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# ‘Moutere’ Red Raspberry

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‘Moutere’ (Fig. 1) is a new floricane-fruiting red raspberry (*Rubus idaeus* L.) cultivar from The Horticulture and Food Research Institute of New Zealand Limited (HortResearch). ‘Moutere’ produces high yields of attractive large-sized fruit early in the season that are well suited to hand picking and fresh markets. It is resistant to Raspberry Bushy Dwarf Virus (RBDV) and to the common strain of the North American raspberry aphid, *Amphorophora agathonica* Hottes.

## Origin

The new cultivar of red raspberry, *Rubus idaeus* L., was created in the course of a planned breeding program carried out at HortResearch Nelson, New Zealand. The parents used to make the cross in 1987 were ‘Haida’ (seed parent) and ‘Qualicum’ (pollen parent). Both of these parents originated in the Agriculture and Agri-Food Canada, Pacific Agri-Food Research Center (PARC). The cross was made in British Columbia, Canada, for the New Zealand HortResearch raspberry breeding program. ‘Haida’ (‘Malling Promise’ × ‘Creston’) was an early release from the PARC breeding program (Daubeny, 1973). It has had limited success as a cultivar in its own right, primarily as a cold-hardy selection in eastern Canada. ‘Haida’ has also been recognized in New Zealand for its resistance to RBDV, upright growth habit, low stature, short internode length, and its low chill adaptation. ‘Qualicum’ (‘Glen Moy’ × ‘Chilliwack’) is susceptible to RBDV and has very vigorous canes, long strongly attached laterals, and large attractive fruit that are good for fresh market and processing (Daubeny and Kempler, 1995). Both parents are resistant to the common strain of the North American raspberry aphid, *A. agathonica*, a vector of the raspberry mosaic virus (RMV) complex.

Seed from this cross was grown at HortResearch Nelson (41°6′ S 172°58′ E) and the original plant of the new cultivar was selected during the 1989 to 1990 summer (Southern Hemisphere) and given the breeder’s designation 87-24WD10. After subsequent advanced trialing as HR112, the cultivar was named ‘Moutere’. The name ‘Moutere’ was chosen after the rural area and townships (Upper Moutere and Lower Moutere) adjacent to Motueka, New Zealand, where ‘Moutere’ was selected. ‘Moutere’ comes from the Maori word meaning “island”. Key characters of ‘Moutere’ are:

1. A semispine-free cane with an upright primocane growth habit of strong vigor;
2. The ability to form attractive large red fruit (Fig. 2A) of good flavor in high yields on medium–long fruiting laterals (Fig. 2B) that ripen moderately early in the season; and
3. Resistance to the common strain of RBDV.

When compared with the parent ‘Haida’ in New Zealand and Canada, the new cultivar is found to form larger fruit with higher yields. ‘Moutere’ is further distinguished from ‘Haida’ by having canes that are thicker and longer and producing fruit that are longer and more conical (Fig. 2A) with similar glossiness and requiring less force to separate the berry from the receptacle. ‘Moutere’ fruit ripen earlier than those of ‘Haida’.

When compared with the parent, ‘Qualicum’, in New Zealand and Canada, ‘Moutere’ exhibits a more compact growth habit, darker red color, and shinier fruit with similar yields, an earlier picking date, and a similar picking duration. ‘Moutere’ is further distinguished from ‘Qualicum’ by having lower cane vigor.

## Performance and Description

‘Moutere’ was tested and evaluated between the years 1992 to 2004 at HortResearch Nelson, New Zealand, and for some years at the PARC’s substation in Abbotsford, British Columbia, Canada. In Canada, Moutere was included as a single plot in a modified randomized complete block design planted in 1996 with cultivars represented in three replicates of three-plant plots with

