

'Spring Satin' Plumcot

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Hybrids between plums (*Prunus salicina* Lindl., *P. cerasifera* Ehrh. or their hybrids) and apricots (*P. armeniaca* L.) are referred to as plumcots. 'Spring Satin' is a large, high-quality, early-ripening fruit that is well-adapted to the humid climate of the southeastern United States. 'Spring Satin' is the first plumcot cultivar released by a public breeding program. This paper will review the origin and history of plumcots as well as describe 'Spring Satin' and its origin.

Plums are placed in the *Prunophora* sub-genus to separate them from peaches, almonds and cherries based on having sutured fruit with a waxy bloom, solitary axillary buds, and no terminal buds (13). Peaches and almonds differ by having three axillary buds with usually sessile, solitary flowers, and conduplicate (rolled) leaves in a terminal bud. Plums are distinguished from cherries by the lack of a terminal bud, the presence of a suture and a waxy bloom on the fruit, and a flatter pit. Within the *Prunus* sub-genus *Prunophora*, the section *Euprunus* contains the Asian and European species of plums, which normally have 1-2 flowers per bud, an often sculptured stone, and their leaves rolled in the bud (13). The section *Prunocerasus* contains the American plum species which have 3 or more flowers per bud, a smooth stone and their leaves folded in the bud. However the Asian species appear to fit better in *Prunocerasus* both taxonomically and horticulturally. The section *Armeniaca* holds the apricots which have pubescent

fruit and their leaves rolled in the bud.

Plumcots. Natural plumcots have a long history in regions of the world where both apricots and myrobalan plums (*P. cerasifera*) are traditionally grown such as in southwest Asia (9, 11). Most of these plumcots have red or purple fruit with light fuzz, although some are glabrous. Typical of the plum parent, their fruit tends to be acidic and small. The first European report was by Nolin and Blavet in 1755, who described the "violet apricot" (11). These plumcots were common enough to merit their own species name, *P. × dasycarpa* Ehrh., in 1791 (11). Manaresi studied these local cultivars, also referred to as "Pope's apricot", "black apricot" and "biricoccolo", for many years (11). Red-skinned cultivars 'Grossa Precoce' and 'Pruna cresammola' are still grown in Italy. Several cultivars have made it to the US, including 'Irani Olju', 'Tlor Csiran', 'Mesch Mesch Amrah' and 'Mirocais'.

'Long Yuan Huang Xing' and 'Jin Huanghou' are two yellow-skinned, yellow-fleshed plum-apricot hybrids produced in northern China (Ruijuan Ma, personal communication: 16). 'Long Yuan Huang Xing' is an intentional hybrid, while 'Jin Huanghou' is a natural hybrid. 'Rikyo' ('Sumomo Anzu') 'Rikoukyo' ('Li Guangxing') and 'Jinkyo' ('Nianzu') are apparent plum-apricot hybrids introduced from China to Japan over a century ago. The first two have pubescent plum-like fruit. The third is more cot-like but with white flowers like plum (14, M. Yamaguchi, person-

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al communication). Other potential plumcots include plums described as pubescent: 'Anshanxingli', 'Changlixingmei', 'Xiandahuan-gli', 'Xingmeili' and 'Zhuanzhongli' (15).

'Sumomoume' is thought to be a natural hybrid of plum and Japanese apricot, *P. mume* (Sieb.) Sieb. & Zucc. It has attractive red skin and large size, with pubescent fruit similar to mume. Found in Wakayama Prefecture, it is not grown commercially because it does not crop reliably (14). Breeders at the Tsukuba Fruit Tree Research Station developed several plum-mume hybrids, including 'PM-1-1' ('Sumomoume Chuukan-bohon Nou-1gou') and 'PM-1-4' ('Sumomoume Chuukannbohon Nou-2gou'). These fruits have larger size and more red color than mume, but retain the highly acid flavor of mume. They are little grown due to low productivity and cracking of the fruit (10).

Another hybrid, *P. × blireiana* Andre was found in 1895 as an apparent hybrid of *P. cerasifera atropurpurea*, the common redleaf plum, with a double-flowered form of *P. mume* (13). This hybrid is still in the trade as an ornamental because it has red leaves and attractive pink double flowers. Apparently the double-flowered trait was dominant in this case. The fruit was not described, apparently because it fruits so rarely. Over the years our trees have had a few small, dark red fruit with light pubescence and red clingstone flesh. The fruit quality is very acidic but otherwise palatable.

In 1908 South Dakota breeders released 'Yuksa', a shrubby hybrid of *P. besseyi* Bailey with apricot (6). Although their goal was to improve hardiness of apricot, they reported this particular hybrid was sterile. This hybrid fruited once at Byron, having small, purple clingstone fruit with pubescence.

