Journal of the American Pomological Society 64(2): 106-109 2010

Yield and Fruit Weight of Japanese Plum (*Prunus salicina* Lindl.) Cultivars in Turkey

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Abstract

A Japanese plum cultivar trial (*Prunus salicina* Lindl.) was conducted in Turkey from 2004 to 2007 to identify the cultivars that perform best in the dry Mediterranean climate of the Mut-Mersin area. 'Black Beauty', 'Fortune', 'President', 'Angeleno', 'T.C Sun', 'Globe Sun', 'Autumn Giant', 'Obilnaja', 'Bella Di Barbiano', 'October Sun', 'Queen Rosa', 'Black Amber', 'Black Diamond' and 'Original Sun' all, on Myrobalan rootstock, were arranged in a randomized complete block design with six replicate trees per cultivar. Flowering periods, harvest date, yield and fruit weight were determined. Cumulative yield ranged from 16 kg·tree ('Original Sun') to 74 kg·tree ('Black Beauty'). 'Black Beauty', 'Obilnaja' and 'Queen Rosa' were the most productive and yield efficient, and 'Original Sun' and 'Bella Di Barbiano' were the least productive cultivars. 'Black Diamond', 'Queen Rosa', 'October Sun' and 'Autumn Giant' had the largest fruit and 'Obilnaja' and 'Original Sun' had the smallest. Date of full bloom ranged from 15 March for 'Black Beauty' to 4 April for 'T.C Sun'. 'Black Beauty', 'Obilnaja' 'Queen Rosa' 'Black Diamond', 'October Sun' and 'Autumn Giant' cultivars were the best for the Mut-Mersin area.

Plums [(*Prunus cerasifera* (Ehrh.), *P. domestica* (L.) and *P. salicina* (Lindl.)] are grown widely worldwide, ranging from the cold climate of Siberia to the subtropical conditions of the Mediterranean region. In Turkey, Japanese plums (*P. salicina*) are the type most commonly grown. They are better adapted to the Mediterranean region than are European plums (8). The total annual plum production of Turkey is 240,874 MT, and Turkey had about 9 million plum trees in 2007 (3).

Japanese plum production in Turkey is increasing (9). Until the year 2000, 'Santa Rosa' and 'Formosa' were the most popular cultivars in the Mediterranean region of Turkey, but now many growers prefer newer cultivars such as 'Black Beauty', 'Black Amber' and 'Black Diamond'. These new cultivars have more persistent spurs, and more numerous flowers than 'Santa Rosa' and 'Formosa'. They are also more precocious, productive, and disease-resistant, have more attractive fruit, and are better adapted than older cultivars. The availability of these new, more desirable cultivars has led progressive, growers in the Mut-Mersin of Turkey to seek information on the adaptation of such cultivars to the conditions in their region.

Mut (36º38´ N; 33º43´ E; elevation 375 m), a small town in the Mersin province of western Turkey, is the most important apricot growing center in the Mediterranean region of Turkey. The climate is rather warm and dry (mean annual maximum temperature, 23.5º; mean annual minimum temperature 15.2º; mean annual rainfall; 29,24 cm) with low humidity (20-30%) in the spring and summer, so disease pressure is low. The aim of this research was to identify the Japanese plum cultivars best suited for commercial production in the Mediterranean climate of the Mut-Mersin area.

Materials and Methods

Data were collected on trees of 14 Japanese plum cultivars from 2004 to 2007. The cultivars were: 'Angeleno', 'Autumn Giant', 'Bella Di Barbiano', 'Black Amber', 'Black Beauty' 'Black Diamond', 'Fortune', 'Globe Sun', 'Obilnaja', 'October Sun', 'Original Sun', 'President', 'Queen Rosa' and 'T.C Sun'. All trees were propagated on Myrobalan rootstock in 2002. Scions of the plum cul-

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tivars were taken from Ataturk Central Horticultural Research Institute of Yalova, and grafted in 2002; the trees were 2 yr old at the beginning of the trial. Trees were arranged in a randomized complete block design with two trees per cultivar in each block, and three blocks (6 trees per cultivars). The trees were drip-irrigated and trained to a vase shape and spaced 5 x 5 m apart (400 trees·ha-1). Each year, the fruit were hand-thinned to a spacing of 12-13 cm apart on fruiting limbs between petal fall and pit-hardening. Current spray schedule recommendations provided by the directorate of the county agriculture of Mut-Mersin were followed for insect and disease control, and glyphosate was used for weed control (2).

The soil texture at the experimental site is sandy loam. It is medium (3.1%) in organic matter, with 0.139% nitrogen, 33.5 ppm exchangeable phosphorus, 270.8 ppm potassium, neutral pH and no soluble salt problem (1).

For each cultivar the date of full bloom (DOFB) was recorded as the time when 90% of the flowers were open, and the date of harvest maturity was determined by visual observations and fruit color changes (from green to red and black). Trunk diameter was measured 20 cm above the ground annually beginning in fall of 2004, and expressed as a trunk cross-sectional area (TCA). Yield per tree was obtained annually, and yield efficiency ($g \cdot cm^2$ TCA) was the cumulative yield divided by final TCA. For fruit size estimation, 90 randomly selected fruits (30 fruit per block x 3 blocks), were sampled from each cultivar when the fruit color changed from green to black.

