	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GT_14216532_Lg15_00816_MAF30_479223_exon2	15	14216532	5.109	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CA_19929848_Lg6_00488_MAF20_MDP00000839129_exon1	6	19929848	5.964	LG06	<lnxll>	{1-}	{1-}
GDsnp01831	6	19929848	5.964	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_TC_20424525_Lg6_00472_MAF30_1635406_exon1	6	20424525	5.964	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GA_20446572_Lg6_00472_MAF40_910234_exon1	6	20446572	5.964	LG06	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CA_21693978_Lg6_00142_MAF20_711715_exon2	6	21693978	7.69	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AC_21727754_Lg6_00142_MAF20_1627841_exon4	6	21727754	7.729	LG06	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AC_21088744_Lg6_155895_MAF20_155895_exon1	6	21088744	7.741	LG06	<lnxll>	{1-}	{1-}

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_22279636_Lg6_02165_MAF30_MDP0000777702_exon2	6	22279636	10.315	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_22247625_Lg6_02165_MAF20_1627766_exon9	6	22247625	11.301	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_23407280_Lg6_01556_MAF20_MDP0000306342_exon1	6	23407280	13.153	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_23422688_Lg6_01556_MAF30_344885_exon3	6	23422688	13.153	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_23453666_Lg6_01502_MAF40_1627896_exon1	6	23453666	14.054	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_23462644_Lg6_01502_MAF20_99517_exon1	6	23462644	14.054	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_16181043_Lg9_RosCOS3080_MAF20_1653925_exon3	9	16181043	14.959	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_16190604_Lg9_RosCOS3080_MAF10_1624067_exon1	9	16190604	14.959	LG06	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_5246942_Lg1_01826_MAF20_MDP0000153933_exon2	1	5246942	0	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_839755_Lg7_01172_MAF50_MDP0000263152_exon1	7	839755	0.933	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_1802488_Lg7_01433_MAF20_1656688_exon5	7	1802488	4.452	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_2176203_Lg7_01994_MAF20_MDP0000243087_exon1	7	2176203	4.452	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_2244430_Lg7_01946_MAF30_1661455_exon1	7	2244430	4.452	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_2824849_Lg7_00802_MAF50_MDP0000804626_exon1	7	2824849	4.452	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4377413_Lg7_01170_MAF20_1647395_exon1	7	4377413	6.135	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_4180170_Lg7_RosCOS3240_MAF50_MDP0000127900_exon4	7	4180170	6.164	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_1191603_Lg7_01997_MAF10_1630190_exon1	7	1191603	6.703	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_35134996_Lg5_62137_MAF20_62137_exon1	5	35134996	8.04	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_5831303_Lg7_00658_MAF10_981215_exon1	7	5831303	8.047	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_7106208_Lg7_01872_MAF20_MDP0000229645_exon1	7	7106208	10.631	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_8026567_Lg7_02619_MAF10_MDP0000322530_exon2	7	8026567	10.631	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_8158759_Lg7_263337_MAF20_263337_exon4	7	8158759	10.631	LG07	<lnxll>	{1-}	(ll,lm)
GDsnp01780	7	8540486	10.631	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_7265453_Lg7_snpEBI06582_MAF30_470278_exon1	7	7265453	10.653	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_9298084_Lg7_RosCOS2471_MAF40_MDP0000130967_exon1	7	9298084	11.48	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_22024068_Lg5_RosCOS3072_MAF30_MDP0000753788_exon2	5	22024068	12.326	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_11012131_Lg7_01882_MAF30_MDP0000138110_exon3	7	11012131	12.326	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_11014276_Lg7_01882_MAF30_MDP0000138110_exon10	7	11014276	12.326	LG07	<lnxll>	{1-}	(ll,lm)
GDsnp01882	7	11050754	12.326	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_18336417_Lg7_237066_MAF30_237066_exon1	7	18336417	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_19500458_Lg7_00871_MAF20_MDP0000625344_exon4	7	19500458	13.168	LG07	<lnxll>	{0-}	(ll,lm)
GDsnp00871	7	19500629	13.168	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_21298099_Lg7_02600_MAF30_1621358_exon2	7	21298099	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_21308179_Lg7_02600_MAF20_MDP0000217912_exon1	7	21308179	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21310787_Lg7_02600_MAF20_MDP0000217912_exon7	7	21310787	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_21316226_Lg7_02600_MAF10_1659961_exon2	7	21316226	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22933123_Lg7_RosCOS1514_MAF20_1619688_exon8	7	22933123	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_22968706_Lg7_RosCOS1514_MAF10_MDP0000446270_exon1	7	22968706	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_23836260_Lg7_328020_MAF20_328020_exon3	7	23836260	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_42973735_Lg15_RosCOS1842_MAF50_MDP0000013737_exon3	15	42973735	13.168	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_25209129_Lg7_00699_MAF50_257331_exon3	7	25209129	21.643	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22540597_Lg1_RosCOS1157_MAF50_MDP0000295917_exon1	1	22540597	26.158	LG07	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_22570796_Lg1_RosCOS1157_MAF40_1644689_exon1	1	22570796	26.158	LG07	<lnxll>	{0-}	(ll,lm)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TG_22565017_Lg1_RosCOS1157_MAF20_601265_exon1	1	22565017	26.244	LG07	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_282703_Lg8_00301_MAF10_516988_exon1	8	282703	0	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_629081_Lg8_00175_MAF20_1682291_exon2	8	629081	0	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_252738_Lg8_00301_MAF30_1634556_exon4	8	252738	0.006	LG08	<lnxll>	{0-}	(ll,lm)
GDsnp00175	8	666945	0.01	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_8933286_Lg8_01625_MAF30_1653734_exon1	8	8933286	25.477	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_15240237_Lg8_00354_MAF40_359397_exon1	8	15240237	50.555	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_17343145_Lg8_01370_MAF20_MDP0000769686_exon3	8	17343145	55.034	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_2030123_Lg3_RosCOS1698_MAF50_1684987_exon3	3	2030123	55.062	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_17357684_Lg8_01370_MAF30_394869_exon5	8	17357684	55.089	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_17361806_Lg8_01370_MAF10_MDP0000220614_exon3	8	17361806	55.089	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_23224503_Lg8_00975_MAF10_767505_exon1	8	23224503	55.958	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_23750084_Lg8_00157_MAF40_MDP0000135062_exon1	8	23750084	55.958	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_25179171_Lg8_01598_MAF40_MDP00000119283_exon4	8	25179171	55.958	LG08	<lnxll>	{1-}	(ll,lm)
GDsnp01598	8	25196549	55.958	LG08	<lnxll>	{1-}	(ll,lm)
GDsnp00311	8	20062692	56.324	LG08	<lnxll>	{0-}	(ll,lm)
Pear_Bartlett_SNP_TC_548_5147574	5147574	548	58.536	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_31310980_Lg11_72762_72762_exon1	11	31310980	60.297	LG08	<lnxll>	{1-}	(ll,lm)
GDsnp01764	8	30178572	62.044	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_30212661_Lg8_01764_MAF30_1666066_exon1	8	30212661	62.044	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_30391205_Lg8_00342_MAF10_MDP0000898538_exon1	8	30391205	62.044	LG08	<lnxll>	{1-}	(ll,lm)
GDsnp00342	8	30440760	62.044	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_30479542_Lg8_00342_MAF30_570403_exon2	8	30479542	62.912	LG08	<lnxll>	{0-}	(ll,lm)
GDsnp00293	8	28146149	64.647	LG08	<lnxll>	{0-}	(ll,lm)
GDsnp01576	8	31168759	64.647	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_32812193_Lg8_01182_MAF30_MDP0000647918_exon1	8	32812193	66.373	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_32814468_Lg8_01182_MAF50_170823_exon1	8	32814468	66.373	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_32820549_Lg8_01182_MAF10_1630387_exon2	8	32820549	66.373	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_32856152_Lg8_01182_MAF20_528574_exon1	8	32856152	66.373	LG08	<lnxll>	{1-}	(ll,lm)
Pear_Bartlett_SNP_CT_454_5147082	5105773	454	66.373	LG08	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_27845733_Lg9_02482_MAF50_MDP0000184435_exon1	9	27845733	67.234	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_27849559_Lg9_02482_MAF30_175649_exon1	9	27849559	67.234	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_35058728_Lg8_00299_MAF20_1651802_exon1	8	35058728	68.103	LG08	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_1433030_Lg9_01339_MAF30_MDP0000316472_exon1	9	1433030	0	LG09	<lnxll>	{1-}	(ll,lm)
GDsnp01339	9	1454354	0.983	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_4461663_Lg9_RosCOS1285_MAF30_1687591_exon3	9	4461663	21.636	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_4429905_Lg9_RosCOS1285_MAF40_1640159_exon7	9	4429905	22.254	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_4673470_Lg9_RosCOS3253_MAF30_1678232_exon1	9	4673470	23.478	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_4757607_Lg9_RosCOS3253_MAF40_1655086_exon1	9	4757607	24.394	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_4764340_Lg9_RosCOS3253_MAF10_1652159_exon1	9	4764340	24.394	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_13654828_Lg5_00978_MAF10_MDP0000178227_exon1	5	13654828	27.268	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5387010_Lg9_00514_MAF40_377304_exon1	9	5387010	27.268	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_5973848_Lg9_01603_MAF30_1675553_exon1	9	5973848	31.131	LG09	<lnxll>	{0-}	(ll,lm)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_5981805_Lg9_01603_MAF50_1683899_exon3	9	5981805	31.131	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6778759_Lg9_00280_MAF40_MDP0000764434_exon1	9	6778759	34.008	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6782368_Lg9_00280_MAF30_1632894_exon1	9	6782368	34.008	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_7220033_Lg9_01706_MAF40_54414_exon1	9	7220033	34.955	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_7211083_Lg9_01706_MAF40_MDP0000171114_exon2	9	7211083	34.955	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_7255390_Lg9_01706_MAF50_MDP0000322282_exon8	9	7255390	35.905	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_7640974_Lg9_00893_MAF20_1669942_exon2	9	7640974	35.905	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_7685092_Lg9_01858_MAF10_326877_exon1	9	7685092	36.836	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_7727491_Lg9_01858_MAF40_1671555_exon1	9	7727491	37.822	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_8265232_Lg9_00337_MAF20_27248_exon1	9	8265232	40.689	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_8236405_Lg9_00337_MAF40_207976_exon1	9	8236405	40.74	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_8273556_Lg9_00337_MAF20_374425_exon1	9	8273556	40.74	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_10476886_Lg9_MDP0000222000_MDP0000222000_exon1	9	10476886	42.698	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_10390776_Lg17_01044_MAF20_1622449_exon2	17	10390776	42.698	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_11719235_Lg9_01755_MAF20_45574_exon1	9	11719235	43.68	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_11729185_Lg9_01755_MAF40_508139_exon1	9	11729185	43.68	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_12886110_Lg9_00331_MAF10_505681_exon2	9	12886110	48.737	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_18226904_Lg9_00109_MAF40_1670050_exon1	9	18226904	51.763	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_33056483_Lg9_01200_MAF50_MDP0000254312_exon19	9	33056483	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_33065704_Lg9_01200_MAF20_MDP0000312752_exon1	9	33065704	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33089957_Lg9_01200_MAF10_1643288_exon4	9	33089957	56.655	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_33180045_Lg9_01293_MAF50_MDP0000168471_exon1	9	33180045	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33182405_Lg9_01293_MAF20_MDP0000186755_exon2	9	33182405	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33185982_Lg9_01293_MAF10_MDP0000507749_exon3	9	33185982	56.655	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_33219450_Lg9_00332_MAF40_743609_exon1	9	33219450	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33227831_Lg9_00332_MAF40_MDP0000175442_exon2	9	33227831	56.655	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_32531545_Lg9_01066_MAF30_1639980_exon1	9	32531545	57.105	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_32578156_Lg9_01066_MAF10_MDP0000226580_exon2	9	32578156	57.105	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_32549950_Lg9_01066_MAF30_MDP0000275261_exon10	9	32549950	57.121	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_32297817_Lg9_00659_MAF40_520045_exon1	9	32297817	57.515	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_32329275_Lg9_00659_MAF20_178008_exon1	9	32329275	57.515	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_31685318_Lg9_00206_MAF20_150466_exon1	9	31685318	57.874	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_31860120_Lg9_9573_MAF40_9573_exon1	9	31860120	57.874	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_35144416_Lg2_86472_MAF20_86472_exon1	2	35144416	57.989	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_29703618_Lg9_02437_MAF10_1653967_exon1	9	29703618	57.989	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_29807663_Lg9_00467_MAF30_MDP0000294547_exon4	9	29807663	58.33	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_35913773_Lg9_00860_MAF20_MDP0000132641_exon2	9	35913773	58.591	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_35885123_Lg9_00860_MAF40_MDP0000267148_exon1	9	35885123	58.637	LG09	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_4428309_Lg16_182011_182011_exon1	16	4428309	59.629	LG09	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_2498716_Lg10_01909_MAF20_320920_exon1	10	2498716	0	LG10	<lnxll>	{0-}	(ll,lm)
GDsnp00839	10	2600272	0	LG10	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_16562159_Lg8_02022_MAF10_MDP0000489996_exon1	8	16562159	0.924	LG10	<lnxll>	{0-}	(ll,lm)
GDsnp01909	10	2477825	0.924	LG10	<lnxll>	{0-}	(ll,lm)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_3294683_Lg10_01947_MAF20_MDP0000226451_exon18	10	3294683	0.924	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_4032707_Lg10_01810_MAF30_483396_exon2	10	4032707	0.924	LG10	<lmxl>	{0-}	{0-}
GDsnp02051	10	7164549	1.814	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_13033111_Lg10_RosCOS724_MAF40_MDP0000193868_exon3	10	13033111	2.675	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_13019481_Lg10_RosCOS724_MAF20_1621359_exon1	10	13019481	2.71	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_13071892_Lg10_RosCOS724_MAF50_MDP0000285181_exon18	10	13071892	2.71	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_25254893_Lg15_RosCOS588_MAF10_1628860_exon8	15	25254893	2.71	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AC_14684226_Lg10_01267_MAF10_2640_exon1	10	14684226	8.289	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_16997826_Lg10_02009_MAF10_354265_exon1	10	16997826	9.207	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_7705858_Lg9_01858_MAF30_MDP0000294257_exon4	9	7705858	9.224	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_16714632_Lg10_01710_MAF30_715511_exon1	10	16714632	9.224	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_17040479_Lg10_02009_MAF20_487699_exon2	10	17040479	9.224	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_17046031_Lg10_02009_MAF40_MDP0000142019_exon2	10	17046031	9.224	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_17911896_Lg10_02252_MAF30_MDP0000125644_exon1	10	17911896	9.224	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_TC_19519947_Lg10_02183_MAF10_MDP00000235804_exon3	10	19519947	12.044	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_TC_22513868_Lg10_RosCOS139_MAF30_1647136_exon1	10	22513868	15.022	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_3093315_Lg15_01814_MAF40_579747_exon1	15	3093315	16.993	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_22536388_Lg10_RosCOS139_MAF20_MDP0000298812_exon1	10	22536388	17	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_TC_23285470_Lg10_RosCOS1786_MAF30_1646669_exon4	10	23285470	17.988	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AC_23287620_Lg10_RosCOS1786_MAF40_1683394_exon1	10	23287620	17.988	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GT_23958720_Lg10_RosCOS2910_MAF10_1686249_exon1	10	23958720	23.05	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GT_24273907_Lg10_RosCOS3104_MAF50_1653415_exon2	10	24273907	23.05	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_24294786_Lg10_RosCOS3104_MAF30_1641181_exon2	10	24294786	23.05	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_2576522_Lg10_00839_MAF10_463248_exon1	10	2576522	27.032	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AC_26616826_Lg10_00812_MAF30_408812_exon1	10	26616826	27.392	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AC_26653496_Lg10_00812_MAF40_MDP0000858559_exon1	10	26653496	28.025	LG10	<lmxl>	{0-}	{0-}
