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'Harmony' Plumcot

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Abstract

'Harmony' is a plumcot originating from a cross between 'Soldam' plum (*P. salicina* Lindl.) and 'Harcot' apricot (*P. armeniaca* L.). The cross was made in 1999 at the National Institute of Horticultural & Herbal Science (NIHHS) of the Rural Development Administration (RDA) in Korea. It was first selected as PA7-1657 in 2004 for its high fruit quality with attractive appearance. After further evaluation of its characteristics, it was named as 'Harmony' in 2007. It blooms almost same time as 'Harcot'. Since its anthers have no pollen, apricots blooming at the same time should be co-planted to facilitate insect pollination. 'Harmony' ripens in early July at Suwon (127.01°E, 37.17°N) Korea, 5 days later than 'Harcot' and 27 days earlier than 'Soldam'. Fruit is round and skin color is reddish orange. Fruit flesh is light orange, marketably firm, sweet and adherent to the pit. Average fruit weight is 71.3 g and total soluble solids concentration is 13.4 °Brix.

Interspecific hybridization is a technique commonly adopted by plant breeders to transfer genes from one species to another. Breeders resort to interspecific hybridization when the characters are absent or inadequately expressed at the intraspecific level. Stone fruit breeders have used interspecific hybridizations to improve *Prunus* cultivars and rootstocks, particularly in the subgenus *Prunophora* (plums) because these species tend to intercross more freely than other subgenera (2, 3, 6, 11).

Interspecific hybrids that originate from crosses between plums (*Prunus salicina* Lindl., *P. cerasifera* Ehrh. or their hybrids) and apricots (*P. armeniaca* L.) are referred to as plumcots (6, 7). Natural plumcots have a long history in regions of the world where both apricots and myrobalan plums (*P. cerasifera*) grow wild, such as in southwest Asia. Most of these plumcots have red or purple fruit skin with light fuzz and their fruit tends to be small and sour. Artificial interspecific crossing among plums, apricots, and Japanese apricots (*P. mume*) have recently been made (3, 5, 8, 11) and as a result, several new plumcot cultivars have been released (7). The development of new cultivars for table fruits as well as rootstocks is urgently needed to solve certain problems in *Prunus* production, such as fruit cracking in apricot, frost injury in Japanese apricot and susceptibility to bacterial leaf spot (*Xanthomonas campestris* pv. *Pruni* (Smith) Dye) in Japanese plum (*Prunus salicina* Lindl.).

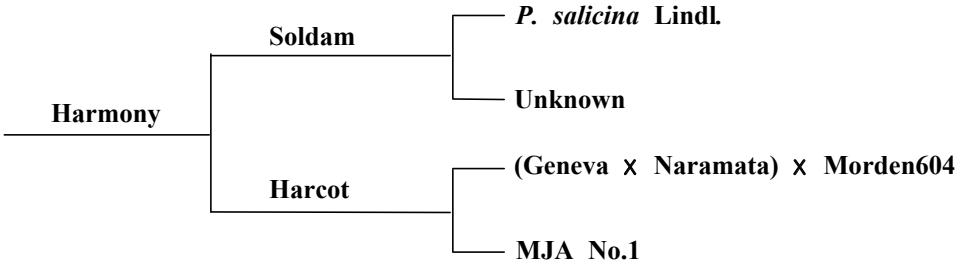
The National Institute of Horticultural & Herbal Science (NIHHS), Suwon, Korea, has conducted interspecific crossing between Japanese plum and apricot to breed new plumcot cultivars with good fruit quality, and to breed new cultivars resistant to bacterial leaf spot and fruit cracking. 'Harmony', the first plumcot cultivar released by NIHHS, produces very attractive and flavorful fruits for the fresh market.

Materials and Methods

To develop new plumcot cultivars, a cross between 'Soldam' Japanese plum and 'Harcot' apricot was made in 1999 at the NIHHS, RDA in Korea (Fig. 1). Twenty three seedlings from the cross were transplanted into a breeding block in 2000. Of the seedlings, PA7-1657 was initially selected and grafted onto wild peach seedling (*Prunus persica* L.) rootstock in 2004. Three grafted trees and the original seedling were evaluated for tree and fruit characteristics following the manual for agricultural investigation (10) and UPOV guidelines for the conduct of tests for distinctness, uniformity and stability for apricot (4). Fruit

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Fig.1. Pedigree of 'Harmony plumcot.



thinning was carried out to prevent biennial fruiting. The final distance between fruits at harvest was maintained at a spacing of 6 to 8 cm. For evaluation of fruit characteristics, five fruits per tree were taken from four trees at ripening time for each of 3 years from 2006 to 2008.

The chlorophyll concentration in leaves (SPAD value) was measured by a SPAD-502 instrument (Minolta, Japan).

