

A Red Triploid Seedless Grape 'Red Dream'

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Because of the success of the grape cultivar Shine Muscat in Korea, consumer interest in high-quality seedless grapes has significantly increased (Kim et al., 2021). In Korea, most seedless grapes are currently produced by treating genetically seeded grape cultivars, such as Shine Muscat and Kyoho, with plant growth regulators before and after flowering. Unfortunately, although the method effectively induces production of seedless fruits, the standardization of fruit quality is difficult to achieve because it is not easy to set an optimal treatment time and concentration of the growth regulator. Furthermore, the additional labor required, which accounts for a large proportion of the operating expenses, increases the total production costs significantly. Therefore, substantial efforts have been made to breed and distribute new seedless grape cultivars to avoid the shortcomings of chemical treatment (Heo and Park, 2017; Kim et al., 2020; Park et al., 2015, 2016, 2020). As an attractive alternative, triploid grapes have extremely low fertility (Heo et al., 2007), and a single GA₃ application at full bloom is presumably sufficient, enabling the standardization of the production of seedless grapes (Heo and Park, 2016a). Therefore, we performed various crosses to breed triploid seedless grapes adapted for the cultivation environments found in Korea to attempt

to satisfy the increasing consumer demand. As a result, we developed the new triploid red seedless grape Red Dream, a cultivar that produces seedless grapes of excellent quality.

Origin

Red Dream is a cultivar selected from a progeny obtained from a cross between the two most widely cultivated grape cultivars in Korea, namely, tetraploid cultivar Kyoho and diploid cultivar Campbell Early (Fig. 1), which are both grown in the vineyard of Agricultural Research and Extension Services

(GARES), in Chuncheon, Gangwon-do, Korea (lat. 37.95°N, long. 127.77°E). Seeds obtained from artificial crossing were harvested in 2002, and seed dormancy was broken by stratification treatment at 4 °C. Subsequently, in 2003, these seeds were sown in a nursery at GARES, and seedlings were grown for 3 months before planting in a greenhouse at GARES. Triploidy of the individuals obtained was confirmed using the chromosome number-counting method described by Heo et al. (2016b). Overall, 12 offspring showing a stable growth pattern without symptoms of any infectious disease or physiological disorder were initially selected in 2006. Selected offspring were propagated through the cutting method in 2007. Five vines were planted at a spacing of 4 m between rows and 2 m between plants and trained to an overhead arbor. Bearing branches were spur-pruned to two buds in February every year, and additional growth and fruit characteristics were examined from 2011 to 2013. 'King Dela' was chosen as the reference cultivar because it was the only triploid grape cultivar registered in Korea. During this period, fruit bagging treatments were performed at 30 d after anthesis to protect fruit against damage from birds, diseases, and pests. Field crop management was performed according to the standard practice method described by Park et al. (2016). As a result, an individual named GW-89 showing excellent horticultural performance was finally selected and named 'Red Dream'. The new cultivar was submitted for Plant Variety Protection at the Korea Seed and Variety Service (KSVS) in 2014. The evaluation conducted by the KSVS verified that the main characteristics of the cultivar we reported were truly expressed, and that uniformity was maintained over multiple years. It was officially registered as a grape cultivar in Korea in 2016.

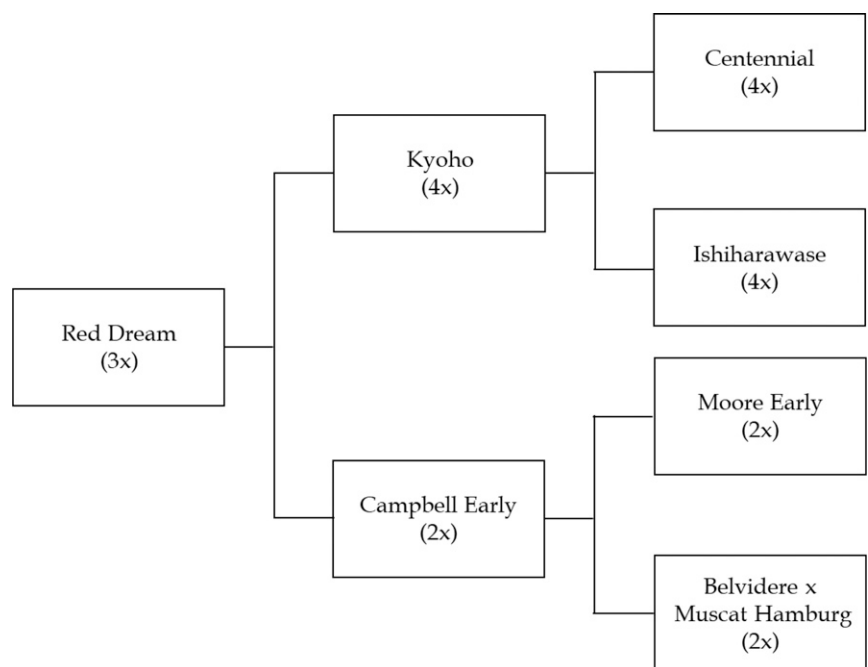


Fig. 1. Pedigree of the Red Dream grape cultivar.