GDsnp00812	10	26660407	28.094	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_28131897_Lg10_68102_MAF40_68102_exon1	10	28131897	31.971	LG10	<lmxl>	{1-}	{1-}
RosBREEDSNP_SNP_GA_28354787_Lg10_148145_MAF30_148145_exon2	10	28354787	32.939	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_29018338_Lg10_01570_MAF40_1642636_exon2	10	29018338	32.939	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_36033314_Lg10_186429_MAF40_186429_exon1	10	36033314	32.939	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CA_29020445_Lg10_01570_MAF40_MDP0000131641_exon2	10	29020445	33.898	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_29213640_Lg10_138979_MAF20_138979_exon2	10	29213640	33.898	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_29213692_Lg10_138979_MAF30_138979_exon2	10	29213692	33.898	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_29324063_Lg10_MDP000080912_MAF30_MDP000080912_exon1	10	29324063	33.898	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AG_30223751_Lg10_00734_MAF50_1646703_exon1	10	30223751	38.79	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_31279293_Lg10_01908_MAF40_689898_exon1	10	31279293	39.885	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_AC_31320811_Lg10_01961_MAF50_MDP0000256011_exon1	10	31320811	41.082	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_GA_31676157_Lg10_00099_MAF30_407257_exon4	10	31676157	44.851	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_CT_32380998_Lg10_RosCOS2362_MAF20_880009_exon2	10	32380998	45.134	LG10	<lmxl>	{1-}	{1-}
RosBREEDSNP_SNP_GA_32372997_Lg10_RosCOS2362_MAF20_1643940_exon1	10	32372997	45.978	LG10	<lmxl>	{1-}	{1-}
RosBREEDSNP_SNP_AC_33501094_Lg10_01683_MAF50_MDP0000305859_exon5	10	33501094	54.079	LG10	<lmxl>	{0-}	{0-}
RosBREEDSNP_SNP_TC_33520271_Lg10_01683_MAF30_MDP0000305861_exon12	10	33520271	54.079	LG10	<lmxl>	{0-}	{0-}

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_34911292_Lg10_00258_MAF40_MDP0000550024_exon6	18636487	10	34911292	54.079	LG10	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_36091067_Lg10_RosCOS2135_MAF40_474692_exon1	29734307	10	36091067	56.883	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_36148204_Lg10_RosCOS2135_MAF10_1665533_exon3	67803442	10	36148204	57.834	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_36560697_Lg10_01761_MAF10_1664399_exon1	29685477	10	36560697	58.697	LG10	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_36606927_Lg10_01761_MAF10_MDP0000221905_exon6	26607382	10	36606927	58.697	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_36848994_Lg10_00405_MAF20_MDP0000293774_exon3	25804416	10	36848994	59.478	LG10	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CA_36783038_Lg10_MDP0000136226_MAF50_MDP0000136226_exon4	20710324	10	36783038	59.574	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_36883478_Lg10_00405_MAF30_281824_exon1	16762447	10	36883478	60.459	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_36985238_Lg10_00604_MAF20_394414_exon1	27768416	10	36985238	61.346	LG10	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_37006565_Lg10_00604_MAF40_1660572_exon2	16730442	10	37006565	61.346	LG10	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_9244650_Lg13_01742_MAF10_767610_exon1	14810352	13	9244650	0	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_30962954_Lg15_RosCOS444_MAF40_MDP0000485280_exon1	12793416	15	30962954	0.929	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_12188459_Lg11_00240_MAF10_MDP0000713484_exon1	24685490	11	12188459	2.481	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_5154472_Lg11_00418_MAF30_186915_exon1	16701440	11	5154472	6.356	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_4937206_Lg11_MDP0000389025_MAF10_MDP0000389025_exon1	52715458	11	4937206	6.388	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_5075367_Lg11_RosCOS2981_MAF50_1677461_exon1	45718494	11	5075367	6.388	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_5133231_Lg11_00418_MAF20_58344_exon1	23695372	11	5133231	6.388	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AC_6496114_Lg11_00621_MAF40_MDP0000172291_exon7	64701359	11	5495238	8.233	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_6484441_Lg11_00621_MAF20_1668684_exon1	40759397	11	6496114	9.169	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GA_7161866_Lg11_01483_MAF30_1629427_exon6	58780348	11	6484441	9.185	LG11	<lmxl>	{0-}	(l,l,m)
GDsnp00621	43756435	11	7161866	11.052	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AG_8427560_Lg11_00185_MAF20_MDP0000185943_exon7	18771496	11	6532369	12.926	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_8687657_Lg11_00735_MAF30_842844_exon1	58694406	11	8427560	13.14	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_8716987_Lg11_00735_MAF10_1618847_exon1	22660484	11	8687657	13.14	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_9976495_Lg11_RosCOS3333_MAF20_1653958_exon1	25752459	11	8716987	13.14	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_11601607_Lg11_02309_MAF20_458582_exon2	47749312	11	9976495	18.364	LG11	<lmxl>	{0-}	(l,l,m)
GDsnp02309	71619371	11	11601607	24.897	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_12898690_Lg11_02465_MAF50_MDP0000524742_exon1	39722501	11	11615576	24.897	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_12328377_Lg11_00441_MAF50_373309_exon3	11618307	11	12898690	30.019	LG11	<lmxl>	{1-}	(l,l,m)
Pear_Bartlett_SNP_TC_471_5062178	71660341	11	12328377	30.047	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_14864469_Lg11_RosCOS224_MAF20_1637382_exon1	56691462	5062178	471	30.047	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CA_13653336_Lg11_RosCOS2909_MAF20_MDP0000193176_exon4	70810500	11	14864469	32.944	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_16672448_Lg11_01640_MAF20_1661258_exon1	61759378	11	13653336	33.864	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_27126226_Lg13_MDP0000716623_MAF50_MDP0000716623_exon1	59677507	13	16672448	34.463	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_27108153_Lg13_MDP0000236565_MAF20_MDP0000236565_exon1	61748491	13	27126226	34.783	LG11	<lmxl>	{0-}	(l,l,m)
GDsnp01187	72779306	11	27108153	34.809	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_23247031_Lg5_RosCOS1210_MAF10_788937_exon1	72785362	5	20557520	34.847	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_19068652_Lg11_GD_SNP01857_MAF50_1631874_exon2	27762468	11	23247031	34.854	LG11	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_25967775_Lg13_MDP0000127457_MAF20_MDP0000127457_exon5	22786429	13	19068652	34.854	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_26252739_Lg13_02452_MAF30_MDP0000212353_exon6	40664445	13	25967775	34.854	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GT_27108273_Lg13_MDP0000236565_MDP0000236565_exon1	61709503	13	26252739	34.854	LG11	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_27108315_Lg13_MDP0000236565_MAF20_MDP0000236565_exon1	34747500	13	27108273	34.854	LG11	<lmxl>	{0-}	(l,l,m)
			27108315	34.854	LG11	<lmxl>	{1-}	(l,l,m)

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Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_26810795_Lg11_01361_MAF20_MDP0000180811_exon3	11	51605477	38.568	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_28699805_Lg11_01705_MAF20_1640642_exon3	11	28699805	39.499	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_29809045_Lg11_00662_MAF20_1633056_exon3	11	29809045	39.501	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_30582252_Lg11_02838_MAF50_MDP0000317343_exon1	11	30582252	40.448	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_30574281_Lg11_02838_MAF40_286253_exon1	11	30574281	40.473	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_22015836_Lg4_MDP0000157871_MDP0000157871_exon1	4	22015836	41.355	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_22016027_Lg4_MDP0000157871_MAF30_MDP0000157871_exon1	4	22016027	41.355	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_32553307_Lg11_00647_MAF40_1683980_exon4	11	32553307	45.086	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_33333488_Lg1_01951_MAF20_1662644_exon1	1	33333488	46.004	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_33426856_Lg11_02576_MAF20_118175_exon1	11	33426856	46.004	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_34229286_Lg11_02910_MAF50_1683154_exon3	11	34229286	46.004	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_33465079_Lg11_02576_MAF40_1632551_exon3	11	33465079	46.011	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_34210655_Lg11_02910_MAF40_MDP0000288220_exon1	11	34210655	46.03	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_35840087_Lg11_00795_MAF30_1638089_exon2	11	35840087	48.745	LG11	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_35936616_Lg11_RosCOS372_MAF50_826662_exon1	11	35936616	48.745	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_36011885_Lg11_RosCOS372_MAF40_459727_exon2	11	36011885	48.745	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_36938301_Lg11_RosCOS1511_MAF10_475601_exon1	11	36938301	49.652	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_36946479_Lg11_RosCOS1511_MAF30_263380_exon1	11	36946479	49.652	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_36949843_Lg11_RosCOS1511_MAF40_848539_exon1	11	36949843	49.652	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_3311328_Lg6_02819_MAF20_MDP0000161610_exon1	6	3311328	49.785	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_8797126_Lg17_01842_MAF10_MDP0000822021_exon4	17	8797126	56.144	LG11	<lnxll>	{0-}	(ll,lm)
GDsnp00182	11	40016712	57.599	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_39990406_Lg11_00182_MAF30_MDP0000322000_exon2	11	39990406	58.05	LG11	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_502092_Lg12_00173_MAF50_1644261_exon7	12	502092	0	LG12	<lnxll>	{1-}	(ll,lm)
GDsnp00173	12	495813	0.042	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_500084_Lg12_00173_MAF40_1659794_exon4	12	500084	0.042	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_1193551_Lg12_RosCOS3293_MAF50_756728_exon3	12	1193551	0.949	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_1195935_Lg12_RosCOS3293_MAF30_1655383_exon1	12	1195935	0.953	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_1475357_Lg12_319216_319216_exon2	12	1475357	2.798	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_1799179_Lg12_00116_MAF20_898942_exon1	12	1799179	5.616	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_2956505_Lg12_RosCOS1934_MAF30_MDP0000283764_exon13	12	2956505	10.239	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_3033227_Lg12_01615_MAF10_MDP0000275151_exon25	12	3033227	12.072	LG12	<lnxll>	{0-}	(ll,lm)
GDsnp01391	12	3499401	12.072	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_3506169_Lg12_01391_MAF50_491101_exon1	12	3506169	12.072	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_3445217_Lg12_324348_MAF40_324348_exon1	12	3445217	12.338	LG12	<lnxll>	{1-}	(ll,lm)
Pear_Bartlett_SNP_GA_467_5144762	5142823	467	12.971	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_4334480_Lg12_01690_MAF20_769350_exon1	12	4334480	13.498	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4704776_Lg12_01907_MAF50_152803_exon2	12	4704776	15.754	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_22147680_Lg4_01026_MAF40_1625428_exon1	4	22147680	19.48	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_9333311_Lg12_02053_MAF30_MDP0000321559_exon2	12	9333311	19.48	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_8799394_Lg12_02857_MAF40_MDP0000135997_exon9	12	8799394	19.534	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_8810680_Lg12_02857_MAF40_MDP0000064909_exon1	12	8810680	19.534	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_16369231_Lg12_01501_MAF40_713285_exon1	12	16369231	23.268	LG12	<lnxll>	{1-}	(ll,lm)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AC_16371830_Lg12_01501_MAF50_566278_exon1	12	16371830	23.268	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_19310678_Lg12_01357_MAF10_1659313_exon1	12	19310678	28.244	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_22654900_Lg12_01150_MAF30_MDP0000151005_exon6	12	22654900	31.26	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_23397899_Lg12_RosCOS3647_MAF20_1648369_exon3	12	23397899	34.266	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_23562759_Lg12_108927_MAF10_108927_exon1	12	23562759	34.266	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_34251015_Lg1_01678_MAF30_MDP0000189607_exon2	1	34251015	39.131	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_29053998_Lg12_00334_MAF20_MDP0000199776_exon3	12	29053998	39.189	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_29070012_Lg12_00334_MAF30_MDP0000163756_exon2	12	29070012	39.189	LG12	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_33692967_Lg12_02008_MAF20_MDP0000291899_exon2	12	33692967	61.885	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_33563721_Lg12_MDP0000140143_MAF20_MDP0000140143_exon2	12	33563721	61.89	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_23897773_Lg4_00681_MAF30_1630036_exon2	4	23897773	67.443	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_34804790_Lg12_01874_MAF30_MDP0000322136_exon1	12	34804790	67.455	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_35420388_Lg12_01793_MAF10_1619944_exon6	12	35420388	70.055	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_35699547_Lg12_00338_MAF20_MDP00000509268_exon1	12	35699547	70.962	LG12	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_256845_Lg13_MDP0000187560_MAF40_MDP0000187560_exon4	13	256845	0	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_371869_Lg13_00368_MAF40_577826_exon3	13	371869	1.074	LG13	<lnxll>	{1-}	(ll,lm)
GDsnp00980	13	3787503	20.943	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_3799687_Lg13_00980_MAF40_229646_exon1	13	3799687	21.89	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_3813153_Lg13_00980_MAF30_893444_exon1	13	3813153	21.89	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_3853770_Lg13_00565_MAF20_208768_exon2	13	3853770	21.89	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_27033824_Lg15_02084_MAF40_MDP0000198805_exon5	15	27033824	21.89	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GT_16977450_Lg9_01648_MAF40_MDP0000583951_exon2	9	16977450	22.665	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_4597171_Lg13_RosCOS841_MAF10_MDP0000286449_exon1	13	4597171	22.79	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4578168_Lg13_RosCOS841_MAF20_522560_exon1	13	4578168	23.001	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_4948282_Lg13_02336_MAF40_522995_exon1	13	4948282	23.698	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_4993103_Lg13_02336_MAF50_1659833_exon6	13	4993103	23.709	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_5637395_Lg13_RosCOS1918_MAF20_276613_exon1	13	5637395	32.469	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_6005626_Lg13_RosCOS2511_MAF40_MDP0000859856_exon1	13	6005626	33.442	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_6017316_Lg13_RosCOS2511_MAF50_MDP0000834158_exon9	13	6017316	33.442	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_6009220_Lg13_RosCOS2511_MAF20_1678475_exon1	13	6009220	33.63	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_6306433_Lg13_226059_MAF30_226059_exon2	13	6306433	35.383	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_6361679_Lg13_155673_MAF30_155673_exon2	13	6361679	37.323	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6361691_Lg13_155673_MAF30_155673_exon2	13	6361691	37.491	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_6451261_Lg13_65890_MAF20_65890_exon1	13	6451261	39.844	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6451182_Lg13_65890_MAF30_65890_exon1	13	6451182	39.951	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6926009_Lg13_166939_MAF30_166939_exon1	13	6926009	40.938	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_7138956_Lg13_00128_MAF50_MDP0000193959_exon4	13	7138956	42.813	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AC_7144285_Lg13_00128_MAF30_MDP0000846055_exon4	13	7144285	42.813	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_7141897_Lg13_00128_MAF50_MDP0000846055_exon1	13	7141897	42.85	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_7165677_Lg13_00128_MAF20_1662884_exon1	13	7165677	43.753	LG13	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_7172710_Lg13_00128_MAF20_956_exon1	13	7172710	44.662	LG13	<lnxll>	{1-}	(ll,lm)
GDsnp02124	13	7637826	44.713	LG13	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_10684342_Lg13_00140_MAF50_1642956_exon1	13	10684342	52.319	LG13	<lnxll>	{1-}	(ll,lm)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_10714013_Lg13_00140_MAF40_188556_exon2	13	46692364	53.382	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_AC_14440697_Lg13_01776_MAF20_1680494_exon1	13	55619462	57.346	LG13	<lmxl>	{1-}	{1,lm}
GDsnp01704	13	11733382	57.635	LG13	<lmxl>	{1-}	{1,lm}
GDsnp00943	13	42616432	59.713	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_CT_16710748_Lg13_00890_MAF10_MDP0000150776_exon8	13	38780356	62.834	LG13	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_TC_16712808_Lg13_00890_MAF20_MDP0000150776_exon2	13	32800357	63.125	LG13	<lmxl>	{0-}	{1,lm}
GDsnp00902	13	43742312	67.717	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_CT_38238894_Lg13_27726_MAF10_27726_exon1	13	70725311	71.343	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_AG_23472396_Lg2_RosCOS2680_MAF20_1662624_exon2	2	60675405	71.857	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TG_23507487_Lg2_02155_MAF20_MDP0000432826_exon1	2	29789406	72.127	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TC_23529831_Lg2_02155_MAF30_1642317_exon3	2	18789444	72.127	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_CT_31089065_Lg13_01316_MAF30_44308_exon1	13	56631321	72.127	LG13	<lmxl>	{1-}	{1,lm}
