

# Pollen Compatibility Studies With European and Japanese Plums

G. TEHRANI\*

**Abstract.** 'Valor', 'Verity', 'Vision' and 'Vineland' selection 'V. 33028' plums were completely self-incompatible. Hand pollination showed that 'Valor' and 'Verity' were cross-compatible. 'Valor' and 'Verity' set fruit satisfactorily with 'Vision' pollen, but 'Vision' did not set well when pollinized by 'Valor' or 'Verity'. 'V. 33028' was cross-compatible with 'Verity' and 'Vision', but not with 'Valor'. 'Italian', 'Stanley', and 'California Blue' were effective pollinizers for 'Valor', 'Verity' and 'V. 33028'. 'Bluebell' was satisfactory for 'Valor', while 'Iroquois' was effective for 'Verity' and 'V. 33028'.

'Shiro' set well with 'Reine Claude', 'Methley', 'Myrobalan B' and '0-3010'. 'Early Golden' and 'Methley' were satisfactory pollinizers for 'Burbank'. 'Shiro' did not fertilize 'Burbank'. 'Ozark Premier', 'Myrobalan B' and '0-3010' were good pollinizers for 'Burbank' and 'Early Golden'. 'Early Golden' set adequately with pollen from 'Burbank', 'Santa Rosa' and 'Woodruff'.

In 1967, 'Valor', 'Verity', and 'Vision' plums were introduced at the Horticultural Research Institute of Ontario (10). At that time, no information was available on their compatibility with other European plums (*Prunus domestica* L.) (1). Also, some growers have been encountering pollination difficulties with 'Shiro' (5), 'Burbank' (8), and 'Early Golden' (4), the main Japanese plums (*P. triflora*, Roxbg.) grown in Ontario.

This paper summarizes the results of plum pollination studies carried out at Vineland since 1968. The primary objective was to determine suitable pollinizers for commercial cultivars.

## Materials and Methods

For European cultivars, a frame was built large enough to include the whole tree, and covered with unbleached factory cotton cloth. For Japanese plums, 3 x 8 ft. cheese-cloth bags were used to enclose branches.

The methods of gathering pollen were the same as ordinarily used in pollination studies. After drying, the pollen was kept in loosely stoppered glass vials until used.

All the cultivars used as female parents in the test were self-incompatible. Emasculation was considered unnecessary and not done.

The pollen was applied directly to the stigmas with a camel-hair brush. Brushes were sterilized in alcohol after use with each type of pollen. Crosses were made on each cultivar using a number of other cultivars of the same species. The only exception was when 'Reine Claude' was used as pollen parent on Japanese cultivars.

Records of fruit set were taken twice—once soon after June drop, before appreciable accidental loss from wind or other agencies might occur; and again 1 or 2 weeks before full maturity. The fruit was counted whether or not seed was produced. Tables 1 and 2 are based on final counts.

Normal set was that produced naturally under open orchard conditions. It is used as the basis for judging the results of hand pollination. A small percentage set on varieties that have a profuse bloom often produces a heavier crop than a large percentage set on cultivars having a small amount

\*Research Scientist; Horticultural Research Institute of Ontario; Vineland Station, Ontario.

Table 1. Summary of results of hand pollination with Vineland cultivars of European plums.

Parent		No. of flowers pollinated	Percent mature fruits (avg.) <sup>1</sup>	No. of years studied
Female	Pollen			
Valor	Italian	1,483	19.0	1
	Stanley	1,794	18.8	1
	Vision	1,716	17.8	1
	California Blue	2,003	27.3	1
	Verity	4,018	17.7	1
	Bluebell	2,437	17.0	1
Verity	Italian	979	30.7	2
	Stanley	3,752	13.8	2
	Vision	3,368	10.4	2
	California Blue	3,769	26.8	2
	Valor	1,898	24.9	2
	Iroquois	2,359	21.5	2
Vision	Italian	3,391	0.3	2
	Stanley	4,865	0.3	2
	Valor	4,218	0.8	2
	Verity	3,195	0.5	2
	Iroquois	3,980	0.4	2
	Bluebell	3,117	0.7	1
	California Blue	2,398	0.3	1
V. 33028	Italian	570	12.8	1
	Stanley	876	34.7	1
	Vision	349	13.2	1
	Valor	1,177	1.4	1
	Verity	426	24.6	1
	Iroquois	940	12.1	1
	California Blue	365	37.0	1

<sup>1</sup>Based on number of blossoms pollinated and average of years studied.

of bloom. In this study, 4% fruit set resulting from artificial pollination was considered satisfactory (6, 7).