Luther Burbank introduced several plumcots in the early 1900's including 'Apex' and 'Rutland', but mostly as novelties. According to Howard (7) Burbank was criticized for

claiming that he had made this interspecific cross and gotten fertile seeds from the offspring. Reportedly most of the hybrids had defective flowers or were sterile. Burbank may have originated the term "plumcot", as he used it at least as early as 1914. King (8) later studied some of these and other putative hybrids morphologically and cytologically. He concluded that 'Rutland', 'Stanford', 'Red Bud' and 'Poe Royal Cotplum' were true hybrids. He considered 'Apex', 'Francis' and 'Gustosa' to be pure plum, and 'Apricot-Plum' to be an apricot. "Apex" and 'Apricot-Plum' both had some chromosomal abnormalities, and in retrospect might be offspring of plumcots.

Breeders at Rutgers University in New Jersey found plumcots were easy to produce if one used 'Methley' plum rather than an apricot as the female parent,. Flesh color ranged from white to yellow to red, while skin color ranged from red to yellow. They produced little normal pollen and cropped poorly (12). Comparison of these plumcots using isozymes suggested they could be clearly distinguished from either species by use of peroxidase isozymes (2).

In the last 25 years private breeders in California have released many plumcot cultivars, such as 'Red Velvet,' 'Royal Velvet,' 'Flavor Supreme,' 'Flavor Delight,' 'Flavor Queen,' 'Plum Parfait,' 'Dapple Dandy' and others (Table 1). Most of the initial wave of plumcots were not very productive, which reduced their commercial value, although some had excellent eating quality. True plumcots do possess distinct flavor components (3, 4).

After backcrossing and intercrossing these plumcots, it has become difficult to distinguish hybrids from plums. In 1991 Zaiger Genetics trademarked the terms "pluot" and "aprium" for use with fruit trees, presumably to label their hybrids that resembled the plum parent or the cot parent, respectively. In 1998 Michael G. Jackson of Kingsburg,

Table 1. Plumcot and related hybrid cultivars patented in the United States, including reported peach x plum (*) and nectarine x plum (**) hybrids (from U.S. Patent and Trademark Office).

Patent Number	Cultivar	Breeder	Date
4338	Plum Parfait	Zaiger	1978
6763	Flavor Supreme	Zaiger	1989
7011	Red Velvet	Bradford	1989
7090	Flavor Delight	Zaiger	1990
7420	Flavor Queen	Zaiger	1991
7431	Royal Velvet	Bradford	1991
8026	Flavor King	Zaiger	1992
8393	Tri-Lite *	Zaiger	1993
8470	Flavorella	Zaiger	1993
8546	Flavorich	Zaiger	1994
9254	Dapple Dandy	Zaiger	1995
10285	Flavorosa	Zaiger	1998
10292	Honey Rich	Zaiger	1998
10386	Geo Pride	Zaiger	1998
10608	Flavor Heart	Zaiger	1998
10899	Flavor Ann	Zaiger	1999
10915	Flavor Gem	Zaiger	1999
11258	Miwang	Korea	2000
11609	Flavorite	Zaiger	2000
11990	Flavorfall	Zaiger	2001
12074	Flavor Gold	Zaiger	2001
12097	Flavor Grenade	Zaiger	2001
12409	Dapple Fire *	Zaiger	2002
12774	Tasty Rich	Zaiger	2002
12936	Flavor Treat	Zaiger	2002
12943	Crimson Heart	Zaiger	2002
13134	Black Kat	Zaiger	2002
13502	Flavor Jewel	Zaiger	2003
13503	Spicezee **	Zaiger	2003
13505	Royal Treat	Zaiger	2003
13526	Yuba Gold *	Zaiger	2003
13530	Early Dapple	Zaiger	2003
13687	Sierra Rose	Zaiger	2003
14571	Spring Flavor	Zaiger	2004
14583	Splash	Zaiger	2004
14599	Emerald Gem	Zaiger	2004
15088	Marcia's Flavor	Zaiger	2004
15235	Plumsweetthree	Bradford	2004

CA trademarked the name ‘Dinosaur Egg’ to market fresh fruit with a mottled appearance, such as ‘Dapple Dandy’.