GDsnp02890	13	67716398	72.127	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TC_34974132_Lg13_01899_MAF20_1651016_exon3	13	37686473	72.127	LG13	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_AC_39662008_Lg13	13	74647440	72.127	LG13	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_CT_32900177_Lg8_01182_MAF40_1620881_exon1	8	20659452	72.51	LG13	<lmxl>	{0-}	{1,lm}
GDsnp01888	14	25738319	0	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_AG_612490_Lg14_AT2_MAF50_MDP0000793769_exon1	14	69728463	0.296	LG14	<lmxl>	{1-}	{1,lm}
GDsnp00025	14	37623491	4.153	LG14	<lmxl>	{0-}	{1,lm}
MdTF11	4	73621451	7.914	LG14	<lmxl>	{0-}	{1,lm}
GDsnp01846	14	39746459	8.824	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TG_4949471_Lg14_00248_MAF20_MDP0000616565_exon1	14	10758328	11.516	LG14	<lmxl>	{0-}	{1,lm}
GDsnp00010	14	47795502	11.516	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_GA_6432371_Lg14_01401_MAF20_1687172_exon3	14	55775487	11.516	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_AG_6473268_Lg14_01401_MAF30_1657233_exon1	14	67692364	11.516	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_GA_68260_Lg5_252545_MAF50_252545_exon1	5	61710392	13.28	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_CT_8303678_Lg14_RosCOS266_MAF50_MDP0000259123_exon9	14	25704374	13.288	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_AG_9119037_Lg14_01650_MAF50_MDP0000183819_exon7	14	74629315	15.076	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_AC_9138727_Lg14_01650_MAF20_1667746_exon1	14	56612353	15.973	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_AC_12582508_Lg14_00170_MAF40_248387_exon1	14	25714425	16.866	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_GA_20380789_Lg14_02363_MAF20_887187_exon2	14	22638470	18.659	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_GA_21013914_Lg14_MDP0000302772_MAF20_MDP0000302772_exon8	14	45703483	18.659	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_TC_21893245_Lg14_02366_MAF10_1664397_exon1	14	41653395	18.659	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_CT_32019527_Lg1_325484_MAF30_325484_exon2	1	66781466	18.665	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_GA_21880406_Lg14_02366_MAF10_1629238_exon2	14	23806368	18.665	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_AC_16175296_Lg4_00321_MAF40_1649301_exon1	4	62809438	25.277	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TG_22384593_Lg14_CH03g04_MAF40_531173_exon1	14	40753388	25.277	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_CT_23446212_Lg14_00062_MAF30_1685833_exon2	14	29778354	28.226	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_AG_23852990_Lg14_MDP0000258032_MAF30_MDP0000258032_exon12	14	71766500	29.225	LG14	<lmxl>	{1-}	{1,lm}
GDsnp02673	14	63611390	29.225	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_TC_27497747_Lg14_01213_MAF50_1683959_exon3	14	59612510	40.906	LG14	<lmxl>	{0-}	{1,lm}
RosBREEDSNP_SNP_CT_29528073_Lg14_01811_MAF50_159748_exon1	14	31780424	54.16	LG14	<lmxl>	{1-}	{1,lm}
RosBREEDSNP_SNP_AG_30481224_Lg14_RosCOS2457_MAF30_122969_exon1	14	36602440	60.665	LG14	<lmxl>	{1-}	{1,lm}

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_31661119_Lg14_00213_MAF30_1627290_exon1	14	68742371	62.526	LG14	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_31889669_Lg14_MDP0000224810_MAF50_MDP0000224810_exon1	14	73725494	63.402	LG14	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_31997923_Lg14_02021_MAF30_1669726_exon1	14	16715482	63.404	LG14	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_31708508_Lg14_00213_MAF30_1682653_exon1	14	74737456	63.405	LG14	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_31951359_Lg14_02021_MAF50_MDP0000230868_exon1	14	35648431	63.405	LG14	<lnxll>	{0-}	(ll,lm)
MdMFTb	14	17638333	67.462	LG14	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_32996485_Lg14_01639_MAF10_MDP0000573842_exon2	14	71733315	67.668	LG14	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_33060196_Lg14_00023_MAF10_513701_exon1	14	16736332	67.668	LG14	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_33259280_Lg14_01548_MAF40_1667656_exon1	14	23805403	67.668	LG14	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GT_33262180_Lg14_01548_MAF30_1685177_exon3	14	73611345	67.668	LG14	<lnxll>	{1-}	(ll,lm)
GDsnp01213	14	20650502	69.324	LG14	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_32748739_Lg1_RosCOS2753_MAF10_520680_exon1	1	36601460	0	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_32769443_Lg1_RosCOS2753_MAF30_MDP0000220174_exon1	1	15736372	0	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_32779405_Lg1_RosCOS2753_MAF30_1629797_exon1	1	43648412	0	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_3325153_Lg1_01951_MAF10_132337_exon1	1	69633482	1.323	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_988661_Lg15_00694_MAF30_1637851_exon1	15	38795473	4.141	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_1070334_Lg15_01009_MAF40_1649909_exon1	15	60774467	4.162	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_976750_Lg15_00694_MAF50_598335_exon1	15	60697425	4.18	LG15	<lnxll>	{1-}	(ll,lm)
GDsnp00694	15	65795361	4.18	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_1098793_Lg15_01009_MAF30_84788_exon1	15	53613474	4.18	LG15	<lnxll>	{1-}	(ll,lm)
GDsnp01009	15	31631430	4.911	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_1516126_Lg15_00717_MAF40_530377_exon1	15	73679491	7.256	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_4914320_Lg15_RosCOS2117_MAF20_1669694_exon1	15	29807481	17.763	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_5934756_Lg15_CXE2_MAF30_1627139_exon12	15	51683464	17.763	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_5937629_Lg15_CXE2_MAF20_1674901_exon1	15	35796472	17.763	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_5955080_Lg15_CXE2_MAF20_MDP0000524927_exon1	15	12731333	17.908	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_6602013_Lg15_00076_MAF30_285792_exon1	15	35731448	27.201	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_6579785_Lg15_00076_MAF30_1661433_exon6	15	44655446	27.416	LG15	<lnxll>	{0-}	(ll,lm)
Pear_Bartlett_SNP_TC_529_5105762	5105762		27.416	LG15	<lnxll>	{1-}	(ll,lm)
GDsnp01989	15	72603380	39.196	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_11859098_Lg15_MDP0000320360_MAF40_MDP0000320360_exon2	15	38729355	46.23	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_13707071_Lg15_01587_MAF10_1623976_exon1	15	66609376	49.06	LG15	<lnxll>	{1-}	(ll,lm)
GDsnp01587	15	19786330	49.1	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_17591764_Lg15_RosCOS2945_MAF30_27176_exon2	15	74665394	51.01	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AC_16479542_Lg15_01229_MAF30_1651717_exon1	15	57651423	51.646	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_17589314_Lg15_RosCOS2945_MAF50_1626426_exon1	15	63658362	52.915	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_29932064_Lg15_RosCOS1232_MAF30_449810_exon2	15	47783492	55.645	LG15	<lnxll>	{0-}	(ll,lm)
GDsnp00357	15	58708362	55.938	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_41915787_Lg15_229871_229871_exon1	15	55747435	55.938	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TG_15015583_Lg10_00015_MAF10_1639295_exon2	10	62621339	56.174	LG15	<lnxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_13752663_Lg5_01505_MAF20_1624285_exon5	5	52664363	56.271	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_7474525_Lg14_RosCOS621_MAF10_531521_exon3	14	27636449	56.271	LG15	<lnxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_28687459_Lg15_02592_MAF30_1662248_exon6	15	66807345	56.531	LG15	<lnxll>	{0-}	(ll,lm)

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_36517806_Lg5_00100_MAF40_MDP0000147560_exon1	5	36517806	56.546	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_11971703_Lg6_02763_MAF30_MDP0000491271_exon1	6	11971703	56.546	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_8352409_Lg13_84982_MAF10_84982_exon1	13	8352409	56.546	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GA_27352264_Lg15_133284_133284_exon1	15	27352264	56.546	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_27882182_Lg15_00208_MAF30_MDP0000138089_exon7	15	27882182	56.546	LG15	<lnxll>	{0-}	{0-}
GDsnp01850	15	26321647	56.783	LG15	<lnxll>	{0-}	{0-}
GDsnp02313	15	21492288	57.152	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CA_18324149_Lg15_RosCOS1184_MAF20_MDP0000309557_exon1	15	18324149	57.544	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_19062612_Lg15_00615_MAF20_1628480_exon1	15	19062612	57.544	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GT_19064661_Lg15_00615_MAF20_869484_exon1	15	19064661	57.544	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_19352650_Lg15_01518_MAF10_397548_exon2	15	19352650	57.553	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_19360134_Lg15_01518_MAF30_1668162_exon4	15	19360134	57.575	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_2313874_Lg9_02134_MAF50_MDP0000218391_exon1	9	2313874	58.216	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_28803709_Lg8_MDP00000319749_MAF20_MDP00000319749_exon4	8	28803709	60.803	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_45049266_Lg15_ACS_MAF20_463384_exon1	15	45049266	61.062	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_44333089_Lg15_01687_MAF40_1633787_exon2	15	44333089	62.358	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CT_45920803_Lg15_RosCOS1627_MAF50_1679367_exon1	15	45920803	62.358	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GA_45915221_Lg15_RosCOS1627_MAF10_1652456_exon3	15	45915221	62.62	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_45923143_Lg15_RosCOS1627_MAF40_707751_exon1	15	45923143	63.518	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_45932116_Lg15_RosCOS1627_MAF40_MDP0000759612_exon1	15	45932116	63.518	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_CA_45952228_Lg15_RosCOS1627_MAF20_MDP0000149372_exon2	15	45952228	63.555	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TG_49891950_Lg15_00525_MAF40_1652653_exon1	15	49891950	67.062	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_50033143_Lg15_01778_MAF30_MDP00000309283_exon14	15	50033143	67.062	LG15	<lnxll>	{0-}	{0-}
GDsnp00079	15	50075110	67.062	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AC_50088799_Lg15_00079_MAF20_474486_exon1	15	50088799	67.062	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_51280174_Lg15_00236_MAF10_602999_exon1	15	51280174	67.062	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AC_51307294_Lg15_00236_MAF40_MDP0000216120_exon4	15	51307294	67.062	LG15	<lnxll>	{0-}	{0-}
GDsnp01392	15	55371893	68.865	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_55611251_Lg15_327586_MAF20_327586_exon1	15	55611251	69.774	LG15	<lnxll>	{1-}	{1-}
GDsnp00525	15	49897101	71.636	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AG_54456004_Lg15_01774_MAF50_1665083_exon4	15	54456004	73.691	LG15	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CA_46671744_Lg15_01752_MAF30_MDP0000209210_exon1	15	46671744	95.02	LG15	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GT_7401256_Lg16_RosCOS1166_MAF30_1620272_exon4	16	7401256	0	LG16	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AC_7424678_Lg16_RosCOS1166_MAF20_812638_exon1	16	7424678	0	LG16	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_AG_1773279_Lg10_RosCOS3613_MAF20_1674870_exon1	10	1773279	1.728	LG16	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_AC_1782356_Lg10_RosCOS3613_MAF30_17174_exon1	10	1782356	1.728	LG16	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GT_1784388_Lg10_RosCOS3613_MAF30_1620734_exon1	10	1784388	1.728	LG16	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_TC_1816885_Lg10_RosCOS3613_MAF40_1626256_exon4	10	1816885	1.728	LG16	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_GA_1891144_Lg16_00047_MAF10_MDP0000259303_exon2	16	1891144	4.345	LG16	<lnxll>	{0-}	{0-}
RosBREED_SNP_TC_3303558_Lg16	16	3303558	9.301	LG16	<lnxll>	{0-}	{0-}
RosBREEDSNP_SNP_CT_3139639_Lg16_01116_MAF10_MDP0000241821_exon3	16	3139639	9.553	LG16	<lnxll>	{1-}	{1-}
RosBREED_SNP_AC_3334689_Lg16	16	3334689	9.553	LG16	<lnxll>	{1-}	{1-}
RosBREEDSNP_SNP_GA_3384428_Lg16_00353_MAF50_1674008_exon2	16	3384428	9.553	LG16	<lnxll>	{1-}	{1-}

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Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_3456566_Lg16_00353_MAF20_463076_exon1	34765402	16	3456566	9.553	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_3461705_Lg16_00353_MAF40_166779_exon2	20787468	16	3461705	9.553	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CA_3855345_Lg16_01627_MAF30_1677837_exon1	28798471	16	3855345	13.939	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_3937877_Lg16_01179_MAF20_1634068_exon4	65645377	16	3937877	15.799	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_4766937_Lg16_MDP0000616079_exon1	54775317	16	4766937	30.888	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_5601568_Lg16_SquamosaTF_MAF50_1632712_exon1	22730453	16	5601568	38.857	LG16	<lmxl>	{0-}	(l,l,m)
GDsnp01003	63757498	16	6056891	44.847	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_6742332_Lg2_01549_MAF30_553488_exon3	73608394	2	6742332	64.419	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_23903552_Lg1_RosCOS1602_MAF20_MDP00000235263_exon4	46781348	1	23903552	64.426	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_6755598_Lg2_01549_MAF30_842423_exon1	42804473	2	6755598	64.43	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_668296_Lg8_00175_MAF50_82344_exon1	32793454	8	668296	64.43	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_23899418_Lg1_RosCOS1602_MAF20_MDP0000283296_exon1	50677448	1	23899418	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_23907081_Lg1_RosCOS1602_MAF40_MDP00000265342_exon2	30755464	1	23907081	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_6725392_Lg2_01549_MAF20_1671501_exon1	52699420	2	6725392	64.433	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_AC_6731200_Lg2_01549_MAF20_MDP0000135135_exon12	12760462	2	6731200	64.433	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_13795873_Lg5_01505_MAF50_MDP0000210085_exon3	39716476	5	13795873	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_23851900_Lg5_MDP0000225209_MAF10_MDP00000225209_exon1	41724417	5	23851900	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_2362438_Lg6_RosCOS777_MAF20_450925_exon1	18764451	6	2562438	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_5459680_Lg11_01713_MAF50_MDP00000254457_exon1	34662352	11	5459680	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_22619889_Lg13_RosCOS1496_MAF10_MDP0000141219_exon2	29782302	13	22619889	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_9571523_Lg16_229389_MAF50_229389_exon3	33692502	16	9571523	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_9947521_Lg16_00879_MAF10_1648971_exon1	52724386	16	9947521	64.433	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_9988815_Lg16_00879_MAF30_1629147_exon1	66689447	16	9988815	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TG_16093732_Lg16_02783_MAF20_1625626_exon1	37716358	16	16093732	64.433	LG16	<lmxl>	{1-}	(l,l,m)
GDsnp02664	16668436	16	16184819	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AC_18500686_Lg16_134900_134900_exon3	62770497	16	18500686	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_AG_20224906_Lg16_00626_MAF40_514275_exon1	69628396	16	20224906	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_20428802_Lg16_01237_MAF50_1678971_exon1	23622470	16	20428802	64.433	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_15461670_Lg16_02207_MAF10_1624116_exon5	21608451	16	15461670	65.22	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_12835413_Lg16_02087_MAF30_349795_exon1	13719442	16	12835413	65.221	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_12854227_Lg16_02087_MAF10_450395_exon2	12747300	16	12854227	65.224	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_12306773_Lg16_01244_MAF20_1660747_exon1	10708474	16	12306773	66.012	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_12329007_Lg16_01244_MAF30_328549_exon1	24652431	16	12329007	66.012	LG16	<lmxl>	{1-}	(l,l,m)
GDsnp01244	36739416	16	12354528	66.012	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_TC_12362737_Lg16_01244_MAF40_MDP00000252150_exon5	14614454	16	12362737	66.012	LG16	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_9113098_Lg16_01730_MAF30_112027_exon1	11699312	16	9113098	66.798	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TC_14334614_Lg13_00943_MAF20_421678_exon2	69730341	13	14334614	67.629	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CA_7638675_Lg4_5050_5050_exon1	72688364	4	7638675	70.701	LG16	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_TG_71128_Lg17_00091_MAF40_1678954_exon1	26786495	17	71128	0	LG17	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_CT_1337720_Lg17_00864_MAF40_961431_exon1	72732506	17	1337720	3.081	LG17	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_GT_1114546_Lg17_01241_MAF10_MDP0000283052_exon2	60775356	17	1114546	3.172	LG17	<lmxl>	{0-}	(l,l,m)
RosBREEDSNP_SNP_CT_1120411_Lg17_01241_MAF30_1645198_exon1	69732421	17	1120411	3.172	LG17	<lmxl>	{1-}	(l,l,m)
RosBREEDSNP_SNP_GA_1159401_Lg17_01241_MAF30_362748_exon1	14766326	17	1159401	3.172	LG17	<lmxl>	{1-}	(l,l,m)

Continued next page

Supplementary Table 2. Continued.