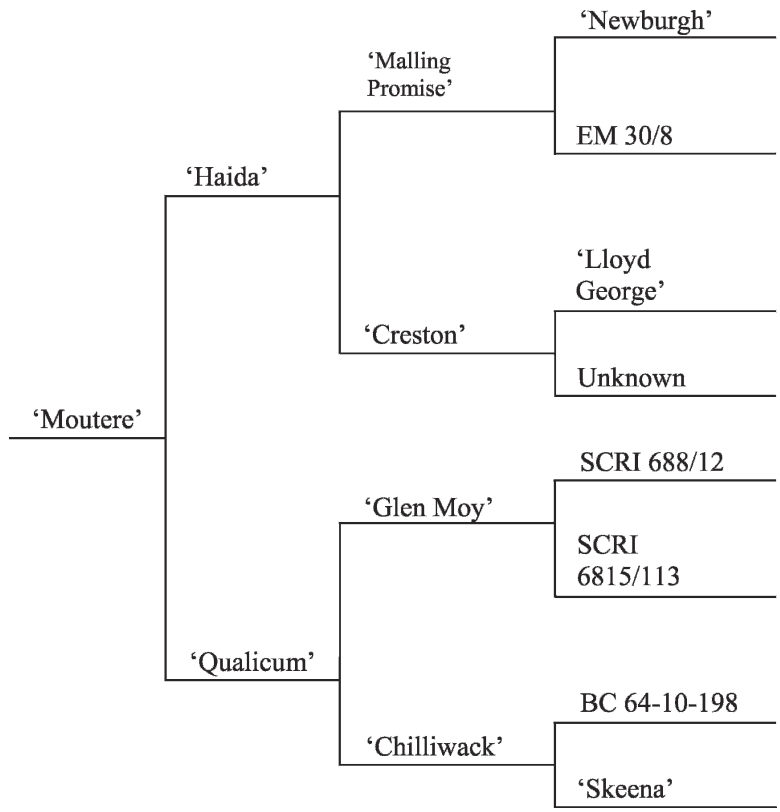


Fig. 1. Pedigree of ‘Moutere’ red raspberry.

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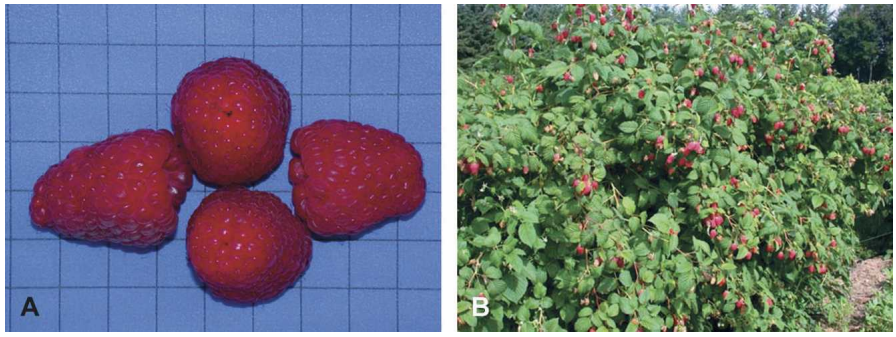


Fig. 2. (**A**) 'Moutere' red raspberry fruit on a 1-cm grid (left); (**B**) mature fruiting plant of 'Moutere' in Canada (right).

0.9 m between plants and 3 m between rows. Yield and berry weights were measured in 1999 and 2000 and fruit firmness, soluble solids, and shelf life were measured in 2000. Throughout each season, fruit were harvested by hand between nine and 13 times. Average fruit weight was calculated from the weight of a 50-fruit sample at each harvest date. To demonstrate the early fruiting of 'Moutere', the fruit ripening season was characterized by calculating the start (5% of total fruit ripe), midpoint (50% of total fruit ripe), and end (95% of total fruit ripe) for 1999 and 2000 seasons in British Columbia (Table 1). Soluble solids were measured according to Barritt et al. (1980), and shelf life was measured using methods similar to those used by Daubeny and Pepin (1974). The main limitation to shelf life was through the presence of postharvest rot, mainly caused by *Botrytis cinerea* Pers. Ex. Fr. Fruit firmness was measured as the force required to close the opening of the fruit with a push–pull spring gauge (Hunter Spring Mechanical Force Gauge Series L; Ametek, Hatfield, PA) similar to Barritt et al. (1980) and was calculated once during the 2000 season on a 10-fruit sample.

