‘Jahong’: A New Indigenous Korean Chestnut Cultivar with Reddish Burrs

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The ‘Jahong’ chestnut (Castanea crenata Siebold & Zucc) was released from Korean native chestnut trees by the Korea Forest Research Institute (KFRI) to develop cultivars with desirable nut characteristics such as high sweetness, easy peeling, and a hard kernel in 2009. This cultivar was first selected from a natural population in 2001, and the preliminary and advanced trials for evaluation were carried out from 2003 to 2007. ‘Jahong’ is a medium-ripening cultivar with reddish burrs distinct from any other cultivars between late July and mid-August before ripening. With its distinct red color, this cultivar could provide beauty in ornamental tree cultivation. ‘Jahong’ is suitable as a pollinator for the indigenous old chestnut trees (Castanea crenata Siebold & Zucc) within 48 h after randomly selecting 20 good clones with nut characteristics such as high sweetness (14% or greater), kernel hardness is 10.3 kg·cm⁻², pellicle removability is 90.0%, which are much higher than those of the control cultivar, Arima (Castanea crenata). This cultivar, Arima (C. crenata), first introduced from Japan, has large fruit, good yields, and excellent plant vigor and has been generally cultivated in Korea for a long time (Chung, 2006). We evaluated the clones from 2007 to 2009 for fructification characteristics, harvesting time, yield, and morphological nut characteristics and nut traits according to guidelines for the conduct of tests for distinctness, homogeneity, and stability in the chestnuts from France (Castanea sativa Mill.) (Rural Development Administrator, 1995). For soluble solid content, we measured the fruit juice extracted from the nuts with a refractometer (RA-510; Kyoto Electronics MFC. Co., Ltd., Kyoto, Japan) within 48 h after randomly selecting 20 good harvested nuts. We examined hardness for kernels without shells with a material tester (Ex-Test/CE; Shimadzu Co., Kyoto, Japan). The proportion of polyembryonic nut was estimated by converting the detected nut number. Pellicle removability was obtained by converting the kernels of deep-fried nuts, into a percentage through the data collection for 3 years (2007–09). The cultivar Jahong shows a half-erect tree shape and vigorous tree force having many bearing branches, whereas ‘Arima’ shows a spreading shape not having enough bearing branches. Also, the cultivar was observed to have resistance to chestnut blight disease (data not shown). The leaf morphological characteristics of ‘Jahong’ show a mucronate incision shape of the leaf margin and a rounded shape of the leaf blade base, whereas the standard cultivar Arima has a dentate incision shape of the leaf margin and the same shape as the ‘Jahong’ of leaf blade base. The winter bud of the new cultivar is dark red in color with dense hairs, whereas the dormant bud is hairless and reddish brown in color, the same as the standard cultivar Arima. As remarkable morphological characteristics, the top site of a first-year shoot and thorns of chestnut burrs before ripening is red in color between late July and mid-August (Fig. 1). The leaf bud of the ‘Jahong’ bursts ±27 Apr. at about the same period as the ‘Arima’. The flowering period of male catkins is from 15 June to 26 June with a full bloom period from 18 June to 22 June. The flowering period of female catkins is from 10 June to 23 June with a full bloom period from 15 June to 18 June (Table 1). ‘Jahong’ is considered to be a medium-flowering cultivar, same as the Arima cultivar, which has been widely cultivated in Korea.

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Table 1. The phenological characteristics of ‘Jahong’.

| Cultivars | Time of bud burst | Male catkins | Female catkins |
|-----------|------------------|--------------|---------------|
|           | Flowering beginning | Full bloom beginning | Flowering end | Full bloom end | Flowering end |
| Jahong    | 27 Apr. | 15 June | 18 June | 22 June | 26 June | 10 June | 15 June | 18 June | 23 June |
| Arima     | 29 Apr. | 10 June | 15 June | 18 June | 23 June | 10 June | 15 June | 18 June | 20 June |

Table 2. Flowering and fructification characteristics of ‘Jahong’.

| Cultivars | No. of female catkins per bearing branch | No. of male catkins per bearing branch | No. of total burrs per bearing mother branch | No. of burrs per bearing branch |
|-----------|----------------------------------------|---------------------------------------|---------------------------------------------|-------------------------------|
| Jahong    | 2.0 ± 0.50 a \*                       | 3.3 ± 1.05 a \*                       | 6.8 ± 2.78 a \*                             | 2.0 ± 0.57 a \*               |
| Arima     | 1.8 ± 0.48 b                          | 2.2 ± 0.82 b                           | 2.6 ± 1.13 b                                | 1.2 ± 0.28 b                 |

*Means ± sd done by Student’s t test at P = 0.05 on five plants per cultivar over 3 years (20 branches/plant); similar letters within a column indicate no significant difference.