Natural infections of brown rot (*Monilinia fructicola* (Winter) Honey) and bacterial leaf spot (*Xanthomonas campestris* pv. *pruni*) were assessed under field conditions, using the 1 to 5 scale defined in the footnotes of Table 1.

Description

Tree characteristics. Trees of 'Harmony' are vigorous with upright growth (Table 1). Flower buds are predominantly distributed on one-year-old shoots. Precocity is similar to 'Harcot' on wild peach rootstock, with the onset of fruiting in the third year. 'Soldam' had elliptic leaf shape, whereas 'Harcot' was circular. However, leaf blades of 'Harmony' are obovate with a right angled tip. Leaf green color is more intense than that of 'Harcot' with the chlorophyll concentration of 'Harmony' being higher than that of 'Harcot'. Leaf length and width are intermediate between those of 'Soldam' and 'Harcot'. Leaf blade margin is bicrenate like that of 'Soldam' but the petiole length of 'Harmony' is longer than that of 'Soldam'. 'Harmony' had no brown rot and bacterial leaf spot infection during the observation period (Table 1).

Bloom characteristics. Flowering is abundant in 'Harmony'. Two or three flowers arise from each lateral bud. 'Harmony' has flowers of 2.44 cm diameter with five white petals (Table 1 and Fig 2). The style is straight with the stigma emerging below or at the same level as the anthers at anthesis. There are some flowers with 2 or 3 styles. Pistil length is shorter than the mid-parent value. Anthers are a pale yellow color with no pollen. 'Harmony' has pubescent ovaries like 'Harcot'. However, the color of the calyx inner side is greenish yellow like 'Soldam'. Pedicel length is shorter than that of 'Soldam' (Table 1).

'Harmony' has medium chilling requirements for breaking dormancy, about 941 ±



Fig.2. Flowers and fruits of plumcot cultivar 'Harmony' plumcot.

Table 1. Comprehensive analysis of tree, leaf, flower and fruit characteristics of interspecific hybrid 'Harmony', its female parent 'Soldam' (*Prunus salicina* Lindl.), and its male parent 'Harcot' (*P. armeniaca* L.) at Suwon, Korea, 2006-2008.

Characteristics	Soldam	Harmony	Harcot
Tree			
Vigor	Medium	Strong	Medium
Habit	Spreading	Upright	Upright to spreading
Degree of branching	Medium	Strong	Medium
Brown rot susceptibility[z]	1	1	1
Black spot susceptibility[z]	2	1	1
Leaf			
Shape	Elliptic	Obovate	Circular
Length (cm)	11.44 ± 0.66[y]	8.51 ± 0.66	6.32 ± 0.58
Width (cm)	4.50 ± 0.83	5.34 ± 0.57	5.50 ± 0.41
Angle of leaf apex	Right-angled	Right-angled	Obtuse
Shape of leaf base	Acute	Truncate	Truncate
Incisions of leaf margin	Bicrenate	Bicrenate	Crenate
Length of petiole (cm)	2.07 ± 0.39	2.49 ± 0.33	3.23 ± 0.60
SPAD value	42.86 ± 1.58	41.63 ± 0.43	38.18 ± 0.49
Flower			
Full bloom date	17 April	12 April	11 April
Blooming period (days)	6	11	7
Flower diameter (cm)	2.02 ± 0.16	2.44 ± 0.20	2.77 ± 0.20
Petal color	White	White	Pink
Number of pistil	1	1-3	1
Pistil length (cm)	0.75 ± 0.07	1.05 ± 0.08	1.86 ± 0.12
Position of stigma relative to anthers	Below	Below to same	Above
Pollen of anther	Abundant	Little	Abundant
Pubescence of ovary	Absent	Present	Present
Color of calyx inner side	Greenish yellow	Greenish yellow	Orange
Length of flower stalk (cm)	0.85 ± 0.12	0.25 ± 0.05	0.10 ± 0.00
Fruit			
Ripening date	4 August	8 July	3 July
Pubescence of fruit skin	Absent	Present	Present
Shape	Round	Round	Obovate
Fruit height (cm)	4.70 ± 0.03	5.12 ± 0.43	5.24 ± 0.10
Fruit diameter (cm)	4.88 ± 0.04	5.07 ± 0.38	4.71 ± 0.11
Fruit weight (g)	64.5 ± 0.71	71.3 ± 12.0	67.5 ± 3.5
Firmness[x]	4.0 ± 0.3	3.9 ± 0.7	3.5 ± 0.5
Flesh color	Red	Light orange	Dark orange
Soluble solids concentration (°Brix)	13.2 ± 1.1	13.4 ± 1.2	12.3 ± 1.1
Acidity (%)	0.56 ± 0.01	1.07 ± 0.08	1.49 ± 0.03

Table 1. *continued*

Adherence of stone to flesh	Cling	Cling	Free
Stone shape	Elliptic	Obovate	Obovate
Stone height (cm)	1.91 ± 0.81	2.76 ± 1.09	2.83 ± 0.78
Stone diameter (cm)	1.42 ± 0.64	1.94 ± 0.94	2.22 ± 0.93
Dry stone weight (g)	0.84 ± 0.06	1.81 ± 0.16	2.70 ± 0.19

[z]Degree of susceptibility to brown rot (*Monilinia fructicola* (Winter) Honey) and black spot (*Xanthomonas campestris* pv. pruni (Smith) Dye): 1 = 0 to 5%, 2 = 6 to 15%, 3 = 16 to 25%, 4 = 25 to 35%, and 5 = more than 36% of fruit infected on the tree 60 days after full bloom.