In New Zealand, 'Moutere' was planted in a replicated row/column design in 2000. It was planted with several standard cultivars in two replicates with a plot size of two plants (1 m between plants and 3 m between rows). Yield and berry weights were measured in the 2002 to 2003 and 2003 to 2004 seasons. Shelf life was measured in the 2001 to 2002 season on an earlier (unreplicated) preliminary trial that contained 'Moutere' as well as in the replicated trial in 2002 to 2003 and 2003 to 2004. For the shelf life study, three replications of a 10-fruit sample were tested three times during the harvest season in a manner similar to that described by Stephens et al. (2002). Statistical analyses were conducted using R Development Core Team (2008).

Analysis of variance indicated that there were no significant ($P > 0.05$) cultivar × year interactions for any of the variates in either trial location; therefore, cultivar means are presented in Tables 2 and 3. In New Zealand, 'Moutere' did not have high yields compared with the better-adapted cultivars in this trial (Table 3). This is likely to be because of reduced budbreak on 'Moutere' as a result of the relatively warm climate for raspberry growing experienced in this location. In British Columbia, 'Moutere' yielded well compared with some new and older cultivars developed in this region (Table 2; Fig. 2B). 'Moutere' yield compared favorably with those of 'Saanich' and 'Chemainus', both recent releases from the British Columbia program (Kempler et al., 2006, 2007). Fruit size of 'Moutere' was large and similar to those of 'Qualicum' and 'Tulameen' (Table 2).

The harvest season of 'Moutere' is moderately early. Fruit ripening was in a similar season to, or possibly a little later than, that of 'Malahat' (Table 1), the current early-season standard cultivar in British Columbia. In New Zealand, 'Moutere' was also early ripening (Table 4) beginning earlier than cultivars Motueka and Tadmor but not as early as 'Korere'. Harvest duration was similar in both locations.

Table 1. Comparison of harvest season (date by which percentage of ripe fruit harvested) of 'Moutere' and red raspberry cultivars in British Columbia in 1999 and 2000.

| | Start 5% | | Midpoint | | End 95% | | Mean harvest |
|---|---|---|---|---|---|---|---|
| Cultivar | 1999 | 2000 | 1999 | 2000 | 1999 | 2000 | duration (d) |
| Kitsilano | 19 July | 10 July | 6 Aug. | 25 July | 23 Aug. | 13 Aug. | 35 |
| Saanich | 17 July | 6 July | 28 July | 22 July | 16 Aug. | 10 Aug. | 33 |
| Moutere | 9 July | 2 July | 20 July | 13 July | 6 Aug. | 30 July | 29 |
| Chemainus | 14 July | 3 July | 26 July | 22 July | 13 Aug. | 12 Aug. | 36 |
| Qualicum | 15 July | 3 July | 26 July | 19 July | 12 Aug. | 2 Aug. | 30 |
| Malahat | 12 July | 30 June | 26 July | 12 July | 16 Aug. | 2 Aug. | 28 |
| Tulameen | 15 July | 3 July | 29 July | 20 July | 19 Aug. | 9 Aug. | 37 |
| Cowichan | 15 July | 4 July | 29 July | 20 July | 12 Aug. | 1 Aug. | 29 |
| Meeker | 19 July | 3 July | 2 Aug. | 19 July | 12 Aug. | 1 Aug. | 27 |
| Chilliwack | 13 July | 4 July | 24 July | 18 July | 9 Aug. | 31 July | 28 |

Table 2. Fruiting performance of 'Moutere' compared with other red raspberry cultivars at Canada Agriculture in British Columbia.

| Clone | Mean yield[z] (kg/plant) | Berry wt[y] (g) |
|---|---|---|
| Kitsilano | 5.3 | 3.2 |
| Saanich | 5.1 | 3.4 |
| Moutere | 4.9 | 4.4 |
| Chemainus | 4.4 | 3.9 |
| Qualicum | 4.3 | 4.7 |
| Malahat | 4.3 | 4.5 |
| Tulameen | 3.9 | 4.5 |
| Cowichan | 3.9 | 4.6 |
| Meeker | 3.6 | 3.2 |
| Chilliwack | 3.1 | 3.5 |
| SED[x] | 0.304 | 0.202 |

[z]Mean from 1999 and 2000 harvest seasons.
[y]Mean of 50-fruit subsamples at each harvest.
[x]SE of difference between means.