Single nucleotide polymorphism name	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp01241	17	59701418	3.298	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_819070_Lg17_RosCOS659_MAF50_341005_exon1	17	74731401	3.478	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_AG_413069_Lg17_MDP00000441376_MDP00000441376_exon2	17	413069	3.505	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_2073815_Lg17_00290_MAF40_1664750_exon2	17	2073815	7.288	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_2716255_Lg17_00508_MAF20_MDP0000252195_exon11	17	2716255	10.263	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_2732314_Lg17_00508_MAF40_1664530_exon3	17	2732314	10.263	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_4152973_Lg17_RosCOS742_MAF50_MDP0000376617_exon1	17	4152973	18.913	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CA_4881457_Lg17_02703_MAF10_1675869_exon1	17	4881457	19.519	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_4893547_Lg17_02703_MAF50_763008_exon1	17	4893547	19.949	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_5757117_Lg17_00606_MAF20_462428_exon1	17	5757117	24.616	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_6635552_Lg17_01542_MAF20_468933_exon1	17	6635552	28.702	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_8234228_Lg17_RosCOS653_MAF10_1688197_exon3	17	8234228	31.774	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_CT_8844305_Lg17_01842_MAF20_MDP0000445291_exon1	17	8844305	32.625	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_8829961_Lg17_01842_MAF20_MDP00000891106_exon1	17	8829961	32.728	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_9375491_Lg17_01042_MAF20_406982_exon1	17	9375491	34.609	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_9381674_Lg17_01042_MAF30_36521_exon1	17	9381674	34.609	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_11956032_Lg17_01800_MAF20_413520_exon1	17	11956032	39.172	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_11958448_Lg17_01800_MAF30_98616_exon1	17	11958448	39.172	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_11993319_Lg17_01800_MAF10_948841_exon1	17	11993319	39.179	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_12031565_Lg17_00682_MAF20_1630270_exon2	17	12031565	39.179	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CA_12059188_Lg17_00682_MAF10_MDP0000137984_exon6	17	12059188	39.179	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_12621135_Lg17_01904_MAF30_MDP0000287687_exon2	17	12621135	40.053	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_12538126_Lg17_02172_MAF30_MDP0000219437_exon2	17	12538126	40.055	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_AG_12614663_Lg17_01904_MAF10_1685619_exon6	17	12614663	40.055	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TG_12623183_Lg17_01904_MAF20_MDP00000287687_exon1	17	12623183	40.055	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_CT_12943589_Lg17_151039_MAF10_151039_exon1	17	12943589	40.929	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_16469678_Lg17_01438_MAF20_1628243_exon3	17	16469678	42.694	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_22179385_Lg17_RosCOS2704_MAF20_MDP0000890639_exon1	17	22179385	42.694	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_GA_16484227_Lg17_01438_MAF30_MDP0000136549_exon5	17	16484227	42.706	LG17	<mxll>	{0-}	(ll,lm)
GDsnp00423	17	30794457	50.24	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_TC_22794175_Lg17_00798_MAF20_476896_exon1	17	22794175	53.018	LG17	<mxll>	{0-}	(ll,lm)
RosBREEDSNP_SNP_GA_23182572_Lg17_02534_MAF40_1660008_exon1	17	23182572	53.018	LG17	<mxll>	{1-}	(ll,lm)
RosBREEDSNP_SNP_TC_22747566_Lg17_00798_MAF40_884658_exon1	17	22747566	53.085	LG17	<mxll>	{0-}	(ll,lm)

Supplementary Table 3. Genetic map of apple rootstock B.9 developed with the RosBREED Infinium single nucleotide polymorphism (SNP) chip. SNP name, chip address, physical location [chromosome and position in base pairs (bp)] are according to Chagne et al. 2012. Mapped linkage group (LG), position in centi-Morgans (cM), segregation type, marker phase and classification are outputs from JoinMap 4.1 (Kyzama, Wageningen, The Netherlands) mapping software.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_31552040_Lg8_00246_MAF20_MDP0000230081_exon1	10760355	8	31552040	0	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31576918_Lg8_MDP0000659362_MAF30_MDP0000659362_exon1	61809415	8	31576918	0.742	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_18706948_Lg11_00212_MAF10_MDP0000204530_exon1	46655472	11	18706948	0.815	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_31133782_Lg8_01576_MAF20_1643087_exon2	20766331	8	31133782	4.259	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_11499061_Lg1_01815_MAF30_516837_exon4	70656449	1	11499061	4.3	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_12356741_Lg1_02334_MAF20_1681645_exon3	56707313	1	12356741	5.112	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_12194485_Lg1_00420_MAF40_1648508_exon1	28755309	1	12194485	5.178	LG01	<nnxp>	{-0}	(nn,np)
GDsnp02334	35625435	1	12355343	5.178	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_12382050_Lg1_02334_MAF40_MDP0000219571_exon3	58712463	1	12382050	6.039	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_13037789_Lg1_01494_MAF30_840712_exon1	45726328	1	13037789	7.734	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_13068176_Lg1_01494_MAF50_MDP0000298776_exon4	29637445	1	13068176	7.738	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_16626073_Lg1_02538_MAF50_MDP0000518676_exon1	29656500	1	16626073	14.124	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_16623809_Lg1_02538_MAF50_MDP0000163421_exon1	62613307	1	16623809	14.383	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_16653424_Lg1_02538_MAF40_MDP0000214470_exon2	64805395	1	16653424	16.316	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_17880738_Lg1_00440_MAF20_944294_exon1	14609436	1	17880738	20.184	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_17882923_Lg1_00440_MAF40_1646533_exon1	41617466	1	17882923	20.193	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_18831803_Lg1_02731_MAF30_MDP0000147688_exon19	40771309	1	18831803	26.547	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_18791535_Lg1_02731_MAF40_MDP0000186097_exon1	15744431	1	18791535	26.942	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_25721098_Lg1_00087_MAF10_755773_exon1	56657451	1	25721098	38.321	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_21289759_Lg1_02518_MAF20_1636950_exon6	24690385	1	21289759	41.439	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_21327009_Lg1_02518_MAF40_1678261_exon1	67646447	1	21327009	41.786	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_4050147_Lg15_snpEB134400_MAF20_667091_exon1	62733463	15	4050147	42.452	LG01	<nnxp>	{-0}	(nn,np)
GDsnp00107	58709489	1	16499097	51.152	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_26734911_Lg1_01228_MAF50_MDP0000236938_exon8	50699506	1	26734911	52.415	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_26763910_Lg1_01228_MAF40_855624_exon1	18623469	1	26763910	54.169	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_26743462_Lg1_01228_MAF20_477610_exon1	23600428	1	26743462	54.337	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_27108076_Lg1_01693_MAF30_172317_exon1	40632494	1	27108076	57.237	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_27095198_Lg1_01693_MAF30_332314_exon1	61628500	1	27095198	57.248	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_29158464_Lg1_10005_MAF40_519911_exon1	62765365	1	29158464	60.992	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_30217061_Lg1_CXE4_MAF40_MDP0000318149_exon1	38703490	1	30217061	62.788	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_31359569_Lg1_327822_327822_exon5	15650404	1	31359569	64.313	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31642444_Lg1_00583_MAF50_178942_exon1	24603461	1	31642444	64.313	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31657598_Lg1_00583_MAF40_422699_exon1	62737432	1	31657598	64.313	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31681861_Lg1_00583_MAF30_1623756_exon3	68676466	1	31681861	64.313	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31941783_Lg1_RosCOS2794_MAF10_1683106_exon1	15730397	1	31941783	64.313	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33699826_Lg1_01371_MAF10_MDP0000282836_exon15	27729457	1	33699826	64.313	LG01	<nnxp>	{-1}	(nn,np)
MdBFTh	74793304	1	31715446	64.323	LG01	<nnxp>	{-0}	(nn,np)
GDsnp01371	73769397	1	33685381	64.33	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30494924_Lg1_250444_250444_exon2	62689486	1	30494924	64.425	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_30590177_Lg1_136617_MAF30_136617_exon1	15719450	1	30590177	64.425	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_35422934_Lg1_02092_MAF20_7047_exon1	74729490	1	35422934	70.796	LG01	<nnxp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_35195077_Lg1_00495_MAF20_MDP0000302199_exon8	69714462	1	35195077	73.566	LG01	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_35197485_Lg1_00495_MAF10_1665417_exon1	53720472	1	35197485	73.566	LG01	<nnxp>	{-1}	(nn,np)
GDsnp00495	62800487	1	35210132	73.626	LG01	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1910740_Lg2_01735_MAF10_458777_exon1	15602314	2	1910740	-0.556	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_1926287_Lg2_01735_MAF50_1659427_exon1	43709480	2	1926287	0	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1958621_Lg2_AAT1_MAF20_1677156_exon1	72782319	2	1958621	0.161	LG02	<nnxp>	{-0}	(nn,np)
GDsnp01565	59791371	2	2436335	1.076	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_3303584_Lg2_RosCOS1998_MAF30_1632534_exon4	10790360	2	3303584	2.018	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_4012052_Lg2_01476_MAF30_143988_exon1	15673500	2	4012052	8.832	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_4085993_Lg2_01476_MAF10_MDP0000283614_exon4	28761398	2	4085993	8.832	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_10706980_Lg2_01223_MAF40_MDP000028614_exon11	59670326	2	10706980	27.628	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_11451663_Lg2_00159_MAF50_331702_exon1	22780311	2	11451663	35.829	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_11438433_Lg2_00159_MAF50_1633417_exon7	49804437	2	11438433	35.875	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_11509973_Lg2_01005_MAF30_504806_exon3	73644317	2	11509973	35.875	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_11512294_Lg2_01005_MAF50_791189_exon1	55700393	2	11512294	36.83	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_11777704_Lg2_00614_MAF40_1665749_exon5	60674473	2	11777704	37.711	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_11972340_Lg2_RosCOS2709_MAF40_889572_exon1	62774468	2	11972340	37.711	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_11998839_Lg2_RosCOS2709_MAF50_1680670_exon1	55707437	2	11998839	37.711	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_12926120_Lg2_01552_MAF50_683506_exon1	65764459	2	12926120	41.379	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_12942637_Lg2_01552_MAF50_MDP0000683486_exon1	67741392	2	12942637	41.379	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_12903929_Lg2_01552_MAF30_1660471_exon1	53644428	2	12903929	41.381	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13651288_Lg2_00214_MAF50_MDP0000131675_exon2	40758446	2	13651288	42.223	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13641108_Lg2_00214_MAF40_MDP0000281231_exon6	73671392	2	13641108	42.316	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_13673350_Lg2_00214_MAF30_MDP0000235958_exon9	54733370	2	13673350	43.181	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_13921344_Lg2_248148_248148_exon1	18687458	2	13921344	44.127	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_14500796_Lg2_00002_MAF50_1621685_exon5	61746331	2	14500796	46.083	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_14571102_Lg2_00987_MAF50_85433_exon1	26686453	2	14571102	46.119	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14478242_Lg2_00002_MAF40_MDP0000805105_exon1	38788390	2	14478242	46.142	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_14599407_Lg2_00987_MAF40_375341_exon1	11653475	2	14599407	46.375	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_15230080_Lg2_00222_MAF40_1630459_exon1	74748488	2	15230080	47.973	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_16177297_Lg2_01309_MAF50_330377_exon1	62661305	2	16177297	49.117	LG02	<nnxp>	{-0}	(nn,np)
GDsnp01309	50671434	2	16224102	51.066	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17179731_Lg2_327287_MAF30_327287_exon1	42773403	2	17179731	53.097	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18003967_Lg2_325713_MAF20_325713_exon3	68806421	2	18003967	54.663	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18004558_Lg2_72623_MAF40_72623_exon1	54801314	2	18004558	54.989	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18005006_Lg2_325713_MAF20_325713_exon1	26803394	2	18005006	54.989	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_18005035_Lg2_325713_MAF40_325713_exon1	14707497	2	18005035	55.32	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_18840569_Lg2_02651_MAF40_MDP0000799945_exon3	13620489	2	18840569	59.728	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_18746181_Lg2_02076_MAF20_MDP0000178428_exon1	18694438	2	18746181	59.744	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18882549_Lg2_02651_MAF50_MDP000053127_exon1	65738462	2	18882549	59.744	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18837099_Lg2_02651_MAF30_426760_exon2	57739455	2	18837099	59.75	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_18748787_Lg2_02076_MAF20_MDP0000274383_exon1	67693316	2	18748787	59.755	LG02	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_19239039_Lg2_00934_MAF30_1661651_exon1	11744469	2	19239039	60.669	LG02	<nnxp>	{-0}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00934	49609472	2	19288490	60.669	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_19320246_Lg2_00934_MAF40_MDP0000226838_exon3	53614419	2	19320246	60.669	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19323566_Lg2_00934_MAF40_MDP0000226838_exon8	73665352	2	19323566	60.669	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_19557571_Lg2_01840_MAF30_1661441_exon2	56785401	2	19557571	60.669	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19258873_Lg2_00934_MAF30_MDP0000306825_exon1	70769379	2	19258873	60.677	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_18979012_Lg2_MDP0000488361_MAF30_MDP0000488361_exon5	66668382	2	18979012	60.679	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23095096_Lg2_RosCOS292_MAF40_1643572_exon1	27738469	2	23095096	63.397	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_23091711_Lg2_RosCOS292_MAF50_1635004_exon3	42731359	2	23091711	63.408	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_24747820_Lg2_00833_MAF30_45322_exon1	64629302	2	24747820	64.347	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_25674246_Lg2_01935_MAF40_1688931_exon1	12745385	2	25674246	66.278	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27303643_Lg2_02271_MAF40_MDP0000305756_exon1	24738399	2	27303643	69.218	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_29828059_Lg2_MDP0000556302_MAF30_MDP0000556302_exon1	17607411	2	29828059	69.218	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_30846235_Lg2_263337_MAF20_263337_exon2	11756382	2	30846235	69.218	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_32171222_Lg2_00022_MAF40_980613_exon1	54720340	2	32171222	72.065	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32203002_Lg2_00022_MAF50_MDP0000225372_exon1	10781420	2	32203002	72.095	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_32854243_Lg2_MDP0000185319_MAF20_MDP0000185319_exon1	10606450	2	32854243	73.102	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32854273_Lg2_MDP0000185319_MAF20_MDP0000185319_exon1	20756349	2	32854273	73.102	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32974291_Lg2_02223_MAF30_283352_exon1	52677313	2	32974291	73.746	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_33290900_Lg2_00629_MAF50_534007_exon1	71697489	2	33290900	74.29	LG02	<nnxnp>	{-0}	(nn,np)
GDsnp01349	66754504	2	33913022	79.882	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_34194147_Lg2_RosCOS2050_MAF50_838967_exon2	64663399	2	34194147	79.882	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_35458744_Lg2_00267_MAF30_MDP0000279745_exon2	53797492	2	35458744	82.757	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_35487462_Lg2_00267_MAF50_MDP0000296536_exon3	72666424	2	35487462	82.757	LG02	<nnxnp>	{-0}	(nn,np)
GDsnp00624	44772491	2	34271311	83.727	LG02	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2465980_Lg3_RosCOS1398_MAF40_MDP0000299171_exon7	34619461	3	2465980	0	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17380823_Lg6_RosCOS414_MAF20_1680701_exon1	48696448	6	17380823	13.574	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_705112_Lg3_RosCOS2149_MAF30_1661159_exon2	60761415	3	705112	13.6	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_721363_Lg3_RosCOS2149_MAF30_887355_exon2	38622432	3	721363	13.6	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_17417078_Lg6_RosCOS414_MAF10_553681_exon1	51747331	6	17417078	13.6	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_1101058_Lg3_00866_MAF40_1635871_exon1	55774385	3	1101058	15.198	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1024417_Lg3_00506_MAF20_MDP0000302259_exon1	62732503	3	1024417	15.212	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1105743_Lg3_00866_MAF20_1662285_exon1	35764406	3	1105743	15.212	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1607374_Lg3_EH034548_MAF20_1638462_exon1	68695307	3	1607374	16.627	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_1625242_Lg3_EH034548_MAF20_1688644_exon1	11691463	3	1625242	16.848	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_1646354_Lg3_EH034548_MAF50_1686875_exon1	62786465	3	1646354	16.848	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1741931_Lg3_EBI40229_MAF40_MDP0000190972_exon3	54642347	3	1741931	16.848	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_3455475_Lg11_01167_MAF30_MDP0000377782_exon2	20808318	11	3455475	18.499	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_6181881_Lg3_00073_MAF10_1646857_exon1	54688371	3	6181881	28.186	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6539382_Lg3_01921_MAF30_1666387_exon1	47786364	3	6539382	31.128	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6578401_Lg3_01921_MAF30_1638332_exon1	71683390	3	6578401	31.158	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_6563127_Lg3_01921_MAF20_1676724_exon4	31736403	3	6563127	31.186	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7178316_Lg3_01493_MAF30_1666882_exon4	53800494	3	7178316	32.073	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_9987791_Lg9_02031_MAF20_1656683_exon2	55610327	9	9987791	32.073	LG03	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_CT_9091637_Lg3_RosCOS449_MAF40_1667685_exon1	54664344	3	9091637	39.907	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_10540206_Lg3_00194_MAF20_346466_exon1	41662497	3	10540206	48.103	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_27149833_Lg3_01487_MAF20_MDP0000289672_exon3	10754444	3	27149833	58.825	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_27212656_Lg3_01487_MAF30_45401_exon1	12732359	3	27212656	58.825	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_8416086_Lg1_00185_MAF30_MDP0000729342_exon1	60785337	11	8416086	72.095	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_29674295_Lg3_01969_MAF50_919825_exon1	257773478	3	29674295	74.879	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_29678862_Lg3_01969_MAF10_1631032_exon3	65744460	3	29678862	74.879	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29843361_Lg3_01604_MAF50_1651320_exon3	16645465	3	29843361	74.879	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29946084_Lg3_01937_MAF50_1629511_exon2	60650409	3	29946084	75.846	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_31143040_Lg3_01779_MAF50_MDP0000140211_exon2	11619426	3	31143040	77.639	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31543437_Lg3_MDP0000678562_MAF40_MDP0000678562_exon1	61611303	3	31543437	82.693	LG03	<nnxnp>	{-0}	(nn,np)
