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Development of a New Wine Grape Cultivar 'Cheongpung'

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Abstract

A new grape cultivar, 'Cheongpung', was bred from a cross between KW-03 and KW-10 that was selected among 155 genetic resources of Korean native *Vitis amurensis* Rupr. at Gangwondo Agricultural Research and Extension Services. The cross was made in 1999, and 'Cheongpung' was finally selected in 2009 after an extensive three-year evaluation of fruit and vine characteristics. Bud burst, full bloom, and fruit maturity dates of 'Cheongpung' are April 29, June 10, and September 20, respectively. It is a mid-late season cultivar. 'Cheongpung' grows vigorously and is resistant to downy mildew and gray mold. The major fruit characteristics of 'Cheongpung' are a distinctive aroma, high fruit quality and functionality. It is therefore expected that 'Cheongpung' can be used for wine production or as a genetic resource to develop better Korean wine grape cultivars.

In Korea, wine consumption has continuously increased because of westernization of the daily diet and increased interest in health foods. The area of grape cultivation for wine production is also growing. European grapes are conceded to contain the best cultivars because many of them have excellent fruit quality, along with attractive coloration and aroma (Jackson, 2008). However, they are susceptible to disease and freeze damage, and cultivating them is difficult under Korean environments which have hot and humid summers and relatively cold winters (Ahn et al., 2012). For this reason, the American grape cultivars 'Sheridan' and 'Campbell Early', which can be grown in unfavorable environments, are frequently cultivated in Korea. But wine produced from 'Sheridan' and 'Campbell Early' has problems such as "foxy aroma" and strong sourness. As an alternative, 'Gaeryangmeoru' has been used but wine from 'Gaeryangmeoru' has also failed to satisfy consumers because it has no attractive characteristics compared to other wines. Hence, developing new cultivars that are easily cultivated in local conditions and that have unique characteristics has been suggested as one of the strategies for the Korean wine industry to achieve a competitive edge.

V. amurensis Rupr., *V. coignetiae* Pulliat., *V. flexuosa* Thunb., and *V. ficifolia* Bunge var. Sinuate Hara grow naturally in Korea. Among these, *V. amurensis* Rupr. has a distinctive flavor and aroma as well as a high amount of functional compounds such as resveratrol and anthocyanin. It has been used previously as a source of homemade wine in Korea. The Gangwondo Agricultural Research and Extension Services (GARES) has operated a breeding program for the development of wine grapes using genetic resources of *V. amurensis* Rupr. collected in Korea since 1990 (Park et al., 2005). As a result, we have developed 'Cheongpung' which has great potential for producing high quality wine and for use in the breeding of new wine cultivars. We report its characteristics in this paper.

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Table 1. Fruit characteristics of 'Cheongpung' and 'Gaeryangmeru' grapes. Values are means (± standard errors) recorded over 2005-2008 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)	Acidity (%)	Anthocyanin content ($mg \cdot g^{-1}$)	Resveratol content ($\mu g \cdot g^{-1}$)
Cheongpung	20 Sept.	70.4±4.5	Conical	1.2±0.1	Circular	Black	18.0±0.7	0.98±0.17	50.2±7.88	0.24±0.05
Gaeryangmeru	15 Sept.	53.0±3.8	Conical	1.0±0.1	Circular	Black	14.1±0.6	0.95±0.12	16.6±3.12	0.12±0.03

Materials and Methods

In 1999, 'Cheongpung' was obtained from a cross between KW-03 and KW-10. The parents had the most attractive fruit and vine characteristics among 155 native genetic resources of *V. amurensis* Rupr. that had been collected in Korea. In 2000, it was initially named 'Gangwon-198' and grown in nursery box soil at the GARES farm in Chuncheon and in 2001, it was transplanted and propagated at the GARES farm. Three vines were finally spaced 3 m (between rows) x 2 m (between plants) and trained to an overhead arbor. No special irrigation was applied, and the soil surface was managed by sod culture during the growing season. Bearing branches were spur pruned to two-buds every February, and the flowers were thinned 10 days before bloom.