Table 3. Yield and fruit weight of 'Moutere' and other red raspberry cultivars at HortResearch Nelson, New Zealand.

| Clone | Mean yield[z] (kg/plant) | Berry wt[y] (g) |
|---|---|---|
| Korpiko | 3.6 | 4.4 |
| Motueka | 3.1 | 3.3 |
| Korere | 2.8 | 3.7 |
| Moutere | 2.6 | 3.8 |
| Tadmor | 2.6 | 4.5 |
| SED[x] | 0.39 | 0.30 |

[z]Mean from 2002 to 2003 and 2003 to 2004 seasons.
[y]Mean of 20-fruit subsamples at each harvest.
[x]SE of difference between means.

In shelf life tests in New Zealand, there were no significant differences between cultivars nor a significant cultivar × year interaction, and shelf life was comparable to those of 'Qualicum', 'Tulameen', and 'Glen Ample' (Table 5) in three seasons of evaluation. In 2000 in British Columbia, significant differences in shelf life were found among cultivars ($P < 0.001$). 'Moutere' shelf life was significantly better than those of 'Tulameen', 'Malahat', and 'Meeker' (Table 6).

'Moutere' fruit are not particularly firm. In firmness tests in British Columbia, 'Moutere' fruit averaged 1.41 N compared with 'Meeker' at 1.37 N, 'Tulameen' at 2.06 N, and 'Malahat' at 1.84 N (Table 6). The fruit have a high number (typically 140) of relatively small drupelets (typically 3.6 mm in diameter). The fruit color is medium red for fresh fruit markets, and the color darkens further on chilling. Fruit flavor can be described as average–good for a red raspberry.

'Moutere' plants produce many canes that are of strong vigor, typically reaching 2.5 m in height. Canes have few spines, particularly in upper regions of the cane, and the spines are small and dark purple in color.

The new cultivar was first asexually propagated in 1991 in New Zealand, being reproduced by root cuttings. The resulting plants propagated true to type, demonstrating that the characteristics of the new cultivar are stable and can be transmitted without change through succeeding generations.

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Table 4. Comparison of harvest season (date by which percentage of ripe fruit harvested) of 'Moutere' and red raspberry cultivars in New Zealand in 2002 to 2003 and 2003 to 2004 seasons.

| | Start 5% | | Midpoint | | End 95% | | Mean harvest duration (d) |
|---|---|---|---|---|---|---|---|
| Cultivar | 2002–2003 | 2003–2004 | 2002–2003 | 2003–2004 | 2002–2003 | 2003–2004 | |
| Korpiko | 9 Dec. | 17 Dec. | 24 Dec. | 2 Jan. | 12 Jan. | 19 Jan. | 35 |
| Motueka | 9 Dec. | 16 Dec. | 23 Dec. | 30 Dec. | 10 Jan. | 14 Jan. | 32 |
| Korere | 28 Nov. | 5 Dec. | 10 Dec. | 18 Dec. | 1 Jan. | 7 Jan. | 35 |
| Moutere | 6 Dec. | 13 Dec. | 16 Dec. | 27 Dec. | 3 Jan. | 9 Jan. | 29 |
| Tadmor | 21 Dec. | 29 Dec. | 15 Jan. | 12 Jan. | 20 Jan. | 27 Jan. | 31 |

Table 5. Mean shelf life of red raspberry cultivars as measured by fruit rot caused by *Botrytis* after 48 h of storage at ambient temperatures at HortResearch Nelson, New Zealand.

| | Fruit rot[z] (%) |
|---|---|
| Moutere | 32.9 |
| Qualicum | 30.1 |
| Glen Ample | 46.3 |
| Tulameen | 52.1 |
| SED[y] | 7.6 |

[z]Means for three harvest seasons (2001–2002, 2002–2003, 2003–2004), 10 berries × 3 replicates × 3 harvest dates for each.
[y]SE of difference between means.