Data were analyzed with ANOVA (COSTAT, Izmir, Bornova, Turkey) and whenever significant differences among cultivars were detected, the means were separated with Tukey's HSD test at the 5% level of significance (6). No missing data values occurred during the trial.

Results and Discussion

Trees of 'Black Beauty' and 'Oblinaja' bloomed earliest while those of 'T.C Sun', 'President' and 'October Sun' bloomed later than other tested cultivars (Table 1). Caliskan et al. (5) also found the DOFB ranged from mid-March to the first week of April in 15 plum cultivars at Erdemli, Turkey, and Balik (4) previously reported that 'Black Beauty'

Table 1. Mean date of full bloom (DOFB) and date of maturity of Japanese plum cultivars in Mersin, Turkey over four years (2004-2007)[z].

Cultivar	DOFB	Date of fruit maturity
Black Beauty	15 March	15 June
Obilnaja	16 March	16 June
Black Amber	18 March	16 July
Black Diamond	18 March	17 July
Globe Sun	18 March	20 August
Bella Di Barbiano	19 March	26 July
Fortune	19 March	18 July
Angeleno	20 March	5 September
Queen Rosa	22 March	14 July
Original Sun	24 March	23 August
Autumn Giant	26 March	1 September
President	3 April	24 August
October Sun	3 April	21 August
T.C. Sun	4 April	4 September

[z]n=6 trees for each cultivar

Table 2. Trunk cross-sectional area (TCA), mean cumulative yield, yield efficiency and fruit size of Japanese plum cultivars in Mersin, Turkey over four years (2004-2007)[z].

Cultivar	TCA (cm^2)	Yield ($kg \cdot tree^{-1}$)	Yield efficiency ($g \cdot cm^{-2}$)	Fruit weight (g)
Black Beauty	83 a	74 a	896 a	83 d
Obilnaja	80 a	63 b	791 b	50 i
Queen Rosa	73 b	57 b	776 b	91 b
Fortune	72 b	36 cde	503 i	78 e
President	59 c	28 ef	476 j	66 g
Autumn Giant	59 c	35 cde	597 fg	88 bc
Globe Sun	58 c	35 cde	602 f	78 e
Black Diamond	58 cd	37 cd	639 e	97 a
October Sun	55 cd	32 cde	581 gh	88 bc
Angeleno	55 cd	31 cde	565 h	71 f
Black Amber	54 cd	38 c	701 d	86 cd
T. C. Sun	53 d	30 de	565 h	59 h
Bella Di Barbiano	48 e	21 fg	439 k	61 h
Original Sun	43 e	16 g	371 l	51 i
HSD	2.8	8.1	17.9	2.8

[z] Means within a column not followed by a common letter are significantly different bty Tukey-Kramer HSD, $P \leq 0.05$

was an early blooming cultivar.

The time of fruit maturity ranged from mid-June to the first week of September (Table 1). 'Black Beauty' and 'Oblinaja' ripened a month before any of the other cultivars (15-16 June). These findings are in agreement with those of other studies done in different ecological regions of Turkey (4, 5).

'Autumn Giant', 'T.C Sun' and 'Angeleno' were the latest ripening cultivars and matured in the first week of September (Table 1). Ozguven et al. (8) evaluated 8 plum cultivars in the Cukurova region of Turkey and found that 'Black Amber' was among the earliest to mature. However their harvest date (26 June) was much earlier than ours (14-17 July), probably because of the different altitude.

TCA of the plum cultivars ranged from 43 cm2 to 83 cm2 (Table 2). From the point of view of tree vigor, 'Black Beauty' and 'Obilnaja' plums were superior to the others, and 'Bella Di Barbiano' and 'Original Sun' plums exhibited weak growth. These data agree with the results of Caliskan et al. (5).

'Black Beauty', 'Obilnaja' and 'Queen Rosa' were found the most productive cultivars both for yield per tree and yield efficieny (Table 2), confirming previous work (5). 'Original Sun' and 'Bella Di Barbiano' ranked last in productivity (Table 2). Productivity in this study was somewhat higher than that found by Unlu et al. (10) in a trial of European plums, even though they had older trees.

Fruit weight is an important factor in marketing. 'Black Diamond' fruit were significantly larger than those of any of the other cultivars, but 'Queen Rosa', 'October Sun' and 'Autumn Giant' also had large fruit (Table 2). 'Obilnaja', 'Original Sun' and 'TC Sun' had the smallest fruit size (Table 2). These trends concur with some previous work (4, 5). However, Karamursel et al. (7), found the fruit weight of 'President' cultivar to be 57 g compared to about 66 g here (Table 2). Similarly, 'Black Amber' was only 52 g in the Cukurova region (8) compared to 86 g here. Different soil or climatic conditions and management practices (perhaps insufficient fruit thinning) probably explain these differences.

In conclusion, on the basis of yield, bloom and harvest times, and fruit size 'Black Beauty', 'Obilnaja' 'Queen Rosa' 'Black Diamond', 'October Sun' and 'Autumn Giant' were most suitable cultivars among those studied for commercial production in the Mut-Mersin area.

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