[y]Each value is expressed as mean ± standard deviation.

[x]Subjective firmness ratings: 1 = least desirable, 3 = commercially acceptable, and 5 = most desirable

17.5 chill units (9). Full bloom (defined as ≥ 80% of flowers open) occurred about 12 April (± 4 days; average of 3 years), one day later than that of 'Harcot'. 'Harmony' should be planted adjacent to other apricots blooming at the same time to facilitate insect pollination since flowers produce no pollen and are cross-incompatible with other plumcots and Japanese plums (5).

Fruit characteristics. Fruits ripen 87 days after full bloom, typically in early July at Suwon, 5 days later than 'Harcot' which is the latest maturing apricot cultivar in Korea (Table 1). Fruit shape is round, and skin color is reddish orange with very short fuzz. The fruit flesh color is greenish yellow when immature, but changes to light orange as the fruit ripens (Fig 2). Fruit size is large (71.3 g average fruit weight). Total soluble solids concentration is 13.4 °Brix, similar to that of 'Harcot'. Flesh firmness is adequate for fresh market use, and the flavor is very good when fully ripe. The flesh texture and flavor are intermediate to both Japanese plum and apricot. Our observations indicate that fruit cracking is less than that of 'Harcot'. The flesh is adherent to the pit like 'Soldam' (Fig 2). The pits are larger than the mid-parent mean and obovate in shape. 'Harmony' possesses many of the desired characters for growers and consumers who want more attractive and flavorful fruits.

Molecular characterization. Five simple sequence repeat (SSR) markers previously developed for peach (1) were screened for polymorphism in 'Harmony' plumcot DNA (Table 2). These five SSR markers were able to distinguish 'Harmony' from its parents. The DNA fingerprints of 'Harmony' and its parents 'Soldam' and 'Harcot' are shown in Table 2 and Fig 3.

Availability

Protection for 'Harmony' was achieved in 2009 and for registration will be achieved in 2011 following two years of records on distinctness, uniformity and stability according to Korean Seed Industry Law. Propagation material of 'Harmony' will be available after cultivar registration. Requests for scions for research purposes may be addressed to Ji Hae Jun (jun0810@korea.kr).

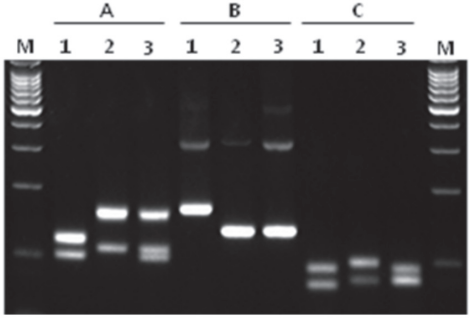


Fig. 3. Allelic segregation of the peach simple sequence repeat (SSR) marker, UDP96-005 (A), UDP96-008 (B), and UDP96-010 (C). M, molecular-size marker; 1, Soldam; 2, Harcot; 3, Harmony.

Table 2. Molecular characteristics of 'Harmony' plumcot cultivar and its parents 'Soldam' (*Prunus salicina* Lindl.), and 'Harcot' (*P. armeniaca* L.) using peach SSR markers.

		Size of amplified bands (bp)		
SSR marker	Reference	Soldam	Harmony	Harcot
UDP96-001	Cipriani et al., 1999	202/202	202/215	215/215
UDP96-003	Cipriani et al., 1999	170/170	170/190	190/202
UDP96-005	Cipriani et al., 1999	200/225	200/265	218/265
UDP96-008	Cipriani et al., 1999	270/410	245/410	245/410
UDP96-010	Cipriani et al., 1999	155/185	165/185	165/198

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Using Composted Mulch in Vineyards – Effects on Grape Yield and Quality

The impacts of composted mulch were studied over three years across six vineyards in central New South Wales, Australia. Yield increases (~1 t·ha^{-1}) from mulch were found only in the low yielding areas and under the highest mulch rate (153 m^{-3}·ha). Mulch also significantly increased berry potassium concentration and pH. The yield increases were attributed to the improved soil moisture and soil temperature conditions of the mulched soil. Paraphrased from K.Y. Chan et al., 2010. International Journal of Fruit Science 10(4): 441-453.