## Pest and Disease Reaction

In greenhouse screening trials in British Columbia, 'Moutere' was tested as resistant to the common strain of the North American raspberry aphid, *A. agathonica*, a vector of the RMV complex. Since the selection of this clone in 1989 to 1990, numerous tests for RBDV have been done on 'Moutere' in New Zealand and in British Columbia using enzyme-linked immunosorbent assay but on no occasion has the virus been detected despite high infection pressure present in trial fields. Graft inoculation trials for RBDV have not been carried out on 'Moutere'. From this we suggest that 'Moutere' is likely to be resistant to the common strain of RBDV found in New Zealand and the Pacific Northwest.

In the Pacific Northwest, 'Moutere' has been rated as moderately susceptible to spur blight [*Didymella applanata* (Niessl) Sacc.] and cane *Botrytis* (*B. cinerea*) but not more susceptible than cultivars Meeker, Chemainus, Cowichan, and Tulameen already grown.

## Adaptability and Uses

Although no large-scale trials of 'Moutere' have been conducted, it has performed well in British Columbia, Canada, and in the Nelson region of New Zealand in small-sized research plots over several years. It is likely 'Moutere' will be well adapted to U.S. hardiness zones 8 to 10. 'Moutere' is suited to hand-picking fresh market operations. It may not be suited to machine harvesting, because fruit does not remove sufficiently easily from the receptacle. In fertile soils and with good management and sufficient winter chill, 'Moutere' will produce high yields of large attractive fruit. In central and northern areas of New Zealand, 'Moutere' is likely to not receive enough chill units to realize maximum budbreak and thus yield potential.

'Moutere' is well adapted to a wide range of environments and is a useful breeding parent for resistance to RBDV and the North American raspberry aphid, *A. agathonica*. This cultivar also carries the recessive gene s for genetic spinelessness inherited from SCRI 6010/52 through Skeena, Chilliwack, and Qualicum.

Table 6. Mean firmness, soluble solids of red raspberry berries, and shelf life as measured by fruit rot caused by *Botrytis* after 48 h of storage at ambient temperatures in British Columbia in 2000.

| | Shelf life, measured as fruit rot[z] (%) | Firmness[2] (N) | SD firmness ($g \cdot cm^{-2}$) | Soluble solids[y] (°Brix) | SD soluble solids |
|---|---|---|---|---|---|
| Esquimalt | 37.5 | 3.04 | 0.90 | 10.4 | 1.0 |
| Saanich | 62.5 | 2.07 | 0.55 | 11.5 | 0.7 |
| Cowichan | 42.2 | 1.84 | 0.96 | 9.2 | 1.0 |
| Moutere | 45.8 | 1.41 | 0.43 | 10.4 | 0.6 |
| Qualicum | 46.9 | 2.79 | 0.87 | 12.5 | 1.1 |
| Chilliwack | 31.2 | 2.02 | 0.79 | 12.7 | 0.9 |
| Tulameen | 87.5 | 2.06 | 0.66 | 11.8 | 0.9 |
| Meeker | 70.3 | 1.37 | 0.55 | 10.9 | 1.4 |
| Malahat | 71.9 | 1.84 | 0.48 | 11.7 | 0.8 |
| SED[x] | 6.07 | | | | |

[z]Ten berries × 4 replicates × 2 harvest dates.
[y]Ten berries.
[x]SE of difference between means.

## Availability

'Moutere' is the subject of a grant of a U.S. plant patent (grant no. PP 17744). For licensee information on 'Moutere', contact the Plant Variety Management Team (wcashmore@hortresearch.co.nz), The Horticulture and Food Research Institute of New Zealand Limited (HortResearch). Certified plant material is currently available in the United States from Nourse Farms Inc. (www.noursefarms.com).

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