From 2002 to 2005, characteristics of these three vines were investigated following UPOV standards (UPOV, 1994). Fruit and vine characteristics were additionally tested from 2005 and 2008. Reactions to downy mildew and gray mold were evaluated in the field and *in vitro*, respectively. Resistance to downy mildew was determined by a severity evaluation using a graded scale ranging from 1 to 9 as follows: 1: highly resistant; 3: resistant; 5: moderately resistant; 7: susceptible; 9: highly susceptible (IPGRI, 1997). Resistance against gray mold was investigated by inspecting aqueous suspensions of *Botrytis* on fruit. The severity of the gray mold was rated using a 1 to 5 scale for lesion appearance and size. No visual evidence of gray mold was 1, less than 10% of the surface infected was 2, 10-30% infected was 3, 30-70% was 4, and greater than 70% was 5 (Archbold et al., 1997). Harvest time was established based on fruit maturity. Five fruits were taken from each of three vines at the time of optimum maturity to investigate fruit characteristics. Fruit cluster weight was measured from the total average weight of fifteen clusters, and berry weight was determined. 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). Titratable acidity of each fruit was measured with an automatic titrator (Schott Titro-line alpha, Mainz, Germany), where the juice was titrated to an end-point of pH 8.2 using 0.1 N sodium hydrogen phthalate. Anthocyanin and resveratrol concentration was measured using an extract obtained from 100 mg of berry skin using high-performance liquid chromatography (1100, Agilent, USA).

Description

Bud burst, full bloom, and fruit maturity dates of 'Cheongpung' are April 29, June 10, and September 20, respectively. 'Cheongpung' has strong vine vigor and high freezing tolerance, with no frost damage to buds occurring at -21.6°C in Chuncheon. It also has resistance to both downy mildew and gray mold. Field evaluations under high temperature and humidity conditions that are favorable to disease incidence demonstrated that 'Cheongpung' is highly resistant (grade 1) to downy mildew. *In vitro* inspection tests showed also that 'Cheongpung' is classified as resistant (grade 2) to gray mold. Hence, it would be well adapted to and easily cultivated in local growing conditions.

Anthocyanin concentration in the main

vein on the upper side of mature leaves was higher than that of the control cultivar, but the density of prostrate hairs was less than that in 'Gaeryangmeoru'. The stamens of 'Cheongpung' are bent, but the ovary is perfect. The cluster appearance is excellent with uniform shape, and rate of fruit set is high because there is no berry shattering. Fruits are produced by parthenocarpy. The average yield of 'Cheongpung' was 10 tonnes per hectare. The average cluster weight of 'Cheongpung' was 78.4 g, 17.4 g heavier than 'Gaeryangmeoru'. However, because cluster weight is comparatively small, the remaining two bearing branches do not lead to the delay of development or of the onset of fruit maturity. The color of fruit skin at optimum maturity time is black, and average berry weight is 1 g with abundant juice and a soft texture. 'Cheongpung' fruits have a ginseng aroma that Koreans like. 'Cheongpung' is not susceptible to cracking since the skin of the fruit is thick. The average total soluble solids concentration of 'Cheongpung' was 18.0°Brix, which was 3.9°Brix higher than that of 'Gaeryangmeoru' while titratable acidity was slightly higher than that of 'Gaeryangmeoru'. It contains an abundance of health-promoting materials such as anthocyanin and resveratrol, more than 'Gaeryangmeoru' and other commercial grapes (data unpublished).