The California industry has recently begun using the term “interspecific” to describe these plumcot derivatives although the term overlooks the fact that most Japanese plums are already just that. Confusion over what is legally a plum affects marketing orders, grade standards, monetary box assessments, and pesticide usage (5). A recent molecular

study compared DNA of pluots ‘Black Kat’, ‘Dapple Dandy’, Flavor Fall’, ‘Flavor Grenade’, ‘Flavorich’, and ‘Flavorosa’ to that of 14 plum cultivars, 7 apricots, and ‘Flavorella’ plumcot (1). The plums and apricots each carried numerous markers unique to that group. There was no evidence of apricot markers in any of the pluots tested, whereas the plumcot had genetic material from both apricot and plum. If this analysis is correct, then at least some of the cultivars marketed

as plum-apricot hybrids are descended from plums only. In any case, the marketing of these pluots as distinct from plums has allowed a wider range of fruit to be marketed, in terms of appearance and quality.

USDA Stone Fruit Breeding. The United States Department of Agriculture (USDA) stone fruit breeding in Georgia began in 1937 at the Horticultural Fruit Laboratory in Fort Valley, in the center of the main peach production area of Georgia. John Weinberger was the peach breeder from 1937-1954, when he transferred to Fresno, California to begin the peach and plum breeding there. Victor E. Prince continued the breeding in Georgia. In 1964, the program was moved 20 miles east from Fort Valley to the newly opened Southeastern Fruit and Tree Nut Research Laboratory in Byron. Prince began testing plums in 1958 and started making crosses in 1964 after moving to Byron. Much of the early seed for evaluating came from Weinberger in Fresno, who was also breeding plums at that time. Unfortunately the large attractive California plums could not survive in the humid climate of Georgia. The California plum germplasm was crossed with southern cultivars such as 'Morris', 'Methley', 'Bruce' and the native wild plum, *Prunus angustifolia* Marshall to combine fruit quality and adaptability. In 1972 James M. Thompson took over the plum breeding. Before he retired in 1986, Thompson released 4 plums – 'Robusto', 'Segundo', 'Byrongold' and 'Explorer'. Three more plums, 'Rubysweet', 'Black Ruby' and 'Ruby Queen' have been released since then. Since 1964, over 56,000 plum seedlings have been grown.

Apricot breeding has been a minor effort at Byron since 1964. Apricot seedlings are easy to grow but they are short-lived in the Southeast and rarely fruit well. The desirability of locally adapted apricots drives the program. About 25,000 seedlings, many of diverse ori-

gin, have been grown to date, and it is clear that apricots are rarely as broadly adapted as peaches or plums. It has been difficult to make local progress in apricot breeding when the trees die young and rarely fruit. A few selections look promising but most of the seedlings have been a complete failure. As Jim Thompson aptly put it "we haven't improved longevity, but we have lost size". Although there was no direct effort to produce plumcots, Thompson released a chance plumcot, BY69-1637P, as a plumcot breeding line because of its size and firmness, and cross-fertility to both parent species. Unfortunately it is quite tart and crops only lightly.

Our current goals in both plum and apricot breeding are to combine good quality, large, firm fruit with consistent production on a healthy long-lived tree. Resistance is needed to *Pseudomonas syringae* pv. *syringae* van Hall (bacterial canker), *Xanthomonas arboricola* pv. *pruni* (Smith) Vauterin et al. (bacterial leafspot and twig canker), and *Xyella fastidiosa* Wells et al. (plum leaf scald). Most of our selections are highly resistant to the first two but only tolerant of the last, which is the disease that finally kills them. Combined with a disease-resistant tree we need fruit that is large, firm and of good flavor and texture. Late blooming is needed to ensure a crop every year.

Spring Satin. 'Spring Satin' originated as an open-pollinated seedling of BY8111-6 planted in 1988. The pollen parent is unknown but presumed to be one of the apricots planted nearby. BY8111-6 is a high-quality plum from a cross of BY4-601 x 'Frontier'. BY4-601 was 'Queen Ann' x 'Santa Rosa', seed for which was obtained from California in 1963 and planted at Byron, GA by V.E. Prince. 'Spring Satin' was selected in 1991, and tested as BY88Z1092.

'Spring Satin' blooms with 'Methley' plum and with peaches having a chilling requirement of about 750 hours below 5°C.

Flowers are white like plums, 2 centimeter in diameter, and are borne in clusters of 2-3. The anthers shed moderate quantities of pollen. 'Spring Satin' should be planted adjacent to other plums or apricots blooming at the same time to facilitate insect pollination since flowers are only partially self-compatible. Trees caged with a beehive but no other pollen source have set lightly. In most years thinning has been required to reduce fruit set and increase fruit size.

Fruit of 'Spring Satin' ripen in late May at Byron, about 2-3 weeks before 'Santa Rosa' and 'Morris'. Skin color is reddish-black to black, with very short fuzz. The flesh is yellow or yellow-orange when immature, changing to yellowish-red as the fruit matures. Flesh is firm with very good flavor when it softens, in contrast to the soft, insipid flesh of most early plums in the Southeast. Firm ripe fruit tends to be quite tart. With proper thinning, 5 centimeter (2 inch) fruit size is possible. Fruit shape is round to oblate. The medium-sized pit is clingstone. Flavor tends to be tarter at the pit.

