

# ‘Bolaroja’ and ‘Primarosa’: Two New Midseason Apricots for the Fresh Market

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‘Bolaroja’ and ‘Primarosa’ are two new high-color, midseason apricots developed by the Agricultural Research Service *Prunus* breeding program in Parlier, CA, and released for propagation in 2009. These new cultivars are self-incompatible and require other cultivars to facilitate pollination and fruit set. With appropriate pollenizers, both new apricots are extremely productive. ‘Bolaroja’ fruit mature with the major tonnage cultivar Castlebrite with ‘Primarosa’ beginning to ripen as ‘Bolaroja’ completes its harvest period. ‘Primarosa’ harvest typically ends before the beginning of ‘Lorna’ apricot. At commercial maturity, sun-exposed fruit of ‘Bolaroja’ acquire a strong pink blush over a light orange ground color, whereas ‘Primarosa’ fruit are bicolored, having a strong red blush on sun-exposed surfaces over a bright orange skin color. Flesh of ‘Bolaroja’ is dark orange, whereas ‘Primarosa’ flesh color is lighter, being very similar in hue to that of ‘Castlebrite’. Fruit of both new cultivars have an acceptable postharvest life at commercial maturity and fruit quality has had a favorable reception from limited consumer trials.

## Origin

‘Bolaroja’, tested as K102-93, arose through the crossing of ‘OrangeRed’ (female parent) and apricot accession K149-70. It was selected in 1985 from among 106 siblings planted in 1981. Tested as K51-71, ‘Primarosa’ was selected in 1987 from an open-pollinated population (330 siblings) of accession K149-70 planted in 1984. Pedigrees of both new apricots are displayed in Figure 1. These seedling trees were initially selected from among their siblings on the basis of attractiveness, eating quality, fruit size, and productivity as compared with the established apricot cultivars available to producers in the San Joaquin Valley during that ripening season.

## Description

*Tree characteristics.* ‘Bolaroja’ trees exhibit vigorous growth and a spreading growth habit as compared with reference cultivars

Hargrand and Harlayne (Guerriero and Watkins, 1984). The development of fruiting spurs can be enhanced through pruning, although the majority of fruit are borne on 1-year-old shoots. Because of its vigor, ‘Bolaroja’ trees might require maintenance pruning during the fruiting season to enhance the light interception and thus its strong fruit overcolor. Furthermore, ‘Bolaroja’ trees appear more susceptible to powdery mildew (*Sphaerotheca pannosa*) than other apricot cultivars grown in the San Joaquin Valley. Current-season shoot removal from within the tree center will help reduce powdery mildew development. ‘Primarosa’ trees are characterized by a more upright growth habit and substantially less vigor as compared with ‘Bolaroja’ trees. As such, ‘Primarosa’ trees can be easily shaped and maintained through appropriate pruning to provide an open center that enhances light interception, and thus color development, on developing fruit. This new variety fruits abundantly on both spurs and 1-year-old shoots.

*Flowering characteristics.* Flowers of both ‘Bolaroja’ and ‘Primarosa’ are male-fertile and produce abundant pollen. Previous studies on the inheritance of sexual incompatibility in apricot (Burgos et al., 1997) have shown ‘Primarosa’ to be clearly self-incompatible, requiring other apricot cultivars with similar flowering periods to facilitate fertilization and fruit set. The Castlebrite cultivar has been used successfully as a pollinator for ‘Primarosa.’ Bagging studies of ‘Bolaroja’ branches during the bloom period have indicated this new cultivar to be functionally self-incompatible. Occasional fruit set occurs within insect-proof bags affixed to flowering branches before anthesis; however, fruit set has never been sufficient to warrant orchard plantings without other synchronously flowering cultivars to facilitate pollination and fruit set. Relative bloom periods

of ‘Bolaroja’ and ‘Primarosa’ are considered average with respect to other apricots grown in the San Joaquin Valley, being typically later than those of early-blooming ‘Apache’ and earlier than late-blooming ‘Robada’ (Table 1). The suitability of other commercial apricot cultivars with blooms that overlap either ‘Bolaroja’ or ‘Primarosa’ has not been specifically studied.