RosBREED_SNP_TC_32129472_Lg3	37790400	3	32129472	86.809	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_33321359_Lg3_01667_MAF10_MDP0000169320_exon2	36680466	3	33321359	92.037	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_33641386_Lg3_01014_MAF10_401159_exon1	48683498	3	33641386	93.93	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33676570_Lg3_01014_MAF50_1683154_exon2	53684434	3	33676570	95.304	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_33703347_Lg3_01014_MAF10_1641371_exon1	40713301	3	33703347	95.341	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_34431436_Lg3_02030_MAF20_MDP0000155220_exon12	70800403	3	34431436	95.341	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_36486314_Lg3_RosCOS1799_MAF40_MDP0000794885_exon4	39695437	3	36486314	99.2	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_37496618_Lg3_01822_MAF20_377044_exon1	58739307	3	37496618	105.748	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_37545191_Lg3_01822_MAF30_263823_exon1	70669309	3	37545191	105.748	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_38255070_Lg3_snpCN897901_MAF50_405974_exon1	69673343	3	38255070	106.612	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_38273471_Lg3_snpCN897901_MAF50_1683481_exon5	30718374	3	38273471	106.612	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_38265327_Lg3_snpCN897901_MAF20_146428_exon2	56607438	3	38265327	106.662	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_38459727_Lg3_00319_MAF40_MDP0000278460_exon11	12797464	3	38459727	107.487	LG03	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33128436_Lg14_00023_MAF20_MDP0000702770_exon1	20806335	14	33128436	108.367	LG03	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_16979476_Lg9_01648_MAF20_MDP0000195966_exon1	67714341	9	16979476	0	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_17000017_Lg9_01648_MAF20_MDP0000386963_exon1	43706397	9	17000017	0.042	LG04	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_15422057_Lg9_Hi01e10_MAF10_MDP0000131856_exon2	31708371	9	15422057	2.4	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_15369270_Lg9_Hi01e10_MAF20_393145_exon1	70729314	9	15369270	2.442	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_4864606_Lg17_02703_MAF10_MDP0000309549_exon1	73806419	17	4864606	2.442	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_3124108_Lg15_01814_MAF40_448082_exon3	69749500	15	3124108	3.28	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_3118408_Lg15_01814_MAF50_725445_exon2	65675469	15	3118408	3.295	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13239431_Lg15_230036_230036_exon3	38685426	15	13239431	3.302	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_13823700_Lg15_00863_MAF30_MDP0000242464_exon15	63664335	15	13823700	5.025	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_13853418_Lg15_00863_MAF40_1677104_exon1	58698478	15	13853418	5.035	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_9983148_Lg1_RosCOS404_MAF40_MDP0000950390_exon1	12723371	1	9983148	6.827	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_9980149_Lg1_RosCOS404_MAF40_MDP0000403248_exon1	55679486	1	9980149	6.851	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_9924715_Lg15_MDP0000157164_MAF30_MDP0000157164_exon4	31659432	15	9924715	19.92	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_9924291_Lg15_MDP0000157164_MAF10_MDP0000157164_exon2	60663372	15	9924291	20.042	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_9924033_Lg15_MDP0000157164_MAF20_MDP0000157164_exon1	74739463	15	9924033	20.128	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4578560_Lg4_00705_MAF20_MDP0000176523_exon9	73793494	4	4578560	24.187	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4580974_Lg4_00705_MAF10_MDP0000244070_exon1	52767465	4	4580974	24.258	LG04	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_4849635_Lg4_snpCO576145_MAF30_94178_exon1	29740323	4	4849635	25.292	LG04	<nnxnp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_13073783_Lg4_4744_MAF40_4744_exon1	12756306	4	13073783	36.087	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14563884_Lg4_01292_MAF30_409786_exon2	15601434	4	14563884	42.218	LG04	<nnxp>	{-0}	(nn,np)
GDsnp00928	55681505	4	14535903	42.24	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_16093765_Lg4_01777_MAF30_MDP0000320984_exon2	25682458	4	16093765	45.032	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_12695374_Lg3_02020_MAF40_MDP0000135469_exon1	45719435	3	12695374	45.039	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_29615350_Lg3_01969_MAF40_272742_exon2	13725357	3	29615350	45.041	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_16090074_Lg4_01777_MAF50_1682043_exon1	14626466	4	16090074	45.041	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_16168045_Lg4_00321_MAF20_344464_exon1	24774497	4	16168045	45.041	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_16719136_Lg4_64850_MAF30_64850_exon1	59799409	4	16719136	48.891	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_23204023_Lg13_RosCOS979_MAF40_MDP0000236905_exon6	31789500	13	23204023	56.423	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_19511608_Lg4_00881_MAF10_1628401_exon7	53703317	4	19511608	58.532	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_21150813_Lg4_01236_MAF10_1650238_exon2	69714475	4	21150813	69.48	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_20956520_Lg4_00686_MAF20_1664939_exon4	26724498	4	20956520	69.682	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21427720_Lg4_01558_MAF50_512626_exon1	27680344	4	21427720	71.81	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_21432277_Lg4_01558_MAF40_1628710_exon9	65634315	4	21432277	71.993	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_22760342_Lg4_02025_MAF20_MDP0000309706_exon3	67798306	4	22760342	72.734	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_23405259_Lg4_01567_MAF30_228756_exon1	62797501	4	23405259	74.577	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23832343_Lg4_00681_MAF50_1640858_exon5	40788432	4	23832343	79.732	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23730745_Lg4_00388_MAF30_290225_exon2	70736451	4	23730745	79.78	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_23735217_Lg4_00388_MAF30_MDP0000295593_exon8	56658442	4	23735217	79.78	LG04	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23895459_Lg4_00681_MAF30_493392_exon2	41710350	4	23895459	81.137	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_24174303_Lg4_00232_MAF50_MDP0000296655_exon2	62605304	4	24174303	83.079	LG04	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_477972_Lg5_MDP0000217438_MAF20_MDP0000217438_exon1	55793486	5	477972	0	LG05	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_551887_Lg5_00737_MAF20_MDP0000694976_exon1	73639452	5	551887	0	LG05	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_575860_Lg5_00737_MAF30_MDP0000493647_exon1	36632322	5	575860	0	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_981417_Lg5_01694_MAF50_1679637_exon2	61631451	5	981417	0	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1037516_Lg5_01694_MAF40_1659922_exon1	38746371	5	1037516	0	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_568363_Lg5_00737_MAF40_852041_exon1	27755433	5	568363	0.102	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_579407_Lg5_00737_MAF40_528780_exon1	14622485	5	579407	0.102	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1194802_Lg5_01956_MAF40_1630694_exon5	64711388	5	1194802	0.102	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_477752_Lg5_MDP0000217438_MAF10_MDP0000217438_exon2	42688339	5	477752	0.332	LG05	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1198941_Lg5_01956_MAF40_1644721_exon1	25766361	5	1198941	0.858	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_2446003_Lg5_00179_MAF50_MDP0000293843_exon2	31668505	5	2446003	3.716	LG05	<nnxp>	{-1}	(nn,np)
GDsnp01566	23781435	5	4180442	8.562	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_4173950_Lg5_01566_MAF50_823038_exon1	56715404	5	4173950	8.601	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_4345700_Lg5_01623_MAF50_1683824_exon3	41784470	5	4345700	10.583	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5218379_Lg5_00544_MAF50_MDP0000933747_exon2	63695498	5	5218379	13.514	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5246563_Lg5_00544_MAF20_497394_exon2	28809306	5	5246563	13.514	LG05	<nnxp>	{-1}	(nn,np)
GDsnp00544	20627434	5	5258785	13.78	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5391928_Lg5_01697_MAF40_932139_exon1	22723459	5	5391928	14.466	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5394062_Lg5_01697_MAF10_1624817_exon5	45771328	5	5394062	14.466	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5470612_Lg5_MDP0000282167_MAF40_MDP0000282167_exon4	19809455	5	5470612	14.466	LG05	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5471550_Lg5_MDP0000282167_MAF40_MDP0000282167_exon3	61789493	5	5471550	14.466	LG05	<nnxp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GC_5472549_Lg5_MDP0000282167_MDP0000282167_exon2	34743317	5	5472549	14.466	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5713160_Lg5_00264_MAF30_MDP0000257478_exon1	70667313	5	5713160	18.289	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6230318_Lg5_01333_MAF50_439245_exon1	43735386	5	6230318	19.25	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6789459_Lg5_00238_MAF40_MDP0000204819_exon5	28716443	5	6789459	21.177	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_6801757_Lg5_00238_MAF40_84995_exon1	24692397	5	6801757	21.177	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_7082370_Lg5_01151_MAF20_1658252_exon9	69600344	5	7082370	22.898	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_7085646_Lg5_01151_MAF30_1655896_exon1	56643454	5	7085646	22.925	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_7095813_Lg5_01151_MAF50_1629285_exon8	60720319	5	7095813	22.925	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7236236_Lg5_MDP0000322440_MAF40_MDP0000322440_exon1	20767334	5	7236236	23.654	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_8173286_Lg5_00189_MAF30_MDP0000231454_exon2	15752468	5	8173286	23.921	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8345524_Lg5_01208_MAF30_973835_exon1	32783300	5	8345524	24.859	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_8655302_Lg5_01942_MAF20_MDP0000264936_exon5	36644485	5	8655302	25.797	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8684631_Lg5_01942_MAF10_327965_exon12	10798347	5	8684631	25.797	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_14376292_Lg5_02834_MAF40_MDP0000184755_exon1	36727425	5	14376292	26.733	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_14412254_Lg5_02834_MAF50_983625_exon1	31775402	5	14412254	26.733	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_14438057_Lg5_229408_MAF50_229408_exon1	44779316	5	14438057	27.506	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_14520884_Lg5_151123_151123_exon1	20705472	5	14520884	27.674	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14520985_Lg5_151123_151123_exon1	69695405	5	14520985	27.674	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_14674287_Lg5_MDP0000553609_MAF40_MDP0000553609_exon3	65658491	5	14674287	28.614	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_14674789_Lg5_MDP0000553609_MAF50_MDP0000553609_exon3	28750390	5	14674789	28.614	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_13038857_Lg10_RosCOS724_MAF40_MDP0000688434_exon2	70651367	10	13038857	29.424	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_9503447_Lg5_01781_MAF20_1621382_exon9	11754394	5	9503447	29.443	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_9499250_Lg5_01781_MAF50_MDP0000532191_exon1	37726310	5	9499250	29.558	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_9507490_Lg5_01781_MAF30_381189_exon1	19778317	5	9507490	29.558	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_26152795_Lg14_00453_MAF20_1634125_exon1	32741375	14	26152795	29.586	LG05	<nnxnp>	{-1}	(nn,np)
GDsnp01651	29638459	5	10324465	30.379	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_10296435_Lg5_01651_MAF40_436577_exon1	72745429	5	10296435	30.401	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_11705984_Lg5_RosCOS544_MAF30_MDP0000186563_exon2	48660479	5	11705984	35.533	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11732907_Lg5_RosCOS544_MAF30_1666925_exon1	26663428	5	11732907	35.533	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11972840_Lg5_01319_MAF30_MDP0000280921_exon2	17609507	5	11972840	37.5	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_11965940_Lg5_01319_MAF40_1673368_exon2	25782406	5	11965940	37.574	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_24406956_Lg5_AT11_MAF40_1672725_exon1	27760361	5	24406956	40.676	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_14723486_Lg16_00356_MAF50_MDP0000317332_exon1	38631392	16	14723486	40.676	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_24403609_Lg5_AT11_MAF20_1620320_exon1	29803434	5	24403609	40.765	LG05	<nnxnp>	{-1}	(nn,np)
GDsnp00978	25724443	5	13662241	44.892	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_18043587_Lg5_MDP0000580952_MAF20_MDP0000580952_exon7	26671487	5	18043587	46.942	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18053412_Lg5_267073_MAF40_267073_exon1	14740309	5	18053412	47.95	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18232690_Lg5_MDP0000193167_MAF30_MDP0000193167_exon10	24751431	5	18232690	48.952	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18232808_Lg5_MDP0000193167_MAF20_MDP0000193167_exon10	27728483	5	18232808	48.952	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18579919_Lg5_00323_MAF30_MDP0000291499_exon1	65684302	5	18579919	50.891	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_18753255_Lg5_MDP0000309680_MAF20_MDP0000309680_exon1	66694402	5	18753255	50.891	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_18754379_Lg5_MDP0000309680_MAF30_MDP0000309680_exon1	72678323	5	18754379	50.891	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_19498219_Lg5_01478_MAF10_1647389_exon1	29619393	5	19498219	51.852	LG05	<nnxnp>	{-0}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_19550690_Lg5_01478_MAF20_382833_exon2	72807477	5	19550690	51.852	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_19577005_Lg5_01478_MAF50_1664633_exon1	32764471	5	19577005	51.852	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19699729_Lg5_00867_MAF40_1675010_exon4	28794432	5	19699729	51.852	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_19678308_Lg5_00867_MAF30_980776_exon1	62750375	5	19678308	51.854	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_20289532_Lg5_RosCOS452_MAF30_1659924_exon3	68772347	5	20289532	52.815	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_20340265_Lg5_RosCOS452_MAF30_1670309_exon4	72783384	5	20340265	52.815	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_11138850_Lg8_107520_MAF30_107520_exon1	611727389	8	11138850	58.789	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_11273420_Lg8_RosCOS936_MAF30_MDP0000781859_exon1	55727388	8	11273420	61.703	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11289162_Lg8_RosCOS936_MAF20_MDP0000165239_exon3	69722303	8	11289162	62.656	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_11293201_Lg8_RosCOS936_MAF40_MDP0000154963_exon1	62807453	8	11293201	62.656	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11298510_Lg8_RosCOS936_MAF20_950609_exon1	17760364	8	11298510	62.656	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_11338203_Lg8_RosCOS936_MAF50_MDP0000274626_exon5	39612332	8	11338203	62.686	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_11286204_Lg8_RosCOS936_MAF30_MDP0000165239_exon1	18782313	8	11286204	62.747	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_24545181_Lg5_01304_MAF30_MDP0000610390_exon1	50627445	5	24545181	63.642	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_15277675_Lg8_00354_MAF10_1648872_exon2	44794483	8	15277675	64.873	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_15274311_Lg8_00354_MAF30_148978_exon1	39745463	8	15274311	65.476	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_9717153_Lg8_RosCOS2185_MAF20_MDP0000405748_exon1	73694387	8	9717153	69.287	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25113506_Lg5_00373_MAF20_1648847_exon1	27773494	5	25113506	71.198	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_25120947_Lg5_00373_MAF40_25601_exon2	71720413	5	25120947	71.198	LG05	<nnxnp>	{-1}	(nn,np)
GDsnp00806	59675460	5	25126012	72.115	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25131275_Lg5_00373_MAF20_MDP0000570588_exon2	65652409	5	25131275	72.214	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_27677928_Lg5_01601_MAF30_1623480_exon4	47789405	5	27677928	76.098	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_648575_Lg3_RosCOS3033_MAF50_181891_exon1	53612337	3	648575	80.168	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_589883_Lg3_RosCOS3033_MAF30_MDP0000488007_exon1	12631417	3	589883	80.315	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_34513161_Lg5_RosCOS2737_MAF10_487971_exon3	23703446	5	34513161	83.135	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_37469684_Lg5_02674_MAF40_324963_exon1	28777487	5	37469684	105.044	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2471400_Lg5_00179_MAF30_MDP0000285776_exon9	52668344	5	2471400	105.123	LG05	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_36546287_Lg5_00100_MAF40_1662719_exon2	50717469	5	36546287	105.229	LG05	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_361822_Lg6_00347_MAF20_335316_exon2	69768340	6	361822	0	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_2553338_Lg6_RosCOS777_MAF40_MDP0000172990_exon2	71729336	6	2553338	6.717	LG06	<nnxnp>	{-1}	(nn,np)