Trees of 'Spring Satin' on peach rootstock are moderately vigorous with upright growth. Trees appear to be compatible with common peach rootstocks such as Guardian®, Lovell, NemaGuard and Halford. Tree health at Byron is much better than 'Santa Rosa' or 'Ozark Premier' but less than that of 'Robusto' or 'Byrongold'. 'Spring Satin' appears moderately resistant to bacterial spot disease and to bacterial canker disease, but only tolerant of plum leaf scald. 'Spring Satin' has performed well in central Georgia and northern Texas and is recommended for trial in areas with similar climates.

The Agricultural Research Service has no trees of 'Spring Satin' for distribution. Limited amounts of budwood are available from the author. Trees are available from several eastern nurseries that propagate peaches. Budwood requests from foreign countries

must include proper import permits and should be made to the NRSP5/IR-2 Fruit Tree Collection (NRSP5/IR-2, IAREC, Washington State University, Prosser, WA 99350) where 'Spring Satin' is available as virus-indexed budwood. There are no restrictions on the plant material. It is requested that appropriate recognition be given when this germplasm contributes to the development of a new breeding line or cultivar.

'Spring Satin' possesses many of the desired characters for a Southeastern plum. As a result we are using it extensively as a parent to develop additional adapted plumcots. It is likely that more plumcots and related hybrids will be developed and released worldwide to supply the needs of growers and consumers for high-quality fruit.

Literature Cited

1. Ahmad, R., D. Potter, and S.M. Southwick. 2004. Identification and characterization of plum and pluot cultivars by microsatellite markers. *J. Hort. Sci. Biotech.* 79:164-169.
2. Byrne, D.H. and T.G. Littleton. 1989. Interspecific hybrid verification of plum X apricot hybrids via isozyme analyses. *HortScience* 24:132-134.
3. Gomez, E. and C.A. Ledbetter. 1993. Transmission of biochemical flavor constituents from apricot and plum to their interspecific hybrid. *Plant Breeding* 111:236-241.
4. Gomez, E., C. A. Ledbetter, and P. L. Hartsell. 1993. Volatile compounds in apricot, plum, and their interspecific hybrids. *J. Agr. Food Chem.* 41:1669-1676.
5. Brantley, W. 2004. About pluots. *Gastronomica* 4(3):84-89.
6. Hansen, N.E. 1937. Fruits, old and new and northern plant novelties. *South Dakota Agr. Expt. Sta. Bul.* 309.
7. Howard, W.L. 1945. Luther Burbank's plant contributions. *California Agr. Expt. Sta. Bul.* 691.
8. King, J.R. 1940. Cytological studies on some varieties frequently considered as hybrids between the plum and the apricot. *Proc. Amer. Soc. Hort. Sci.* 37:215-217.
9. Komarov, V.L. (ed). 1941. *Flora of the U.S.S.R. Volume X. (English Translation). Botanicheskii Institut Akademii Nauk SSR, Moscow*, pp.380-448.
10. Kyotani, H., M. Yoshida, M. Yamaguchi, Y. Ishizawa, T. Kozono, T. Nishida, and K. Kanata. 1988. Breeding of plum-mume parental lines 'PM-1-1'

- and 'PM-1-4' interspecific hybrids of Japanese plum (*Prunus salicina* Lindl.) and mume (*P. mume* Sieb. et Zucc.). Bull. Fruit Tree Res. Sta. A15:1-10.
11. Manaresi, A. 1950. On the origin and genetic constitution of the black apricot *Prunus dasycarpa* Ehrh. (In Italian). Memorie Accademia Scienze Istituto di Bologna. Series X, Vol. VII, 1949-50. 19 p.
 12. Ramming, D. 1976. Diploid plum X apricot interspecific hybrids. Fruit Var. J. 30:17.
 13. Rehder, A. 1940. Manual of cultivated trees and shrubs hardy in North America. MacMillan, New York.
 14. Yoshida, M. 1987. Interspecific hybrids in plum, mume and apricot. Kajushubyou 25:1-5, 17.
 15. Zhang, J. and E. Zhou. 1998. China Fruit-Plant Monograph Vol. 4. Plum Flora. (In Chinese). China Forestry Publishing House, Beijing.
 16. Zhang, J. and J. Zhang. 2003. China Fruit-Plant Monograph Vol. 10. Apricot Flora. (In Chinese). China Forestry Publishing House, Beijing.



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