Journal of the American Pomological Society 69(3): 170-172 2015

Breeding of a New Triploid Seedless Table Grape Cultivar 'Paradise'

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Additional index words: triploid, superior quality, gibberellic acid, rain shelter cultivation

Abstract

'Paradise' is a new triploid seedless table grape cultivar obtained from a cross between 'Delaware' (*V. labrusca* L.) and 'Kyoho' (*Vitis* spp.). Fruit and vines of 'Paradise' (*Vitis* spp.) were observed from 2006 to 2009, and it was finally selected in 2009. Its bud burst, full bloom and fruit maturity dates are April 29, June 10 and September 20, respectively, in Korea and it is characterized as a mid-late season cultivar. It has a vigorous growth habit and an excellent taste, with abundant juice and soft firmness. The average weight of a cluster is 296 g, and its average soluble solids concentration is 20.6°Brix. It is seedless and has larger fruit size and better quality than 'King De La' (*V. labrusca*). This cultivar requires the application of gibberellic acid at full bloom for the production of commercially useful fruits. Rain shelter cultivation is recommended for protection from downy mildew.

In Korea, a few cultivars such as 'Kyoho' (*Vitis* spp.), 'Campbell's Early' (*V. labrusca*) and 'Muscat Bailey A' (*Vitis* spp.) occupy 90% of the total area cultivated for table grapes. Seedless grapes have recently been imported in significant amounts from Chile and America, due to a Free Trade Agreement, meaning that the cultivation of high-quality seedless grapes is of increasing priority to table grape growers in Korea. 'King De La', one of the most famous seedless grapes in the world, is grown in a small part of the country. However, table grape growers in Korea have sought the development of seedless grapes that are well adapted to and easily cultivated in local growing conditions, because problems such as coloring delay and berry cracking are frequently encountered while cultivating 'King De La' in the Korean environment. Kangwon National University in Korea has operated a breeding program for the development of triploid seedless grapes for the last 15 years in order to introduce new improved table grape cultivars whose higher quality can accommodate the needs of grape growers. In this paper, we report the characteristics of 'Paradise' (*Vitis* spp.), a new seedless table grape with superior fruit quality, obtained from this breeding program.

Materials and Methods

'Paradise' was obtained from a cross between 'Delaware' (*V. labrusca*) and 'Kyoho' in 1999, a diploid x tetraploid hybrid. In 2000, it was initially designated KD-1 and was grown in seedling boxes in a greenhouse at Kangwon National University, Chuncheon, Korea. In 2001, it was transplanted and propagated at the Kangwon National University farm. Root tips of KD-1 were collected to examine chromosome number as described by Park et al. (1999). Five trees were selected and spaced at 3.5 m (between rows) x 5 m (between plants) and were trained into an overhead arbor. Pests and diseases were controlled with periodic fungicide and insecticide applications following the guidelines of the Rural Development Administration in Korea. Daily irrigation was applied and the soil surface was managed by sod culture during growth under rain-shelter cultivation conditions. Bearing branches were spur pruned to two-buds every February, and the flowers were thinned 10 days before bloom.

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From 2002 to 2005, the characteristics of three random vines were investigated following UPOV standards (UPOV, 1994). Fruit and vine characteristics were additionally tested from 2006 to 2009. During the evaluation period, the lowest temperature was -20.7°C and the maximum temperature was 35.6°C, which represented relatively unfavorable growing conditions compared to other regions in Korea. In order to investigate fruit quality, a single treatment of 100 ppm gibberellic acid was applied at the full bloom stage, and 10 fruits were taken from each of three vines at the time of optimum maturity. Fruit cluster weight was measured from the total average weight of thirty clusters, and berry weight was also investigated. The total soluble solids concentration was additionally measured on each fruit by expressing juice from each side of the fruit onto a digital refractometer (Atago PR-101, Japan). Finally, the titratable acidity of each fruit was measured with an automatic titrator (Schott Titro-Line Alpha, Germany).

Following detailed investigation, KD-1 proved to have better fruit quality than and similar growth characteristics to 'King De La', and it was finally named as 'Paradise' in 2009.

Fig. 1. Fruit appearance of 'Paradise' (*Vitis* spp.) grape at harvest.

Description

Observations of chromosome number demonstrated that 'Paradise' is a triploid. 'Paradise' is characterized as a mid-late season cultivar. Its optimum harvest time in Korea is September 20, 17 days later than 'King De La'. 'Paradise' has strong vine vigor and moderate freezing tolerance, with no bud damage occurring during winter in Chuncheon, Korea. The leaf petioles of 'Paradise' are slightly shorter than those of 'King De La', while leaf thickness is similar to that of 'King De La'.