Recently, the wine-processing qualities of 'Cheongpung' have been under evaluation. The results obtained so far indicate that it has high potential for good quality wine production. Results indicate that the functional compounds of wine produced from 'Cheongpung' grapes are two to three times higher than those of both 'Campbell Early' and 'Gaeryangmeoru' (data unpublished). The wine does not taste acidic, and it has an aroma of ginseng. 'Cheongpung' has high quality that can also be used for eating. It has abundant functional materials, parthenocarpy, an attractive aroma and high resistance against various diseases. It is also expected to be used as an elite breeding line for the development of various new cultivars. Hence, introduction of 'Cheongpung' grape will contribute to the diversification and renewal of Korean grape cultivars.

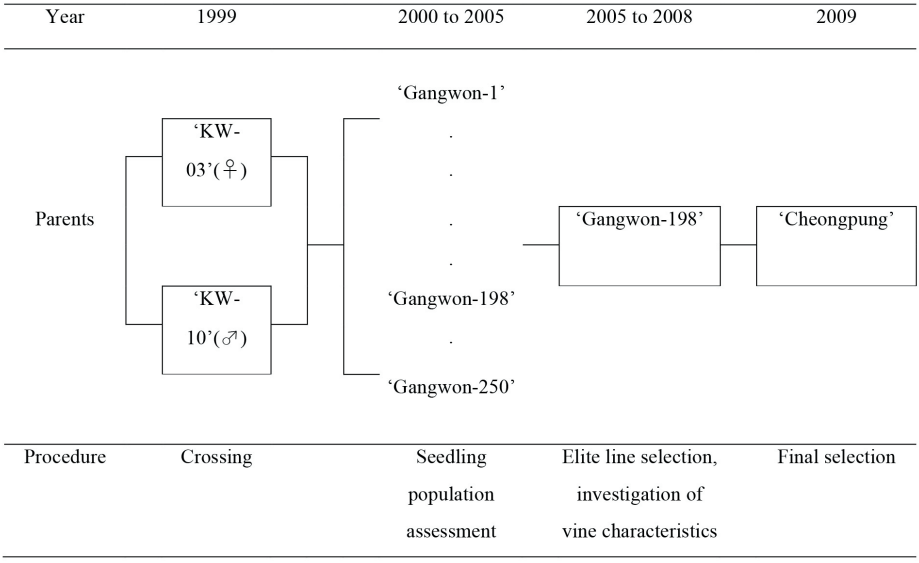

Fig. 1. Pedigree of 'Cheongpung' grape

Availability

'Cheongpung' became a protected in June 2009 when it was registered as a new variety in Korea. Requests for cuttings for research purposes may be addressed to Young-Sik Park (yspark06@korea.kr).

Literature Cited

Ahn, S.J., S.H. Kim, S.J. Choi, and H.K. Yun. 2012. Characteristics of cold hardiness and growth of grapevines grown under rain shelter type cultivation system in the vineyard. Kor. J. Hort. Sci. Technol. 30(6):626-634.

Archbold, D.D., T.R. Hamilton-Kemp, M.M. Barth, and B.E. Langlois. 1997. Identifying natural volatile compounds that control gray mold *(Botrytis cinerea)* during postharvest storage of strawberry, blackberry and grape. J. Agric. Food Chem. 45:4032-4037.

IPGRI, UPOV, OIV 1997. Descriptors for grapevine *(Vitis spp.)*. In: International Union for the Protection of New Varieties of Plants, Geneva, Switzerland/Office International de la vigne et du Vin, Paris, France/ International Plant Genetic Resources Institute, Rome, Italy.

Jackson R. 2008. Wine science: principles and applications. Academic Press, San Diego, CA, USA, p. 15-49.

Park, Y.S., J.Y. Heo, I.J. Kim, S.J. Heo, K.H. Kim, B.C. Jeong, and S.M. Park. 2005. Growth and fruit characteristics of *Vitis amurensis* Rupr. collected in Gangwondo. Korean J. Medicinal Crop Sci. 13(6):226-233.

Union internationale pour la protaection des obtentionsvegeta blue (UPOV). 1994. UPOV test guidelines for grapevine.

Fig. 2. Fruit appearance of newly bred 'Cheongpung' grape at harvest maturity.