Vegetative Propagation of Japanese Plum (*Prunus salicina* Lindl.) by Softwood Cuttings

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Seasonal changes in rooting ability, effect of IBA treatment, and cultivar difference in rooting ability of softwood cuttings of Japanese plum cultivars were investigated. When treated with IBA, the cuttings stuck in June gave the highest rooting rate. The rooting rate gradually decreased and plants did not root in September. Without IBA treatment, the highest rooting rate was obtained in May and rooting did not occur later than July. Soaking the basal portions of the cuttings in 20 or 80 ppm IBA solution for 20 h and dipping the basal portions of the cuttings into 4000 ppm IBA solution for 10 sec gave similar rooting rates. The number of roots per rooted cutting was greater with the IBA treatment at 20 or 80 ppm than the 4000 ppm dipping treatment. There was a great variability in the rooting ability among Japanese plum cultivars. Rooting rates varied from 24% for 'King' to 100% for 'Methley'.

INTRODUCTION

Japanese plum (*Prunus salicina* Lindl.) has been propagated by grafting onto rootstocks. Recently, interest in own-rooted plants has increased. High-density planting using own-rooted plants requires a large number of trees at low cost (Couvillon and Erez, 1980). Inexpensive plum trees can be produced using softwood cuttings. In this study, we investigated the seasonal changes in rooting ability, the effect of IBA treatments, and cultivar differences on the rooting ability of Japanese plum cultivars.

MATERIALS AND METHODS

Seasonal Changes in Rooting Ability. Softwood cuttings were collected monthly from May until September from field-grown 'Oishi-wase' Japanese plum trees. At each date the cuttings were prepared from long shoots. Cutting length was about 12 cm and had three distal leaves. After treating the basal ends of the cuttings with IBA at 4000 ppm for 10 sec, the cuttings were stuck in the rooting medium under mist. The rooting medium was coarse vermiculite. The beds were situated in a glasshouse with a natural ambient temperature, and natural daylight and daylength. Intermittent mist was applied for 10 sec every 30 min. The rooting percentage and number of roots per rooted cutting were recorded after the rooting period (30 days).

Effects of IBA Concentration on Rooting. In July, the cuttings of 'Oishi-wase' were collected and prepared as described above. The basal portions of the cuttings were immersed in IBA solution at 0, 20, 80 ppm for 20 h or dipped in 4000 ppm IBA solution (50% EtOH solution) for 10 sec. The cuttings were planted in vermiculite under mist as previously described. The cuttings were evaluated after 30 days for the number of cuttings that survived, the number that rooted and the number of

roots per rooted shoot.

Cultivar Difference in Rooting Ability. The difference in rooting ability of five cultivars ('King', 'Sordum', 'Methley', 'Santa Rosa', 'Taiyo') was evaluated. Cuttings of each cultivar were collected and prepared in July. The cuttings were treated by dipping the basal portion in an IBA 4000 ppm solution for 10 sec. The cuttings were planted in vermiculite under mist as previously described. They were evaluated after 30 days for the number of cuttings that survived, the number that rooted, and the number of roots per rooted shoot.

RESULTS AND DISCUSSION

Seasonal changes in the rooting ability of 'Oishi-wase' plum from May to September are shown in Table 1. When treated with IBA, the cuttings stuck in June gave the highest rooting rate (93.5%), the rooting rate gradually decreased and cuttings stuck in September failed to root. Without IBA treatment, the highest rooting rate (33.3%) was obtained in May and rooting did not occur later than July.

Table 1. Seasonal changes in rooting ability of 'Ooishi–Wase' plum cuttings.

Date of cutting collection (month/day)	IBA treatment[z]	Survival rate (%)	Rooting rate (%)	No.of roots per rooted cutting
5/17	+	93.3	76.6	11.8
	-	100	33.3	2.7
6/3	+	100	93.5	12.8
	-	93.1	18.5	4.0
7/6	+	66.7	66.7	9.9
	-	68.0	0	-
8/1	+	75.9	20.7	6.5
	-	92.9	0	-
9/2	+	92.0	0	-
	-	100	0	-

[z]The IBA treatment was applied by dipping the base 1 cm of each cutting into a 4000 ppm IBA solution for 10 sec.

The time of cutting collection has an important influence on rooting (Couvillon, 1988). For softwood cuttings of deciduous species, the best rooting is generally obtained if the cuttings are taken when the leaves are fully expanded and the shoot have attained some degree of maturity (Hartmann and Kester, 1975). Many cultivars of peach root best when the cuttings are taken in July rather than any other time of year (Couvillon et al., 1975). Sharmar and Aier (1989) reported that plum cuttings stuck during summer under mist gave better rooting than autumn cuttings. The results in this paper were in accordance with other reports. However, in this experiment, environmental factors such as temperature and daylength were not controlled. It was not clear whether the decline in rooting percentages in August and September could be related to the physiological state of the cuttings or was merely

a reflection of the existing environmental conditions.

Table 2 shows the effect of IBA on rooting. IBA increased the rooting percentages of Japanese plum cuttings. Soaking the basal portions of cuttings in 20 or 80 ppm IBA solution for 20 h and dipping the basal portions of cuttings into 4000 ppm IBA solution for 10 sec gave similar rooting rates. The number of roots per rooted cutting was greater in the IBA treatments of 20 and 80 ppm than with the 4000 ppm dipping treatment.

Table 2. Rooting of 'Ooishi–Wase' plum cuttings as affected by IBA concentration.

IBA conc. (ppm)	Survival rate (%)	Rooting rate (%)	No.of roots per rooted cutting
0	100	10.0	1.7
20[Z]	86.7	86.7	12.6
80[Z]	80.0	80.0	16.7
4000[Y]	80.6	80.6	8.0

[Z]Soaking the basal 1 cm of each cutting into 20 or 80 ppm IBA solution for 20 h.
[Y]Dipping into 4000 ppm IBA solution for 10 sec.

Table 3 shows the cultivar differences of rooting ability among five Japanese plum cultivars ('King', 'Sordum', 'Methley', 'Santa Rosa', 'Taiyo'). There was a great degree of variability in the rooting ability of the plum cultivars. Rooting rates varied from 24% for 'King' to 100% for 'Methley'.

Table 3. Cultivar difference in rooting ability of plum cuttings.

Cultivar	Survival rate (%)	Rooting rate (%)	No.of roots per rooted cutting
King[1]	64.0	24.0	2.2
Sordum	84.0	72.0	4.3
Methley	100	100	17.4
Santa Rosa	84.6	61.5	10.1
Taiyo	90.5	76.2	8.1

[1]The basal 1 cm of each cutting was dipped into 4000 ppm IBA solution for 10 sec.

Most Japanese plums grown in Japan are grown on rootstocks of *Prunus cerasifera*. There has been a recent increase in trials using micropropagated own-rooted trees (Zimmerman and Miller, 1991). However, vegetative propagation by softwood cuttings is more convenient and less expensive than micropropagation. There have been many reports on the rooting of plum rootstocks, such as *Prunus insititia* and *P. cerasifera*, however, very few reports have been available on Japanese plum

cultivars. Sharmar and Aier (1989) reported the seasonal rooting behavior of plum cultivars and the effect of IBA treatment on rooting. They also reported that the Japanese plum cultivars showed better rooting percentages than the European plum cultivars. In this paper, we showed that the rooting ability varied markedly among Japanese plum cultivars. However, it remains unknown what physiological or morphological factors are involved in cultivar differences in rooting success.

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