When 'Paradise' fruits are fully ripened, the skin is black. The average cluster weight of 'Paradise' is 296 g, with 55 berries per cluster (Table 1). The cluster appearance is excellent with uniform shape (Fig. 1). The average yield of 'Paradise' is 23,000 kg per hectare. Cluster and berry shapes are conical and circular, respectively. The flesh texture of 'Paradise' is soft and very juicy. Cluster volume is abundant and the berries are not susceptible to cracking from rainfall near or at maturity, as are 'King De La' berries. Large berries set with gibberellic acid application showed a very low rate of small seed formation (0.01 seeds per berry). The average

Table 1. Fruit characteristics of 'Paradise' (*Vitis* spp.) and 'King De La' (*V. labrusca*) grapes. Values are means (± standard errors) recorded from 2006-2009 in Chuncheon, Republic of Korea.

Cultivar	Harvest date	Cluster weight (g)	Cluster shape	Berry weight (g)	Berry shape	Berry skin color	Total soluble solids (°Brix)	Titratable acidity* (%)
Paradise	20 Sept.	295.8±22	Conical	5.4±1.3	Circular	Black	20.6±1.5	0.38±0.14
King De La	3 Sept.	230.4±25	Conical	2.1±0.7	Circular	Red	17.0±1.2	0.45±0.16

*Titratable acidity is expressed as tartaric acid.

total soluble solids concentration of 'Paradise' was 20.6°Brix, which is 3.6°Brix higher than that of 'King De La'. The titratable acidity of 'Paradise' was also lower than that of 'King De La'. These values indicated that 'Paradise' has attractive fruit characteristics.

There are some precautions related to the cultivation of 'Paradise'. It should be noted that gibberellic acid treatment at the full bloom stage is essential for commercially viable fruit production; otherwise, the clusters do not have sufficient cluster fill because of low pollen fertility. The cultivar is relatively susceptible to downy mildew (*Plasmopara viticola*) and to attack by fruit fly (*Drosophila suzukii*) during the rainy season. It has been reported from the research farm that the incidence of grape ripe rot (*Glomerella cingulata*) was also observed. Consequently, when favorable conditions for disease or pest incidence occur, standard control measures should be applied and cultivation under rain-out shelters is recommended.

Availability

'Paradise' became a protected in April 2010 when it was registered as a new variety in Korea. Requests for cuttings for research purposes may be addressed to Sung-Min Park (parksm@kangwon.ac.kr).

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Adaptability of peach [*Prunus persica* (L.)] cultivars to the climate conditions of the Ebro valley, with special focus on fruit quality

Adaptability of 89 peach cultivars of distinct origin to climatic conditions of the Ebro Valley at the IRTA-Experimental Station of Lleida (Lleida, northern Spain) over three consecutive years (2009–2011) was studied. For this purpose, several agronomic, morphological and internal quality traits of the fruits were evaluated. Agronomic traits included bloom and harvest dates, yield, and yield efficiency, while morphological traits encompassed fruit shape and size, percentage of red skin, and an appearance quality index. The latter was established to facilitate the assessment of each cultivar on the basis of fruit appearance. Internal quality parameters included flesh firmness, soluble solids content, titratable acidity, sensory attributes, and relative antioxidant capacity. Under the climatic conditions of the Ebro Valley, extensive variability was observed for most quantitative and qualitative (breeding program, fruit type and flesh color) traits. In terms of agronomic performance and fruit quality (fruit appearance included), we considered that a well-adapted cultivar for a given area should achieve the following characteristics: high yield efficiency, high appearance index quality, high relative antioxidant capacity, strong flavor, and medium to high ripening index. However, according to the different breeding programs, fruit types, and flesh colors evaluated in this study, none of them simultaneously showed these characteristics. However, some achieved a number of the desired traits. A principal component analysis for melting peach, nectarine, non-melting peach and flat peach cultivars revealed the best ones for each fruit type. The results showed that cultivars do not combine all the desired traits. Nevertheless, these findings are valuable for breeding strategies aiming to achieve cultivars with better adaptation to the climatic conditions of the Ebro Valley. Abstract from: G. Reig, S. Alegre**,** F. Gatius, and I. Iglesias. Scientia Horticulturae 190:149-160.