*Fruit characteristics.* ‘Bolaroja’ and ‘Primarosa’ fruit are distinctly different in appearance. Fruit of ‘Bolaroja’ are round in shape. The skin surface is not completely smooth and has been observed during some harvest years to be somewhat rough or wrinkled. ‘Bolaroja’ fruit are freestone with dense, fine-textured, and aromatic flesh. ‘Primarosa’ fruit appear round when viewed perpendicular to the fruit’s equatorial axis; however, they have a distinctively flat pistil end. ‘Primarosa’ fruit are freestone and have a smooth skin surface. This cultivar generally ripens from the pit toward the outside of the fruit, providing acceptable fruit quality when well matured, but flesh can become mealy when overripe. Neither of the new cultivars has shown to be susceptible to rain-induced skin cracking in the San Joaquin Valley.

*Fruit size, firmness, and color.* Physical measurements of ‘Bolaroja’ and ‘Primarosa’ are presented in Table 2 along with those of ‘Castlebrite’ apricot as a standard of comparison. The values presented represent average  $\pm$  SE for each variable from two separate harvests during each of 3 consecutive years. At each harvest, attempts were made to select those fruit that represented commercial maturity based on fruit firmness and skin color. Akin with commercial practices, sampled trees were fruit-thinned  $\approx$ 6 weeks past bloom such that 15 to 20 cm separated fruit along 1-year-old shoots and no more than a single fruit remained on fruiting spurs. Fruit firmness was measured on a freshly cut fruit surface (skin removed) with a handheld penetrometer equipped with an 8-mm tip (D. Ballauf Mfg. Co., Washington, DC). A chroma meter (CR-200; Minolta Camera Co., Ltd., Osaka, Japan) was used to obtain CIELAB coordinates L\*, a\*, and b\* for flesh color determination. Coordinates a\* and b\* were then used to calculate hue angle (h°), a more intuitively understandable representation of visual color (McGuire, 1992). The CR-200 Meter was calibrated to a standard white tile (calibration plate CR-A43) before flesh color evaluations.

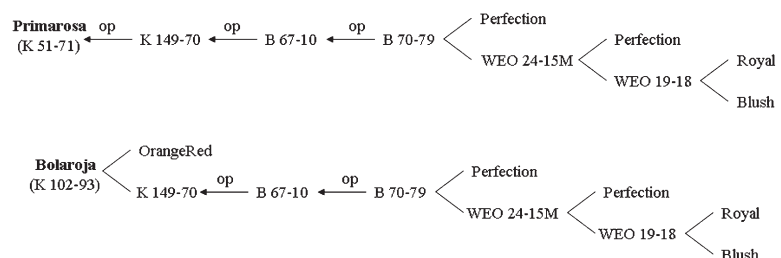


Fig. 1. Pedigrees of ‘Bolaroja’ and ‘Primarosa’ apricots.

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Table 1. Three years of bloom ranges (first bloom to full bloom) in Parlier, Fresno County, CA, for new ARS apricots 'Bolaroja' and 'Primarosa', with bloom ranges of reference cultivars Apache, Castlebrite, and Robada.

Crop yr	New ARS cultivars				Reference cultivars					
	Bolaroja		Primarosa		Apache		Castlebrite		Robada	
	First <sup>z</sup>	Full <sup>y</sup>	First	Full	First	Full	First	Full	First	Full
2007	20 Feb.	28 Feb.	20 Feb.	27 Feb.	16 Feb.	23 Feb.	20 Feb.	2 Mar.	23 Feb.	6 Mar.
2008	23 Feb.	5 Mar.	21 Feb.	1 Mar.	15 Feb.	26 Feb.	19 Feb.	26 Feb.	26 Feb.	8 Mar.
2009	13 Feb.	2 Mar.	17 Feb.	2 Mar.	5 Feb.	18 Feb.	14 Feb.	25 Feb.	23 Feb.	4 Mar.

<sup>z</sup>First bloom represents date at which less than 1% of flowers have opened.

<sup>y</sup>Full bloom represents date at which greater than 80% of flowers have opened.

Table 2. Fruit characteristic comparison (mean ± SEM) of 'Castlebrite', 'Bolaroja', and 'Primarosa' apricots grown in Parlier, CA, 2006 through 2008.