GDsnp02819	69755492	6	3286599	11.416	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_3891842_Lg6_01747_MAF20_451241_exon1	41606475	6	3891842	11.507	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_4083944_Lg6_00181_MAF50_59957_exon1	31759459	6	4083944	13.221	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_4782504_Lg6_263940_exon2	60743447	6	4782504	16.874	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_4782545_Lg6_263940_MAF50_263940_exon2	40765416	6	4782545	16.874	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_5249377_Lg6_00082_MAF20_627308_exon1	42612309	6	5249377	18.709	LG06	<nnxnp>	{-0}	(nn,np)
GDsnp02779	45804464	6	16873174	23.807	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_9378475_Lg6_02258_MAF10_1637701_exon2	42794416	6	9378475	23.823	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_35521993_Lg10_RosCOS663_MAF40_1677514_exon1	45636439	10	35521993	24.683	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14219779_Lg15_00816_MAF10_482713_exon1	37779348	15	14219779	28.774	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_5404288_Lg7_324951_MAF30_324951_exon1	29779356	7	5404288	31.721	LG06	<nnxnp>	{-0}	(nn,np)
GDsnp00094	72717451	6	17589823	39.274	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_23449074_Lg6_01502_MAF20_1622876_exon1	21799473	6	23449074	49.552	LG06	<nnxnp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_16177861_Lg9_RosCOS3080_MAF20_1669257_exon1	52797456	9	16177861	51.791	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_25205225_Lg6_258116_MAF10_258116_exon1	25759449	6	25205225	63.096	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_26007783_Lg6_01682_MAF40_604254_exon1	17791475	6	26007783	69.856	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_25957598_Lg6_01682_MAF20_1661685_exon1	12726488	6	25957598	69.873	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_27451132_Lg6_RosCOS1040_MAF30_MDP0000311035_exon3	10649475	6	27451132	71.719	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_27779095_Lg6_RosCOS750_MAF20_945201_exon1	20785449	6	27779095	73.479	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27850051_Lg6_RosCOS750_MAF50_1672727_exon1	30691459	6	27850051	73.479	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_28848270_Lg6_01574_MAF30_333049_exon1	34685334	6	28848270	76.92	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_28855425_Lg6_01574_MAF50_483121_exon1	49773463	6	28855425	76.92	LG06	<nnxnp>	{-1}	(nn,np)
GDsnp01574	34721464	6	28872053	76.92	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_28988729_Lg6_165001_MAF20_165001_exon1	14796410	6	28988729	76.92	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_33272703_Lg14_01548_MAF10_1639540_exon5	49739469	14	33272703	76.92	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_30080885_Lg6_02138_MAF40_MDP0000151563_exon2	56793403	6	30080885	77.531	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30075128_Lg6_02138_MAF40_1659860_exon4	48690483	6	30075128	77.727	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_30104465_Lg6_02138_MAF30_820238_exon1	59634373	6	30104465	77.747	LG06	<nnxnp>	{-1}	(nn,np)
GDsnp02138	52797385	6	30105757	78.532	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_30154941_Lg6_02138_MAF30_1650126_exon2	53609382	6	30154941	78.532	LG06	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30289276_Lg6_MDP0000236390_MAF20_MDP0000236390_exon2	66654459	6	30289276	78.54	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30289681_Lg6_MDP0000236390_MAF30_MDP0000236390_exon1	26788421	6	30289681	78.551	LG06	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_823290_Lg7_01172_MAF40_1641721_exon6	29709314	7	823290	0	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1804847_Lg7_01433_MAF30_MDP0000650449_exon3	48746412	7	1804847	3.809	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_2164889_Lg7_01994_MAF20_587697_exon1	56782498	7	2164889	4.722	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2240795_Lg7_01946_MAF10_1661439_exon2	64664487	7	2240795	4.722	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_28113349_Lg1_108136_MAF50_108136_exon1	36756451	1	28113349	7.369	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_3810018_Lg7_187559_MAF50_187559_exon3	49743370	7	3810018	7.369	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3864649_Lg7_RosCOS418_MAF20_MDP0000281359_exon5	54691316	7	3864649	8.276	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4130061_Lg7_RosCOS3240_MAF30_1668323_exon2	28666500	7	4130061	8.276	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4391386_Lg7_01170_MAF40_138892_exon2	15807496	7	4391386	12.304	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_4381600_Lg7_01170_MAF30_MDP0000213321_exon1	59703410	7	4381600	12.331	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4407205_Lg7_01170_MAF10_1640275_exon1	69759321	7	4407205	13.234	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_5776221_Lg7_00658_MAF30_509047_exon1	70665385	7	5776221	17.672	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5770325_Lg7_00658_MAF20_MDP0000307551_exon1	58768361	7	5770325	17.769	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_7113399_Lg7_01872_MAF40_411592_exon2	47761418	7	7113399	22.195	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2303403_Lg16_00719_MAF30_1629301_exon14	67697415	16	2303403	22.224	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_2301322_Lg16_00719_MAF20_1655216_exon1	60719384	16	2301322	23.584	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_8004468_Lg7_02619_MAF40_MDP0000766223_exon2	52633499	7	8004468	24.342	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7988246_Lg7_02619_MAF40_257792_exon1	11653487	7	7988246	26.057	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_8520200_Lg7_01780_MAF30_525134_exon4	51692455	7	8520200	28.955	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8529100_Lg7_01780_MAF20_1643257_exon1	19769435	7	8529100	28.955	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_22953808_Lg7_RosCOS1514_MAF10_346982_exon3	50788320	7	22953808	38.654	LG07	<nnxnp>	{-1}	(nn,np)
GDsnp02600	27758481	7	21340719	38.871	LG07	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_22864266_Lg1_MdExp7_MAF50_1639944_exon2	28755310	1	22864266	57.221	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_22862141_Lg1_MdExp7_MAF30_1625535_exon1	41809300	1	22862141	57.451	LG07	<nnxnp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AC_2919674_Lg4_244093_244093_exon1	68603409	4	2919674	64.183	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_30446117_Lg1_00782_MAF10_679939_exon1	14611506	1	30446117	75.83	LG07	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_266256_Lg8_00301_MAF20_1674145_exon1	45763459	8	266256	0	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_GA_30021_Lg8	19759402	8	30021	0.614	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_25035111_Lg12_02228_MAF50_579916_exon1	62631420	12	25035111	1.501	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_718350_Lg8_01670_MAF10_1633492_exon1	21743341	8	718350	5.06	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_1323911_Lg8_00487_MAF40_1687140_exon1	74808382	8	1323911	7.844	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1316702_Lg8_00487_MAF30_MDP0000392194_exon1	43687430	8	1316702	8.032	LG08	<nnxnp>	{-0}	(nn,np)
GDsnp00419	25760437	8	1615449	10.623	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1632544_Lg8_00419_MAF40_MDP0000270476_exon5	17689432	8	1632544	10.623	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_29493560_Lg8_02575_MAF20_138927_exon2	24665430	8	29493560	15.284	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_5166014_Lg8_01378_MAF30_1645550_exon1	60710460	8	5166014	21.632	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_5173996_Lg8_01378_MAF40_526644_exon2	22803416	8	5173996	21.632	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8456044_Lg8_01550_MAF50_1659733_exon3	59634495	8	8456044	22.564	LG08	<nnxnp>	{-0}	(nn,np)
GDsnp00215	29705452	8	8059620	26.497	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_10562520_Lg8_snpC0066276_MAF50_MDP0000751527_exon3	33766446	8	10562520	32.622	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_16509379_Lg8_324685_MAF40_324685_exon1	63775459	8	16509379	50.859	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16577884_Lg8_02022_MAF40_1640897_exon5	43758381	8	16577884	51.488	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17364174_Lg8_01370_MAF20_MDP0000195444_exon17	64679310	8	17364174	52.327	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17392486_Lg8_01370_MAF30_1660200_exon1	44601342	8	17392486	52.344	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_17359704_Lg8_01370_MAF50_MDP0000284300_exon4	36626381	8	17359704	52.358	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_17401414_Lg8_01370_MAF40_MDP0000376895_exon1	68711411	8	17401414	52.358	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_18192194_Lg8_02689_MAF50_MDP0000284531_exon10	73612429	8	18192194	54.011	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_19609667_Lg8_00862_MAF30_268224_exon1	39794404	8	19609667	54.702	LG08	<nnxnp>	{-1}	(nn,np)
GDsnp01768	66612386	8	16617616	55.014	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_20065241_Lg8_00311_MAF20_1688636_exon2	69687427	8	20065241	55.811	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_20088635_Lg8_00311_MAF30_473110_exon1	28694318	8	20088635	55.811	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_21571716_Lg8_02685_MAF20_1664096_exon1	42806491	8	21571716	55.811	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_21581037_Lg8_02685_MAF30_MDP0000202383_exon1	57609374	8	21581037	55.811	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_15882944_Lg12_138007_138007_exon1	37700485	12	15882944	56.9	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_23228275_Lg8_00975_MAF40_17265_exon1	15703388	8	23228275	57.906	LG08	<nnxnp>	{-1}	(nn,np)
GDsnp01479	36809339	8	22565350	60.56	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22580590_Lg8_01479_MAF50_MDP0000308808_exon1	24767404	8	22580590	60.583	LG08	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_23754916_Lg8_00157_MAF20_157405_exon1	17648494	8	23754916	62.419	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_25196746_Lg8_01598_MAF50_526504_exon4	22736323	8	25196746	62.458	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_28263232_Lg8_00636_MAF20_1651668_exon1	32679466	8	28263232	67.309	LG08	<nnxnp>	{-0}	(nn,np)
GDsnp02575	15753379	8	29527318	84.306	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29562018_Lg8_02575_MAF40_1619664_exon3	72702392	8	29562018	84.306	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30403968_Lg8_00342_MAF30_1619977_exon6	53779306	8	30403968	88.315	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_30420390_Lg8_00342_MAF20_444762_exon1	11803450	8	30420390	88.315	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_31137343_Lg8_01576_MAF20_1645315_exon2	43738473	8	31137343	93.986	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31145617_Lg8_01576_MAF50_410454_exon1	13797501	8	31145617	93.986	LG08	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_498570_Lg9_01891_MAF20_1629474_exon4	15694474	9	498570	0	LG09	<nnxnp>	{-1}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_TC_1536173_Lg9_62719_exon1	47726486	9	1536173	2.597	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1502793_Lg9_01339_MAF40_1648141_exon3	64698309	9	1502793	2.972	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1273803_Lg9_02013_MAF20_MDP0000312439_exon4	72656326	9	1273803	3.004	LG09	<nnxnp>	{-1}	(nn,np)
GDsnp02134	32727389	9	2361381	7.726	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3818449_Lg9_01524_MAF50_MDP0000305191_exon1	57665365	9	3818449	12.383	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_31598641_Lg12_00641_MAF40_54410_exon1	36766355	12	31598641	12.383	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_4685551_Lg9_RosCOS3253_MAF30_MDP0000321404_exon7	57661330	9	4685551	16.086	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_4739364_Lg9_RosCOS3253_MAF40_MDP0000595471_exon1	65686375	9	4739364	16.289	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5399131_Lg9_00514_MAF30_1663095_exon2	58648464	9	5399131	18.02	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_5966501_Lg9_01603_MAF30_26840_exon1	10795444	9	5966501	20.862	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5969202_Lg9_01603_MAF20_583681_exon4	48774327	9	5969202	20.946	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_6024891_Lg9_01603_MAF40_1683715_exon1	39805425	9	6024891	22.833	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_7605137_Lg9_00893_MAF20_1636210_exon1	54624365	9	7605137	24.941	LG09	<nnxnp>	{-1}	(nn,np)
GDsnp00337	48731430	9	8277127	28.143	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp00947	58716444	9	11135949	44.677	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_14241533_Lg9_00958_MAF30_1654980_exon3	22673470	9	14241533	51.087	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_14350830_Lg9_02046_MAF20_MDP0000159004_exon2	49729362	9	14350830	51.087	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_18224270_Lg9_00109_MAF30_682493_exon1	38697402	9	18224270	53.995	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_34565017_Lg13_MDP0000128682_MAF30_MDP0000128682_exon1	45662305	13	34565017	56.182	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp02482	35751386	9	27881557	57.986	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp00467	49731405	9	29815380	58.028	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_35857597_Lg9_00860_MAF30_1682680_exon3	58664396	9	35857597	59.257	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp02437	58780453	9	29748531	59.846	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_25678674_Lg1_00087_MAF20_MDP0000397231_exon1	65708412	1	25678674	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_25688049_Lg1_00087_MAF30_1632262_exon1	70690474	1	25688049	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_25741771_Lg1_00087_MAF50_MDP0000240636_exon1	71689339	1	25741771	61.745	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_35144180_Lg2_86472_86472_exon2	31733358	2	35144180	61.745	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_21992669_Lg3_02644_MAF30_MDP0000450695_exon2	51806333	3	21992669	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_13612293_Lg5_00978_MAF30_MDP0000427354_exon3	28724483	5	13612293	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREED_SNP_GT_21216802_Lg9	18783442	9	21216802	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_21583930_Lg9_02230_MAF20_MDP0000233239_exon5	21782305	9	21583930	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_21614543_Lg9_02230_MAF30_MDP0000651477_exon1	53611467	9	21614543	61.745	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_24193344_Lg9_00053_MAF20_MDP0000253632_exon25	56769469	9	24193344	61.745	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp00053	16631483	9	24208807	61.745	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_25690200_Lg1_00087_MAF30_1632262_exon3	43669436	1	25690200	61.747	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_21570393_Lg9_02230_MAF30_1625063_exon9	54749381	9	21570393	61.747	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_24188449_Lg9_00053_MAF20_1629721_exon5	18611471	9	24188449	61.747	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_19974933_Lg9_02100_MAF20_449660_exon1	33760508	9	19974933	62.353	LG09	<nnxnp>	{-0}	(nn,np)
GDsnp02100	39746392	9	20013404	62.353	LG09	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_32862929_Lg13_02890_MAF10_MDP0000451570_exon4	66786410	13	32862929	62.919	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_33217975_Lg13_02487_MAF40_394887_exon1	35738497	13	33217975	62.919	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_19536792_Lg9_268341_MAF20_268341_exon1	29761455	9	19536792	62.929	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_33270813_Lg13_02487_MAF50_1618604_exon3	10735425	13	33270813	63.874	LG09	<nnxnp>	{-0}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00206	44656419	9	31733974	67.42	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_18277441_Lg9_00109_MAF20_MDP0000197208_exon10	70682405	9	18277441	84.541	LG09	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18564112_Lg5_00323_MAF50_307503_exon1	66686510	5	18564112	0	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2553386_Lg10_00839_MAF40_MDP0000424666_exon2	30617507	10	2553386	1.167	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_2479664_Lg10_01909_MAF40_257666_exon1	21648490	10	2479664	1.285	LG10	<nnxnp>	{-0}	(nn,np)
GDsnp01789	65601304	10	337598	1.739	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_30192525_Lg8_01764_MAF40_MDP0000209681_exon4	43744405	8	30192525	1.904	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1282648_Lg10_RosCOS2296_MAF30_MDP0000226508_exon1	25646486	10	1282648	2.077	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_2440066_Lg10_01909_MAF30_411914_exon1	62650373	10	2440066	2.402	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_867947_Lg10_00106_MAF40_546402_exon1	59612446	10	867947	2.77	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_377816_Lg10_01789_MAF50_MDP0000257837_exon3	24806330	10	377816	2.784	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4034839_Lg10_01810_MAF40_460310_exon1	16743384	10	4034839	9.437	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4041727_Lg10_01810_MAF50_1646123_exon1	51626502	10	4041727	9.437	LG10	<nnxnp>	{-0}	(nn,np)