### Results

#### Vineland Cultivars

The percentage of mature fruits resulting from hand pollination of 'Valor', 'Verity', 'Vision' and 'V. 33028' are presented in Table 1. All of these cultivars are self-incompatible and require cross-pollination for adequate fruit set.

**Valor:** 'Italian', 'Stanley', 'California Blue' and 'Bluebell' were satisfactory

pollinizers for 'Valor'. This cultivar was also cross-compatible with 'Verity' and 'Vision'. Since most of these cultivars are widely grown in Ontario, no serious pollination problem should develop.

**Verity:** This cultivar was cross-compatible with 'Valor', 'Vision', 'Italian', 'Stanley', 'California Blue' and 'Iroquois'.

**Vision:** Hand pollination of 'Vision' has been very discouraging in the 2 years of trials. None of the cultivars used as pollen parent produced an ac-

ceptable set. 'Vision', however, is productive under natural orchard conditions at Vineland.

**V. 33028:** 'Italian', 'Stanley', 'Vision', 'Verity', 'Iroquois' and 'California Blue' all were satisfactory pollinizers. On the basis of 1-year hand pollination, only 'Valor' gave poor set. Reciprocal crosses between 'V. 33028' and 'Valor', 'Verity', and 'Vision' are required to establish its usefulness as a pollinizer.

### Japanese Cultivars

The percentage of mature fruits resulting from cross-pollination of 'Burbank', 'Early Golden' and 'Shiro' are presented in Table 2.

**Burbank:** This cultivar was readily fertilized by 'Early Golden', 'Methley', 'Ozark Premier', 'Myrobalan B' and '0-3010' (a selection from the Ottawa Research Station). The only poor results were obtained when 'Shiro' and 'Freeman' were used as pollen parents (Table 2).

**Early Golden:** With the exception of 'Methley', all the cultivars reported in Table 2 were satisfactory pollinizers for 'Early Golden'. On a 1-year trial basis, 'Freeman', 'Ozark Premier', 'Myrobalan B' and 'Woodruff' (a chance seedling from a local grower) effectively pollinized 'Early Golden'. 'Burbank', 'Santa Rosa', and 'Ozark Premier' seem the most desirable to interplant with 'Early Golden'.

**Shiro:** 'Burbank', 'Reine Claude', 'Methley', '0-3010' and plum rootstock 'Myrobalan B' were satisfactory, but 'Early Golden' and 'Ozark Premier' were inadequate pollinizers for 'Shiro'.

### Discussion

A suitable pollinizer is usually one which is self-incompatible, will flower at about the same time as the cultivar to be pollinated, and is compatible with it. It should flower and crop regularly each year. Cultivars chosen as pollinizers should have commercial importance and market value.

So far, no adequate pollinizer has been found for 'Vision', although this cultivar bears a good crop under natural orchard conditions. It is possible that it is not receptive when the tree is in full bloom. In our studies, hand pollination has been done during this period. In future work, the flowers of 'Vision' will be hand pollinated at different times from full bloom to several days thereafter. Also, several other cultivars and Vineland selections will be used, hopefully to discover a desirable pollinizer for it.

'Methley' is self-fruitful and an adequate pollinizer for 'Shiro' and 'Burbank' (Table 2). On the other hand, 'Burbank' is a satisfactory pollinizer for 'Early Golden'. Over a 2-year period, 'Burbank' set an average of 12.9% with 'Early Golden' pollen. The reciprocal of this cross, i.e., 'Early Golden' x 'Burbank', resulted in 11% set. 'Early Golden' could be used satisfactorily as a pollinizer for 'Burbank'. 'Reine Claude' also is an adequate pollinizer for 'Shiro' (Table 2), and 'Burbank' (6).