*Measured during the first week of September.

*Measured during the second week of June.

Table 3. Yield and morphological characteristics of ‘Jahong’.

| Cultivars | Nut wt (g) | Soluble solid content (%) | Kernel hardness (kg·cm\(^{-2}\)) | Percent of Polyembryonic nuts (%) | Pellicle removability (%) |
|-----------|------------|---------------------------|----------------------------------|----------------------------------|--------------------------|
| Jahong    | 13.8 ± 2.91 a \* | 16.3 ± 4.05 a \* | 10.3 ± 1.99 a \*                   | 0.0 a \*                         | 90.0 ± 7.70 a \*            |
| Arima     | 19.2 ± 2.9 b   | 13.4 ± 3.62 b             | 7.8 ± 2.48 b                       | 1.1 ± 2.90 b                     | 54.6 ± 9.97 b              |

*Means ± sd done by Student’s t test at P = 0.05 on five plants per cultivar over 3 years (20 nuts/plant); similar letters within a column indicate no significant difference.

*Measured during the fourth week of September; measured at 8 years old for yield.

‘Jahong’ has 2.0 more female catkins than ‘Arima’. The number of bearing branches, burrs per bearing mother branch, and burrs per bearing branch are also more than those of ‘Arima’ (Table 2). So the total yield of ‘Jahong’ with an 8-year-old tree capable of producing 6.2 kg of nuts was similar to that of a standard cultivar (Table 3). This cultivar is also a medium-ripening cultivar and optimally harvested ≈24 Sept. ‘Jahong’ has short and dense burrs, dark brown nuts, a rounded triangular shape, a nut height-to-nut width ratio of 0.86, and a hilum length-to-nut width ratio of 0.59. So, the nuts from ‘Jahong’ can be distinguished from those of other cultivars and more easily processed for peeled products because of their unique shape (Table 3). Nut weight is 13.8 g with a soluble solid content of 16.3% within 48 h after harvesting, a kernel hardness of 10.3 kg·cm\(^{-2}\), 0.0% polyembryonic nuts, and 90.0% pellicle removability (Table 4). Because the important factors in deciding nut quality such as the soluble solid content, kernel hardness, and pellicle removability were higher than in existing cultivars, we predict that this cultivar has great potential product value for eating raw and making roasted products. Also, because polyembryonic nuts are not high marketability products, ‘Jahong’ with a low percent of polyembryonic nuts has potential product value (Kim et al., 2003).

Table 4. Nut characteristics of ‘Jahong’.

| Cultivars | Nut wt (g) | Soluble solid content (%) | Kernel hardness (kg·cm\(^{-2}\)) | Percent of Polyembryonic nuts (%) | Pellicle removability (%) |
|-----------|------------|---------------------------|----------------------------------|----------------------------------|--------------------------|
| Jahong    | 13.8 ± 2.91 a \* | 16.3 ± 4.05 a \* | 10.3 ± 1.99 a \*                   | 0.0 a \*                         | 90.0 ± 7.70 a \*            |
| Arima     | 19.2 ± 2.9 b   | 13.4 ± 3.62 b             | 7.8 ± 2.48 b                       | 1.1 ± 2.90 b                     | 54.6 ± 9.97 b              |

Note in Cultivation

‘Jahong’ is differentiated from other cultivars because of its reddish burrs before ripening, and this characteristic could make this new cultivar useful as an ornamental tree between late July and mid-August. It is also easy to distinguish from most oblate-shaped cultivars, because the nut shape is an obvious rounded triangular form for picking in harvest season. However, because ‘Jahong’ is a cultivar bearing heavy fruiting in young 6-year-old trees, this cultivar could show small nuts and annual fructification. So, the cultivar does demand proper pruning and fertilizer control to maintain tree vigor continuously. ‘Jahong’ is suitable for silt loam, which is deep in soil depth and contains proper moisture. This cultivar is also more suitable for extensive cultivation that uses small inputs of labor, fertilizers, and capital relative to the land area being farmed because of the small nut size compared with existing cultivars with large nuts. Moreover, ‘Jahong’ with good nut quality is suitable for planting for pollination purposes in chestnut plantations, because the effects of pollen could be expressed in fresh fruit through nut characteristics such as sweetness and the peeling of seedcoat (Mckay and Crane, 1939; Serdar et al., 2011).

Availability

On 15 Oct. 2013, the new cultivar Jahong was granted cultivar protection by seed industry law (Korea Seed and Variety Service, grant number 44). Nurseries interested in a propagating program may contact the Korea Forest Research Institute, Chestnut Research Center, 39, Onjeong-ro, Gwonsen-gu, Suwon-si, Gyeonggi-do, Korea, or otttr@forest.go.kr.

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