GDsnp01810	41629413	10	4043640	9.691	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7118008_Lg10_02051_MAF10_MDP0000280646_exon1	59672300	10	7118008	20.888	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_10732590_Lg10_01867_MAF10_229384_exon1	18800359	10	10732590	28.317	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_12053580_Lg10_RosCOS2353_MAF20_1671141_exon4	13693337	10	12053580	32.109	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_12048247_Lg10_RosCOS2353_MAF20_1651936_exon1	58681429	10	12048247	32.162	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_11061321_Lg12_02115_MAF20_MDP0000257734_exon1	17733410	12	11061321	33.114	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_10300805_Lg12_02814_MAF40_MDP0000273159_exon4	41625460	12	10300805	34.373	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_13716782_Lg14_MDP0000567775_MAF50_MDP0000567775_exon5	72686508	14	13716782	35.63	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_28447378_Lg11_02800_MAF20_MDP0000568007_exon1	52676448	11	28447378	35.694	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21301195_Lg7_02600_MAF10_20543_exon1	60649408	7	21301195	35.701	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_25242473_Lg15_RosCOS588_MAF50_MDP0000306115_exon8	48651452	15	25242473	35.701	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_13746522_Lg10_snpEG631376_MAF50_MDP0000525059_exon1	40724502	10	13746522	36.554	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_13748677_Lg10_snpEG631376_MAF50_MDP0000525059_exon1	31797446	10	13748677	36.554	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_38151714_Lg2_MDP000020317_MAF10_MDP000020317_exon6	59636397	2	38151714	39.574	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_8557916_Lg10_00260_MAF50_1627495_exon2	37740396	10	8557916	41.88	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4983104_Lg17_145834_MAF50_145834_exon1	13609505	17	4983104	44.66	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_16680919_Lg10_01710_MAF30_MDP0000226923_exon1	65693375	10	16680919	47.387	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_16726719_Lg10_01710_MAF40_1666563_exon2	39686467	10	16726719	47.387	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_17036268_Lg10_02009_MAF30_1683116_exon1	31673482	10	17036268	47.387	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_17894779_Lg10_02252_MAF50_1673029_exon1	40788427	10	17894779	49.172	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_17914122_Lg10_02252_MAF40_1669028_exon6	48650336	10	17914122	49.172	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_18494279_Lg10_01832_MAF40_MDP0000545759_exon1	59783429	10	18494279	49.172	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_18478773_Lg10_01832_MAF20_873421_exon1	51624473	10	18478773	49.209	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_20058117_Lg10_00869_MAF40_1652486_exon1	71803459	10	20058117	56.416	LG10	<nnxnp>	{-0}	(nn,np)
GDsnp00869	71600347	10	20058217	56.416	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_20833228_Lg10_PG_MAF50_184244_exon1	55746491	10	20833228	56.416	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_3090142_Lg15_01814_MAF30_1651710_exon1	69775437	15	3090142	57.168	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22571534_Lg10_RosCOS139_MAF50_1647758_exon3	50624496	10	22571534	57.766	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_23617796_Lg10_AT9_MAF40_MDP0000253114_exon1	53759477	10	23617796	60.702	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_23963166_Lg10_RosCOS2910_MAF50_1675871_exon1	14790307	10	23963166	61.708	LG10	<nnxnp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_29048592_Lg10_01570_MAF50_1660917_exon1	18665440	10	29048592	69.068	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_30396941_Lg10_01299_MAF30_519689_exon1	59753469	10	30396941	85.344	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_31285569_Lg10_01961_MAF20_MDP0000130173_exon4	59609435	10	31285569	87.381	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31331375_Lg10_01961_MAF50_1619986_exon1	73692342	10	31331375	87.381	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_32378216_Lg10_RosCOS2362_MAF30_461155_exon1	36726429	10	32378216	94.199	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32391514_Lg10_RosCOS2362_MAF10_1619851_exon3	67608426	10	32391514	94.199	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_32402084_Lg10_RosCOS2362_MAF40_MDP0000383515_exon5	32679503	10	32402084	94.199	LG10	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27687938_Lg3_00607_MAF30_605396_exon1	61758382	3	27687938	101.543	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_27691074_Lg3_00607_MAF50_380398_exon1	118000342	3	27691074	101.543	LG10	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_495547_Lg11_01480_MAF30_435739_exon1	60797472	11	495547	0	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_30952644_Lg15_RosCOS444_MAF50_1641741_exon4	34615465	15	30952644	0	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_30956956_Lg15_RosCOS444_MAF40_1621872_exon1	34642509	15	30956956	0	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_26943295_Lg14_02079_MAF50_160202_exon1	74731379	14	26943295	1.719	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_5944780_Lg11_MDP0000163230_MAF20_MDP0000163230_exon1	28767415	11	5944780	8.512	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_6534066_Lg11_00621_MAF50_860447_exon1	44779301	11	6534066	9.389	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_6688015_Lg11_01788_MAF40_61995_exon7	45737368	11	6688015	9.389	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_716431_Lg3_RosCOS2149_MAF20_1637331_exon3	38793337	3	716431	12.768	LG11	<nnxnp>	{-0}	(nn,np)
GDsnp00735	21782332	11	8720693	17.367	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_11309307_Lg11_00377_MAF20_1662030_exon1	63671413	11	11309307	43.679	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_12352575_Lg11_00441_MAF30_1646884_exon1	46763457	11	12352575	48.459	LG11	<nnxnp>	{-1}	(nn,np)
GDsnp02465	52684488	11	12947663	51.429	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_14850427_Lg11_RosCOS224_MAF40_MDP0000195336_exon3	50679452	11	14850427	55.276	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_13746528_Lg11_RosCOS2909_MAF50_1658545_exon1	16789314	11	13746528	58.47	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_23268845_Lg5_RosCOS1210_MAF30_885821_exon1	69669349	5	23268845	60.693	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_16621686_Lg7_MDP0000882156_MAF20_MDP0000882156_exon3	39716508	7	16621686	61.616	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_29128375_Lg2_226032_226032_exon2	16736313	2	29128375	64.269	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_24562661_Lg11_02407_MAF30_913956_exon1	23769490	11	24562661	64.269	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_26942761_Lg11_4114_MAF40_4114_exon1	31779441	11	26942761	71.599	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26829691_Lg11_01361_MAF50_1663355_exon1	51630446	11	26829691	71.671	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29832087_Lg11_00662_MAF30_1642163_exon1	60637483	11	29832087	76.068	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_30610341_Lg11_02838_MAF10_MDP0000127896_exon3	63630427	11	30610341	77.756	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30066535_Lg11_02351_MAF50_1627361_exon3	64632324	11	30066535	77.955	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_22007324_Lg4_01965_MAF50_636863_exon1	70710472	4	22007324	77.963	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_38347479_Lg11_224792_MAF30_224792_exon1	45614485	11	38347479	103.686	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_38694306_Lg11_01465_MAF40_MDP0000164488_exon2	37697455	11	38694306	104.591	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_38732054_Lg11_01465_MAF30_1632780_exon2	66654388	11	38732054	104.591	LG11	<nnxnp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_39149329_Lg11_00646_MAF30_257012_exon2	48748427	11	39149329	105.476	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_21208413_Lg12_RosCOS1969_MAF40_682553_exon1	74755346	12	21208413	105.476	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39190659_Lg11_00646_MAF40_1634484_exon1	70622464	11	39190659	106.353	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39914254_Lg11_237065_MAF50_237065_exon1	45600401	11	39914254	109.797	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_39914390_Lg11_237065_MAF50_237065_exon1	65765331	11	39914390	109.797	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_40016890_Lg11_00182_MAF50_MDP0000370712_exon1	43725444	11	40016890	109.797	LG11	<nnxnp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_40045235_Lg11_00182_MAF50_512766_exon1	73636338	11	40045235	109.797	LG11	<nnxnp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_40056015_Lg11_00182_MAF20_MDP00000151539_exon1	32804449	11	40056015	109.797	LG11	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_39998759_Lg11_00182_MAF20_MDP00000440570_exon2	19745427	11	39998759	109.817	LG11	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_494465_Lg12_00173_MAF20_1666098_exon1	54681350	12	494465	0	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1211722_Lg12_RosCOS3293_MAF20_1680883_exon1	73680469	12	1211722	0.928	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1803604_Lg12_00116_MAF30_1640687_exon8	35617491	12	1803604	3.594	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1801327_Lg12_00116_MAF10_514173_exon1	11801455	12	1801327	3.629	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1834083_Lg12_00116_MAF10_1653707_exon3	55781452	12	1834083	3.629	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_2341962_Lg12_262602_MAF40_262602_exon1	52622345	12	2341962	5.38	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_10438643_Lg1_RosCOS3195_MAF50_MDP00000253600_exon1	50649481	1	10438643	5.438	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_10476695_Lg1_RosCOS3195_MAF10_1682584_exon7	26701417	1	10476695	5.438	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2343296_Lg12_262602_262602_exon2	47780324	12	2343296	5.438	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_2024247_Lg2_AAT1_MAF50_1670831_exon1	54801382	2	2024247	6.498	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_2970938_Lg12_RosCOS1934_MAF30_1681178_exon3	16771445	12	2970938	7.292	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_2978136_Lg12_01615_MAF40_714673_exon1	62766395	12	2978136	7.292	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_4304933_Lg12_01690_MAF30_MDP00000294146_exon4	43653445	12	4304933	13.073	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3784455_Lg12_00430_MAF10_264279_exon1	72743471	12	3784455	13.093	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_4336568_Lg12_01690_MAF20_1687172_exon3	31764390	12	4336568	13.093	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_5173229_Lg12_MDP00000221924_MAF30_MDP00000221924_exon2	14730379	12	5173229	17.187	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_7044670_Lg12_159023_MAF40_159023_exon1	16796378	12	7044670	20.221	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_8805420_Lg12_02857_MAF30_MDP00000305826_exon16	65801457	12	8805420	24.162	LG12	<nnxp>	{-0}	(nn,np)
GDsnp02857	18788473	12	8845002	24.167	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6959369_Lg15_snpDT001928_MAF40_MDP0000184571_exon3	21727406	15	6959369	24.167	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_9308316_Lg12_02053_MAF10_626028_exon1	51732488	12	9308316	24.188	LG12	<nnxp>	{-0}	(nn,np)
GDsnp02053	45775416	12	9294227	25.024	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_9274031_Lg12_02053_MAF20_1662678_exon5	31771369	12	9274031	25.148	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14746316_Lg12_00318_MAF20_22577_exon1	69703314	12	14746316	26.796	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_15159267_Lg12_MDP0000134241_MAF20_MDP00000134241_exon2	54709394	12	15159267	26.975	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16317377_Lg12_01501_MAF20_MDP00000263613_exon3	59745466	12	16317377	27.068	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_17350965_Lg12_01607_MAF10_425520_exon1	35779509	12	17350965	27.068	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_19247345_Lg12_01555_MAF40_480653_exon1	23775457	12	19247345	27.068	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_21248954_Lg12_RosCOS1969_MAF20_1627732_exon7	14708477	12	21248954	30.982	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_21322878_Lg12_01426_MAF40_MDP00000636042_exon2	40807487	12	21322878	32.957	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_21387181_Lg12_01426_MAF40_1680072_exon2	71674335	12	21387181	33.941	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_22652840_Lg12_01150_MAF40_713737_exon1	33659454	12	22652840	35.91	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_2722118_Lg12_01150_MAF20_MDP00000282387_exon3	52781388	12	2722118	35.91	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_23280662_Lg12_155506_155506_exon1	56702313	12	23280662	36.855	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_23385635_Lg12_RosCOS3647_MAF20_MDP0000138764_exon2	48797393	12	23385635	36.855	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_23387995_Lg12_RosCOS3647_MAF40_600732_exon1	31706441	12	23387995	36.855	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_27155494_Lg12_00883_MAF20_1680192_exon2	29620405	12	27155494	37.785	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_6907918_Lg17_01927_MAF30_MDP00000453369_exon1	57662316	17	6907918	37.785	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_29040874_Lg12_00334_MAF20_1639988_exon1	23728499	12	29040874	40.715	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_29116035_Lg12_00334_MAF50_402210_exon2	71751357	12	29116035	40.864	LG12	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_30657538_Lg12_00714_MAF20_MDP00000300196_exon1	32606434	12	30657538	44.744	LG12	<nnxp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_30679125_Lg12_00714_MAF30_1620539_exon3	59658400	12	30679125	44.952	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_30691702_Lg12_00714_MAF40_8855_exon1	17694436	12	30691702	45.807	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_32114913_Lg12_00762_MAF10_1662400_exon1	52675347	12	32114913	49.728	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_32146694_Lg12_00762_MAF40_MDP0000197092_exon1	36677451	12	32146694	49.728	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_32494035_Lg12_00362_MAF50_MDP0000200340_exon2	24745326	12	32494035	54.182	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_32467148_Lg12_00362_MAF30_MDP0000200335_exon11	23778371	12	32467148	54.54	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_32469819_Lg12_00362_MAF40_45140_exon1	52624328	12	32469819	54.54	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_32489536_Lg12_00362_MAF40_151627_exon1	22605329	12	32489536	54.54	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_33117888_Lg12_135549_MAF20_135549_exon1	57651336	12	33117888	56.448	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_33383602_Lg12_02848_MAF30_MDP0000230470_exon1	13764458	12	33383602	56.448	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_33687206_Lg12_02008_MAF40_287310_exon1	68713329	12	33687206	58.4	LG12	<nnxp>	{-0}	(nn,np)
GDsnp01874	41742468	12	34848760	66.341	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_34947963_Lg12_01647_MAF40_517970_exon1	39672451	12	34947963	68.332	LG12	<nnxp>	{-0}	(nn,np)
GDsnp01665	19747379	12	35132678	69.237	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_35393262_Lg12_01793_MAF40_MDP0000288367_exon4	31765477	12	35393262	71.008	LG12	<nnxp>	{-0}	(nn,np)
GDsnp01793	69781460	12	35425746	71.083	LG12	<nnxp>	{-0}	(nn,np)
GDsnp00915	16765349	12	31093576	72.895	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_35649702_Lg12_01855_MAF40_530326_exon1	63788462	12	35649702	72.895	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_35721635_Lg12_00338_MAF30_987792_exon1	67620332	12	35721635	72.895	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_35724634_Lg12_00338_MAF40_1672836_exon2	42710441	12	35724634	72.895	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_35906824_Lg12_325708_MAF30_325708_exon1	30728409	12	35906824	73.811	LG12	<nnxp>	{-0}	(nn,np)
MdFT1	34781417	12	36130288	74.659	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_30699442_Lg12_00714_MAF10_1655952_exon3	21777356	12	30699442	86.883	LG12	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_31223042_Lg12_01759_MAF30_1659775_exon1	57623376	12	31223042	88.184	LG12	<nnxp>	{-0}	(nn,np)
GDsnp00368	73792318	13	366899	0	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_602461_Lg13_01579_MAF40_1652644_exon1	57681382	13	602461	0	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_880764_Lg13_02018_MAF10_489361_exon1	36768502	13	880764	2.665	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1140009_Lg13_00279_MAF50_933324_exon1	59724484	13	1140009	4.546	LG13	<nnxp>	{-0}	(nn,np)
GDsnp01579	66687420	13	646325	5.461	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_2194655_Lg13_00098_MAF30_MDP0000188704_exon3	17702377	13	2194655	7.297	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_2811025_Lg13_00195_MAF40_657508_exon1	61784448	13	2811025	11.134	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_2852846_Lg13_00195_MAF30_407880_exon1	26673498	13	2852846	12.124	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_3796261_Lg13_00980_MAF20_1672084_exon1	58781302	13	3796261	15.986	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_3850600_Lg13_00565_MAF30_1674510_exon2	74733435	13	3850600	15.986	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_4574491_Lg13_RosCOS841_MAF20_1660629_exon1	13727408	13	4574491	17.912	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_4952306_Lg13_02336_MAF40_1656834_exon1	74658304	13	4952306	18.88	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_4938074_Lg13_02336_MAF10_MDP0000739574_exon1	67604448	13	4938074	19.973	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_5654946_Lg13_RosCOS1918_MAF30_MDP0000190335_exon1	32789379	13	5654946	23.329	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_7608807_Lg13_02124_MAF40_1660721_exon2	15792401	13	7608807	29.551	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_8641735_Lg13_RosCOS2067_MAF40_764854_exon1	52654454	13	8641735	34.515	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8644507_Lg13_RosCOS2067_MAF50_680433_exon1	35706489	13	8644507	34.515	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_8622383_Lg13_RosCOS2067_MAF30_1632184_exon1	46728337	13	8622383	34.527	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_10651693_Lg13_00140_MAF40_MDP0000692529_exon1	52738434	13	10651693	36.448	LG13	<nnxp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
GDsnp00140	62631496	13	10683506	36.497	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_10705345_Lg13_00140_MAF50_171969_exon1	58769488	13	10705345	37.371	LG13	<nnxp>	{-0}	(nn,np)