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Table 1. Fruit characteristics of Red Dream and King Dela grape cultivars.

Characteristics ^z	Red Dream	King Dela
Bud sprouting date	21 Apr.	23 Apr.
Flowering date	5 June	8 June
Veraison date	8 Aug.	28 July
Maturing date	22 Sept.	10 Sept.
Cluster shape	Conical	Conical
Berry shape	Round	Round
Cluster weight (g) ^y	416.8	118.6
Berry weight (g) ^x	5.3	1.8
Total soluble solids (°Brix) ^w	18.6	15.8
Titrateable acidity (%) ^w	0.59	0.68
Total soluble solids/titrateable acidity ratio	31.5	23.2

^zAll values are means investigated in Chuncheon, Republic of Korea, from 2011 to 2013.

^yTen clusters were sampled randomly from five vines during the optimum harvest period for calculation.

^xDetermined by dividing the total fruit weight by the number of berries.

^wTen berries were randomly sampled from each cluster. The total soluble solids concentration was measured for each berry by expressing juice from each side of the fruit onto a digital refractometer (PR-101; Atago, Tokyo, Japan). Titrateable acidity of each berry was measured with an automatic titrator (TitrLine alpha; Schott, Mainz, Germany). The juice was titrated to an endpoint pH of 8.2 using 0.1 N sodium hydrogen phthalate.

Description

In Chuncheon, Korea, the dates for bud sprouting and full bloom of ‘Red Dream’ are 21 Apr. and 5 June, which are ≈2 and 3 d earlier than the corresponding dates for the reference cultivar King Dela (Table 1). Stamens and ovaries of ‘Red Dream’ are morphologically perfect and defined as hermaphroditic. The veraison date of ‘Red Dream’ is 8 Aug., which is ≈10 d later than that of ‘King Dela’; consistently, the ripening date of ‘Red Dream’ is 22 Sept., nearly 12 d later than that of the reference cultivar. Fruit skin color at maturity is pink (Fig. 2), and clusters develop a sweet scent as harvest season approaches.

As with other triploid grape cultivars, because of their extremely low fertility (Heo and Park, 2015), a single application of 100 ppm of GA₃ at full bloom is necessary to induce normal fruit setting and growth in ‘Red Dream’. Cluster and berry shapes of ‘Red Dream’ are conical and round, respectively. It is a slipskin grape. It produces juicy fruits, but the fruits of ‘Red Dream’ have a



Fig. 2. Cluster appearance of the Red Dream grape cultivar.

soft texture. The average number of berries per cluster is 77.8, which is 18.5 more berries than ‘King Dela’ has. In turn, the mean cluster and berry weights of ‘Red Dream’ are 416.8 and 5.3 g, respectively; these values are 3-fold higher than those reported for ‘King Dela’. Finally, the total soluble solids (TSS) and titrateable acidity (TA) are 18.6 °Brix and 0.59%, respectively (i.e., 2.8 °Brix higher and 0.09% lower than those of the reference cultivar, respectively). The TSS/SC ratio, which has been recently suggested as an important indicator of consumer choice (Park et al., 2015), was also found to be superior to that of ‘King Dela’. In Korea, the cultivar is considered as outstanding; consequently, with export potential, if the TSS is more than 18 °Brix and the SSC/TA ratio is more than 30, then good taste is guaranteed (Sonogo et al., 2002). Therefore, ‘Red Dream’ is considered a high-quality, outstanding cultivar.

Because ‘Red Dream’ grows very vigorous vines, an excessive fertilizer supply can result in excessively large, dark green leaves. Therefore, it is necessary to properly control the amount of fertilizer during cultivation. To improve skin coloration, the lower part of the bags needs to be opened 15 d before harvest, and the bag needs to be completely removed 5 d before harvest. It is necessary to bear two clusters per shoot because the skin color may deteriorate if clusters have too many berries. Additionally, harvesting must be completed within the proper harvesting season because fruit shattering may occur if harvesting is delayed. Most grape cultivars grown in Korea, including Kyoho and Shine Muscat, are sensitive to freezing injury, and their vines should be covered to avoid freezing injury during the winter at Chuncheon, where the ambient temperature declines to –20 °C in winter. The freezing tolerance of ‘Red

Dream’ is considerably high among grape varieties cultivated in Korea because it can be cultivated without applying specific management in open fields in the same areas. Cultivation in the coldest northern regions of Korea is perfectly viable.

Availability

‘Red Dream’ is a triploid, red seedless grape bred for the first time in Korea. This is a high-yielding cultivar, and its berries have excellent color. Hence, the utilization of the cultivar can be expanded, and it is expected to become a cultivar that is appreciated by growers and consumers alike. ‘Red Dream’ is a patented Korean cultivar from KSVS and is owned by GARES. Requests for cuttings for research purposes may be addressed to Young-Sik Park (yspark06@korea.kr).

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