Fruit characteristic	Castlebrite	Bolaroja	Primarosa
<b>Physical characteristic<sup>z</sup></b>			
Fruit mass (g)	65.6 ± 3.8	85.8 ± 5.3	117.9 ± 6.9
Axial diameter (mm)	49.3 ± 0.3	52.7 ± 0.5	60.8 ± 0.6
Flesh firmness (N)	21.1 ± 1.9	19.0 ± 1.4	13.7 ± 2.4
Flesh hue (°)	74.7 ± 1.1	67.6 ± 0.8	72.4 ± 0.5
<b>Juice characteristic<sup>y</sup></b>			
°Brix	10.6 ± 0.3	13.8 ± 0.3	11.5 ± 0.2
pH	3.29 ± 0.08	3.58 ± 0.05	3.38 ± 0.07
Acid (Meq/100 mL)	1.02 ± 0.08	0.77 ± 0.02	1.12 ± 0.04
Fruit maturity date	19 May	20 May	23 May

<sup>z</sup>Calculated values based on two separate harvests per accession per year, seven fruit evaluated per harvest, 3 consecutive harvest years.

<sup>y</sup>Calculated values based on two separate composite juice samples derived from seven fruit at each of two harvests per accession, over three consecutive harvest years.

Of the three apricots described in Table 2, cultivar Castlebrite, the standard of comparison, was the smallest in terms of fruit mass (65.6 g) and fruit axial diameter (49.3 mm). Fruit mass of 'Bolaroja' (85.8 g) was similar to that of 'Castlebrite', and 'Primarosa' fruit were much larger (117.9 g). Flesh of sampled 'Primarosa' fruit was much less firm (13.7 N) compared with flesh firmness of 'Castlebrite' and 'Bolaroja' (21.1 N and 19.0 N, respectively). Averaged across the six evaluated harvests in 3 consecutive years, 'Bolaroja' fruit had the deepest orange flesh (67.6°) as indicated by lower hue angle values, whereas flesh colors of 'Castlebrite' and 'Primarosa' were similar and lighter orange in color (74.7° and 72.4°, respectively).

**Juice characteristics.** Juice °Brix was highest in evaluated fruit of 'Bolaroja' (13.8°) and lowest for the commercial standard 'Castlebrite' (10.6°) with 'Primarosa' juice being more similar to that of 'Castlebrite' (Table

2). Juice pH ranged from 3.29 for 'Castlebrite' to 3.58 for 'Bolaroja'. Titratable acidity of apricot juice was lowest in samples of 'Bolaroja' (0.77 Meq/100 mL) and highest for 'Primarosa' (1.12 Meq/100 mL). In terms of eating quality, °Brix/acid ratio has been used successfully as a measure of consumer acceptability with higher ratios denoting better eating quality (Jayasena and Cameron, 2008). Accordingly, °Brix/acid ratios of 'Castlebrite' and 'Primarosa' were very similar (10.4 versus 10.3, respectively) and much lower than that of 'Bolaroja' (17.9).

**Fruit maturation time.** When trees of similar age are grown in the same orchard and on the same rootstock, 'Castlebrite' is expected to ripen before 'Bolaroja' and 'Primarosa'. Average ripe date of 'Castlebrite' was 19 May during the 3-year period between 2006 through 2008. The ripe date of 'Bolaroja' during this period was 1 d later (20 May) than 'Castlebrite' with 'Primarosa'

ripening to commercial maturity on 23 May. 'Primarosa' fruit mature rather synchronously with few passes through the orchard necessary to harvest the entire crop. Conversely, the hanging 'Bolaroja' crop requires numerous passes through the orchard because fruit maturity varies throughout the tree. Similar to enhancing its overcolor, maintenance pruning of 'Bolaroja' during the fruit development period may assist in balancing the maturity status of fruit within the tree, ensuring a more efficient harvest.

**Availability.** 'Bolaroja' and 'Primarosa' mother trees are located at the Agricultural Research Service's San Joaquin Valley Agricultural Sciences Center in Parlier, CA. The new cultivars are considered free with no restrictions placed on propagation or availability. Neither 'Bolaroja' nor 'Primarosa' is patented in the United States or in any other country. Dormant budwood is usually available on request. Budwood that has been virus-indexed and found to be free from economically important apricot viruses is available from the National Research Support Project 5 (NRSP5) in Prosser, WA.

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