GDsnp01776	59734476	13	14420871	41.268	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_14428980_Lg13_01776_MAF40_MDP00000313626_exon1	32771466	13	14428980	41.268	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_16737064_Lg13_00890_MAF40_MDP00000715848_exon1	24796510	13	16737064	48.628	LG13	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_20366909_Lg13_02063_MAF40_244507_exon2	10712330	13	20366909	54.848	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_21429305_Lg13_119422_MAF20_119422_exon1	58683414	13	21429305	56.143	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_21716536_Lg13_02069_MAF40_MDP00000262190_exon1	48670461	13	21716536	57.004	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_38238865_Lg13_27726_27726_exon1	36720436	13	38238865	66.123	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23469119_Lg2_RosCOS2680_MAF30_137329_exon2	66638343	2	23469119	67.545	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_23515102_Lg2_02155_MAF20_696941_exon3	14756344	2	23515102	67.545	LG13	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2138918_Lg14_01846_MAF30_506172_exon1	65788481	14	2138918	0	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_2130966_Lg14_01846_MAF10_1638997_exon2	72789407	14	2130966	0.508	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_735528_Lg14_01902_MAF50_1631360_exon1	31661435	14	735528	20.819	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_3598110_Lg14_01767_MAF20_1678273_exon2	53736509	14	3598110	25.691	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_6130026_Lg14_02706_MAF30_1663732_exon1	34725416	14	6130026	29.428	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_6135950_Lg14_02706_MAF30_MDP00000320229_exon1	32675421	14	6135950	29.448	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_6394163_Lg14_01401_MAF50_MDP00000302540_exon2	12668401	14	6394163	29.448	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_9382541_Lg6_02258_MAF10_MDP00000474161_exon2	14702478	6	9382541	32.862	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_12453621_Lg14_02638_MAF40_MDP00000311542_exon1	63642436	14	12453621	37.08	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_12456572_Lg14_02638_MAF40_MDP00000311542_exon2	45770510	14	12456572	37.106	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_22379821_Lg14_CH03g04_MAF10_134656_exon1	32690445	14	22379821	39.89	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23448287_Lg14_00062_MAF20_1683927_exon1	56777354	14	23448287	44.33	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_23439790_Lg14_02039_MAF10_253599_exon1	44668502	14	23439790	44.494	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_24046950_Lg14_01531_MAF20_1658676_exon2	60768377	14	24046950	47.071	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_23859882_Lg14_327428_MAF20_327428_exon1	29792478	14	23859882	47.294	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_26895027_Lg14_02079_MAF10_MDP00000268960_exon1	10800475	14	26895027	54.069	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_27509563_Lg14_01213_MAF20_1639558_exon3	29741324	14	27509563	59.195	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_29465265_Lg14_01811_MAF50_1664953_exon1	27776508	14	29465265	70.617	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_29619098_Lg14_00171_MAF30_1677423_exon1	35731378	14	29619098	71.567	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_31688397_Lg14_00213_MAF50_1643105_exon3	37750482	14	31688397	85.406	LG14	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_33279650_Lg14_01548_MAF20_972972_exon1	69677316	14	33279650	97.382	LG14	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_1511146_Lg15_00717_MAF30_MDP00000252438_exon1	72715397	15	1511146	0	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1857875_Lg15_RosCOS2766_MAF50_1661741_exon1	38806342	15	1857875	0.307	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_3046222_Lg15_01814_MAF20_480291_exon1	72800316	15	3046222	7.319	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_33384748_Lg3_MDP00000126553_MAF20_MDP00000126553_exon18	69630328	3	33384748	8.243	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_4037337_Lg15_snpEB134400_MAF40_134949_exon6	22807446	15	4037337	9.563	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3870711_Lg15_01827_MAF20_1637811_exon3	52738350	15	3870711	10.064	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_3558718_Lg15_01047_MAF40_674936_exon1	72732499	15	3558718	10.19	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_3556145_Lg15_01047_MAF20_1684295_exon6	38676508	15	3556145	10.219	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_4212845_Lg15_00330_MAF10_151886_exon1	39748311	15	4212845	12.027	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_4941303_Lg15_RosCOS2117_MAF20_MDP00000782534_exon10	59771426	15	4941303	13.89	LG15	<nnxp>	{-1}	(nn,np)
GDsnp01185	69786406	15	5725967	17.749	LG15	<nnxp>	{-0}	(nn,np)

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Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_5727221_Lg15_01185_MAF30_1632908_exon1	39645311	15	5727221	18.725	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_5944490_Lg15_CXE2_MAF50_226553_exon1	52731309	15	5944490	19.709	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_5767560_Lg15_01185_MAF20_MDP0000205199_exon3	60649345	15	5767560	20.015	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_5972769_Lg15_CXE2_MAF40_MDP0000280145_exon2	49772396	15	5972769	21.036	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AC_6548475_Lg15_00076_MAF40_1672512_exon1	47635494	15	6548475	26.395	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_6893289_Lg15_snpDT001928_MAF30_1622091_exon1	46798438	15	6893289	27.206	LG15	<nnxp>	{-1}	(nn,np)
GDsnp00076	48602466	15	6584581	27.476	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_7273686_Lg15_00274_MAF20_876795_exon1	32747441	15	7273686	29.344	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_7254175_Lg15_00274_MAF40_1678650_exon1	50696496	15	7254175	29.594	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_7749743_Lg15_01488_MAF50_1645527_exon3	12634500	15	7749743	31.455	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_8229724_Lg15_00796_MAF50_614785_exon1	59765365	15	8229724	34.414	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_8718910_Lg15_00396_MAF20_MDP0000290709_exon1	41672480	15	8718910	36.404	LG15	<nnxp>	{-1}	(nn,np)
GDsnp00894	11661498	15	8967412	40.333	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_9838626_Lg15_01989_MAF50_MDP00000157854_exon1	73711499	15	9838626	41.261	LG15	<nnxp>	{-1}	(nn,np)
GDsnp00543	46795499	15	10405669	41.261	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_12099465_Lg15_166295_MAF20_166295_exon4	56624377	15	12099465	44.118	LG15	<nnxp>	{-1}	(nn,np)
GDsnp00397	15639445	15	12189325	44.144	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_15046874_Lg15_02003_MAF50_369521_exon2	44668403	15	15046874	52.429	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_15075316_Lg15_02003_MAF10_1620656_exon6	57749409	15	15075316	54.583	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_17586388_Lg15_RosCOS2945_MAF50_1674931_exon1	33686476	15	17586388	60.351	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_17219891_Lg15_MDP0000876321_MAF40_MDP0000876321_exon9	59704461	15	17219891	62.255	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_20348625_Lg15_02080_MAF10_MDP0000571121_exon1	55649425	15	20348625	81.612	LG15	<nnxp>	{-0}	(nn,np)
GDsnp02080	69763498	15	20378055	81.689	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_21320047_Lg15_MDP0000677258_MAF50_MDP0000677258_exon1	38577347	15	21320047	84.389	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TG_15165069_Lg1_MDP0000171153_MAF40_MDP0000171153_exon2	52618434	1	15165069	84.422	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21317002_Lg15_MDP0000677258_MDP0000677258_exon4	53787441	15	21317002	84.422	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_22117026_Lg15_01813_MAF50_MDP0000270324_exon3	13780484	15	22117026	86.134	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_22112531_Lg15_01813_MAF50_MDP0000313840_exon1	69701439	15	22112531	86.253	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_23523902_Lg15_00038_MAF10_524070_exon1	47685477	15	23523902	87.515	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_26289434_Lg15_01850_MAF20_479535_exon1	34670394	15	26289434	90.663	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_27052178_Lg15_02084_MAF50_MDP0000276022_exon5	65631441	15	27052178	90.663	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_27079169_Lg15_02084_MAF50_193810_exon2	11688310	15	27079169	90.663	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_33322460_Lg1_01951_MAF10_1639343_exon1	31738486	1	33322460	97.349	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8839952_Lg9_00400_MAF50_MDP0000498282_exon1	55785460	9	8839952	97.494	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_29926704_Lg15_RosCOS1232_MAF50_MDP0000283141_exon1	22731483	15	29926704	98.34	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_33663997_Lg15_01897_MAF20_1618900_exon1	58719487	15	33663997	105.687	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7544343_Lg14_RosCOS621_MAF40_MDP0000320239_exon3	147600393	14	7544343	110.402	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_41031897_Lg15_00357_MAF30_265938_exon1	18802336	15	41031897	110.402	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_44674746_Lg15_01805_MAF50_MDP0000262289_exon13	26661433	15	44674746	116.607	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_44703827_Lg15_01805_MAF40_MDP0000418839_exon1	56800358	15	44703827	116.607	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_45058256_Lg15_ACS_MAF50_MDP0000318443_exon5	55636371	15	45058256	116.607	LG15	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_44666551_Lg15_01805_MAF20_MDP0000771563_exon1	69701355	15	44666551	116.647	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_49929629_Lg15_00525_MAF20_MDP0000284330_exon1	59787344	15	49929629	125.99	LG15	<nnxp>	{-0}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_AG_51295332_Lg15_00236_MAF20_MDP0000216269_exon2	52782311	15	51295332	126.726	LG15	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_7417624_Lg16_RosCOS1166_MAF30_1632728_exon1	70805327	16	7417624	0	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1225178_Lg16_01588_MAF30_278806_exon1	60667309	16	1225178	6.084	LG16	<nnxp>	{-1}	(nn,np)
GDsnp01588	37801390	16	1220909	6.085	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CA_1187517_Lg16_01588_MAF10_545103_exon1	43647445	16	1187517	6.097	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1210107_Lg16_01588_MAF10_521001_exon1	38778454	16	1210107	6.097	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_1216243_Lg16_01588_MAF20_468133_exon1	53600314	16	1216243	6.097	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_1301926_Lg16_01600_MAF50_1683802_exon2	73698348	16	1301926	6.097	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AC_1452699_Lg16_MDP0000303483_MAF50_MDP0000303483_exon2	22787316	16	1452699	6.097	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_1540624_Lg16_LAR1_MAF40_1618769_exon2	49634505	16	1540624	7.78	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_1578941_Lg16_01734_MAF20_90585_exon1	60643336	16	1578941	8.613	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_1614876_Lg16_01734_MAF40_975544_exon1	36804366	16	1614876	8.613	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_1617869_Lg16_01734_MAF20_248174_exon1	68620459	16	1617869	8.613	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_1669091_Lg16_01734_MAF50_193795_exon1	37694428	16	1669091	9.465	LG16	<nnxp>	{-1}	(nn,np)
RosBREED_SNP_TC_3297840_Lg16	53748353	16	3297840	18.257	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3299822_Lg16_MDP0000423596_MAF40_MDP0000423596_exon3	38736453	16	3299822	18.965	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_6054018_Lg16_01003_MAF30_1630610_exon2	167772328	16	6054018	32.573	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CA_17569426_Lg13_00390_MAF20_59089_exon1	51707465	13	17569426	48.899	LG16	<nnxp>	{-1}	(nn,np)
RosBREED_SNP_AG_12002621_Lg16	64669364	16	12002621	54.194	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_8363529_Lg16_RosCOS1090_MAF30_1630062_exon2	54612489	16	8363529	54.347	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14189280_Lg13_MDP0000180408_MAF30_MDP0000180408_exon3	71797364	13	14189280	54.379	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_14191222_Lg13_MDP0000180408_MAF30_MDP0000180408_exon7	10664497	13	14191222	54.379	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_14143772_Lg16_01624_MAF20_910261_exon1	22686417	16	14143772	60.329	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_15458275_Lg16_02207_MAF10_1629914_exon1	52600320	16	15458275	65.174	LG16	<nnxp>	{-0}	(nn,np)
GDsnp02207	16759315	16	15443593	75.192	LG16	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_20469396_Lg16_01237_MAF10_431506_exon2	74702465	16	20469396	76.122	LG16	<nnxp>	{-0}	(nn,np)
Pear_Bartlett_SNP_AG_162_5088916	5095848	16	162	79.89	LG16	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_363262_Lg17_01974_MAF30_1638015_exon9	59656415	17	363262	0	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_312936_Lg17_01974_MAF20_216975_exon1	60744330	17	312936	0.004	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_49174_Lg17_00091_MAF20_1640662_exon1	32680402	17	49174	0.043	LG17	<nnxp>	{-0}	(nn,np)
GDsnp00091	62623395	17	50303	0.043	LG17	<nnxp>	{-1}	(nn,np)
GDsnp01974	24779447	17	338336	0.043	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_357921_Lg17_01974_MAF40_MDP0000156410_exon2	37690488	17	357921	0.043	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_415618_Lg17_MDP0000441376_MAF30_MDP0000441376_exon1	61652334	17	415618	0.043	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_772407_Lg17_RosCOS659_MAF20_1675105_exon1	35806382	17	772407	0.907	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_1314921_Lg17_00864_MAF20_88118_exon1	50643434	17	1314921	6.439	LG17	<nnxp>	{-0}	(nn,np)
GDsnp01205	28609434	17	1619944	7.35	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_1621844_Lg17_01205_MAF40_967370_exon1	54649369	17	1621844	7.35	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_1640875_Lg17_01205_MAF30_1658589_exon1	24784500	17	1640875	7.35	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_TC_2414010_Lg17_MDP0000291802_MAF20_MDP0000291802_exon9	66736380	17	2414010	9.169	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GT_2608050_Lg17_00210_MAF20_1622747_exon1	13774400	17	2608050	9.169	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2622909_Lg17_00210_MAF30_MDP0000206391_exon2	36758504	17	2622909	9.169	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_2741553_Lg17_00508_MAF30_1637847_exon1	11810349	17	2741553	9.169	LG17	<nnxp>	{-1}	(nn,np)

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Supplementary Table 3. Continued.

Single nucleotide polymorphism name	Chip address	Chromosome	Position (bp)	LG	cM	Segregation	Phase	Classification
RosBREEDSNP_SNP_GA_3113587_Lg17_01584_MAF20_25029_exon1	36736506	17	3113587	10.982	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_AG_3153316_Lg17_01584_MAF40_1620853_exon1	19791380	17	3153316	11.004	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3503210_Lg17_02049_MAF50_478011_exon1	73766373	17	3503210	11.004	LG17	<nnxp>	{-1}	(nn,np)
GDsnp02049	52626434	17	3527079	11.004	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_3529973_Lg17_02049_MAF10_MDP0000321089_exon5	54712472	17	3529973	11.004	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_5689554_Lg17_00606_MAF40_333837_exon1	27790319	17	5689554	18.612	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_5737459_Lg17_00606_MAF20_896868_exon1	53657428	17	5737459	18.623	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_5713144_Lg17_00606_MAF30_1631410_exon1	22676501	17	5713144	18.637	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5943747_Lg17_00515_MAF40_1664712_exon1	44623439	17	5943747	19.591	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_AG_5951435_Lg17_00515_MAF20_MDP0000945267_exon1	11745384	17	5951435	19.591	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_6947667_Lg17_01927_MAF10_1688280_exon3	31726378	17	6947667	24.642	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_7363032_Lg17_02512_MAF20_251336_exon1	12731391	17	7363032	24.642	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_7402862_Lg17_02512_MAF50_416025_exon1	16751301	17	7402862	24.642	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_8257224_Lg17_RosCOS653_MAF40_1620736_exon6	47727489	17	8257224	26.681	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_GA_8655852_Lg17_00039_MAF30_264652_exon2	42782504	17	8655852	28.257	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_8827345_Lg17_01842_MAF30_MDP0000891106_exon4	56616482	17	8827345	29.572	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_9390133_Lg17_01042_MAF40_MDP0000206358_exon1	12806410	17	9390133	33.046	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_10376441_Lg17_01044_MAF20_1628527_exon2	25809334	17	10376441	37.142	LG17	<nnxp>	{-1}	(nn,np)
GDsnp01044	10662446	17	10425943	37.142	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_10872135_Lg17_00918_MAF20_MDP0000232773_exon6	43726343	17	10872135	38.23	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_12549633_Lg17_02172_MAF50_MDP0000261954_exon1	29758351	17	12549633	43.662	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_12093889_Lg17_00682_MAF40_514292_exon2	51737356	17	12093889	43.674	LG17	<nnxp>	{-0}	(nn,np)
GDsnp02172	62650399	17	12546690	43.678	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_17291565_Lg17_01964_MAF10_1624693_exon1	72802343	17	17291565	49.383	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17325549_Lg17_01964_MAF30_1648331_exon4	19691403	17	17325549	49.383	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_CT_17294445_Lg17_01964_MAF10_1662340_exon9	71736353	17	17294445	49.391	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_17320126_Lg17_01964_MAF30_232619_exon1	70701475	17	17320126	49.394	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_17296923_Lg17_01964_MAF20_1662340_exon1	73770436	17	17296923	49.42	LG17	<nnxp>	{-1}	(nn,np)
GDsnp00358	11646454	17	14251952	50.164	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GT_15738068_Lg17_RosCOS2834_MAF20_MDP0000268544_exon2	69701470	17	15738068	50.662	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_15760100_Lg17_RosCOS2834_MAF50_422175_exon1	39685307	17	15760100	50.662	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_15764597_Lg17_RosCOS2834_MAF40_267186_exon2	21689509	17	15764597	50.662	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_15782830_Lg17_RosCOS2834_MAF40_MDP0000499284_exon1	53679314	17	15782830	50.689	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_20078487_Lg17_01298_MAF50_1623446_exon6	66662466	17	20078487	58.362	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_21049709_Lg17_01525_MAF10_159640_exon1	19810390	17	21049709	62.934	LG17	<nnxp>	{-0}	(nn,np)
RosBREEDSNP_SNP_CT_21052311_Lg17_01525_MAF10_373383_exon2	58658466	17	21052311	62.971	LG17	<nnxp>	{-0}	(nn,np)
GDsnp02534	52703492	17	23184647	68.247	LG17	<nnxp>	{-0}	(nn,np)
GDsnp00341	18649394	17	24851043	70.198	LG17	<nnxp>	{-1}	(nn,np)
GDsnp01467	55746417	17	25489178	75.39	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_GA_26486132_Lg17_MDP0000161181_MAF20_MDP0000161181_exon3	69679307	17	26486132	79.245	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26486285_Lg17_MDP0000161181_MAF20_MDP0000161181_exon3	36737473	17	26486285	79.245	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TG_26487122_Lg17_MDP0000161181_MAF20_MDP0000161181_exon4	43684477	17	26487122	79.245	LG17	<nnxp>	{-1}	(nn,np)
RosBREEDSNP_SNP_TC_26778435_Lg17_snpEB140474_MAF30_1685014_exon3	32669510	17	26778435	80.146	LG17	<nnxp>	{-1}	(nn,np)