Keeping in mind the above findings and the characteristics of good pollinizers, it appears that interplanting of 'Shiro', 'Burbank', 'Early Golden', 'Methley', and 'Reine Claude' should assure effective cross-pollination of all these cultivars.

Dickson (2) reported that when 'Shiro' was hand pollinated with 'Burbank', the cross resulted in 20.0% fruit set. However, he observed that under orchard conditions, 'Shiro' growing beside 'Burbank' was not effectively pollinated by that cultivar. In this study, 8% fruit set was obtained when 'Burbank' was used as pollen parent on 'Shiro'. It appears that if acceptable fruit set can be obtained by artificial pollination, similar results should be expected under natural orchard conditions. More work is needed to clarify the contradictory results reported above. Undoubtedly, 'Bur-

Table 2. Summary of results of hand pollination with Japanese plums.

Female	Parent		No. of flowers pollinated	Percent mature fruits (avg.) <sup>1</sup>	No. of years studied
		Pollen			
		Early Golden	1,689	0.5	2
		Burbank	478	8.0	1
		Myrobalan B	3,553	25.0	2
		Reine Claude	9,147	6.5	3
		Ozark Premier	1,186	1.1	1
		Methley	2,337	5.2	
		0-3010	2,013	12.4	
Burbank		Early Golden	2,054	12.9	
		Shiro	5,736	0.7	
		Myrobalan B	5,460	14.9	
		Ozark Premier	2,600	9.1	
		Methley	1,521	15.4	1
		0-3010	1,940	13.1	1
		Freeman	1,367	0.3	
Early Golden		Woodruff Seedling	5,053	20.9	2
		Myrobalan B	13,310	6.6	3
		Ozark Premier	6,482	6.5	2
		Methley	3,510	0.3	1
		0-3010	2,548	17.4	1
		Santa Rosa	3,777	7.9	2
		Freeman	3,184	18.5	2
		Burbank	1,305	11.0	1

<sup>1</sup>Based on number of blossoms pollinated and average of years studied.

bank', though completely self-incompatible (3), is one of the most effective pollinizers for its season, and a valuable cultivar for this reason.

Previously, it was reported that 'Shiro' will pollinize 'Burbank' (9). This was based only on observation and hand pollination was not carried out to substantiate the statement (2). In the present hand pollination study, 'Shiro' was not an adequate pollinizer for 'Burbank' (Table 2). An average of only 0.7% fruit set was obtained in 2 years of tests. More work will be carried on to test the validity of the above reports.

#### References

1. Bradt, O. A., A. Hutchinson, E. A. Kerr, C. L. Ricketson, and G. Tehrani. 1968. Fruit varieties. *Ont. Dep. Agr. and Food Publ.* 430.
2. Dickson, G. H. 1937. Pollination of Shiro plum. *Sci. Agr.* 17:727-729.
3. Dorsey, M. J. 1919. A study of sterility in the plum. *Genetics* 4:417-488.
4. Eaton, G. W. 1964. Early Golden plum. *Fruit Var. and Hort. Dig.* 18:22.
5. Hedrick, U. P., R. Wellington, O. M. Taylor, W. H. Alderman, and M. J. Dorsey. 1911. The plums of New York. *N.Y. Agr. Exp. Sta. Rep.* 3:342-344.
6. Hendrickson, A. H. 1919. Inter-species pollination of plums. *Proc. Amer. Soc. Hort. Sci.* 16:50-52.
7. Hendrickson, A. H. 1922. Further experiments in plum pollination. *Calif. Agr. Exp. Sta. Bull.* 352:247-266.
8. Jones, D. F. 1928. Burbank's results with plums. *J. Hered.* 19:359-371.
9. Smith, M. V., and O. A. Bradt. 1965. Fruit pollination. *Ont. Dep. Agr. and Food Publ.* 172.
10. Tehrani, G., and G. H. Dickson. 1968. Valor, Verity, and Vision plum cultivars. *Hort. Res. Inst. of Ont. Rep.* for 1967:57.