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Effect of supplementary pollination in grapes (Vitis vinifera)*)

by

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Sartorius (1926) concluded after extensive experiments that this plant is a self pollinator. Einset (1930) reported that loose bunches are characteristic of self unfruitful grape varieties, in which compact bunches were obtained by hand pollination. Podrazenskiic (1951) claimed increase in yield on supplementing the normal pollination. Sosunkov (1953) reported that the yield of self-fertile varieties, Sasla Muskatnaja and Malengr Ranii (Early Malengre), was increased on an average by 15.8 per cent by cross pollination over self pollination.

Dvornic (1960) found greatest number of fertilized ovules in Muscat de Hamburg where a mixture of pollen from Muscat de Hamburg and Chasselas doré had been used. Deidda (1964) found cross pollination advantageous in 10 varieties with hermaphrodite flowers and normal pollen. Calo and Liuni (1965) got increased fruit-set in the self fertile variety Cabernet by the use of certain pollens.

In addition to the above findings the benefits of cross pollination have been reported in a number of instances, but the specificity of the pollen used or the extent of increase in yield have not been well reported. For deriving the maximum benefits in a given variety, it is necessary to have more information on these aspects. In the present paper, the results of a study on the effect of different pollinizers on varieties Bharat Early and Pusa Seedless *(Vitis vinifera)* are reported.

Material and Methods

Supplementary pollinations with different pollinizers were done during 1966 on the varieties Bharat Early and Pusa Seedless. Full bloom panicles of the pollinizer variety, with a large number of just opened flowers, were brought and brushed thoroughly but gently with the panicles of female varieties. Pollinations were done twice, once on the second day of anthesis and again on the fourth day of anthesis of the mother panicles, between 8 to 10 a. m.

Pollinizers:

For Bharat Early	For Pusa Seedless
Bharat Early (self)	Pusa Seedless (self)
Pusa Seedless	Pearl of Csaba
Pearl of Csaba	Beauty Seedless
Perlette	Bharat Early
Beauty Seedless	Hur
Bhokri	Bhokri

Observations recorded: Bunch weight: All the bunches under each treatment were weighed individually, but the results were expressed as average weight per bunch. Berry number per cluster was recorded by counting all the normal ber-

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Table 1

Effect of supplementary pollinations with different pollinizers on the bunch and berries of Bharat Early

Pollinizer	Weight of bunch		No. of berries		Shot berries		Weight of 100 berries
	av. weight (g)	% increase over control	av. No. per bunch	% increase over control	% per bunch	% decrease over control	(g)
Control	151.537	—	59.50	—	21.178	—	229.449
Bharat Early	175.527	15.83	71.87	20.79	14.664	6.514	226.084
Pearl of Csaba	243.362	60.59	98.75	65.97	3.254	17.924	237.150
Pusa Seedless	226.997	49.80	96.91	62.87	6.475	14.703	233.154
Perlette	174.980	15.47	72.00	21.01	7.969	13.209	228.460
Beauty Seedless	173.235	14.32	69.75	17.23	9.672	11.506	231.044
Bhokri	169.706	11.99	70.50	18.49	10.762	10.416	224.782
L.S.D. at 5%	61.166	—	23.368	—	3.401	—	N.S.

ries; the shot berries excluded. Berry weight: About 50 to 100 berries from each bunch were randomly selected (excluding shot berries) and their weight was recorded. The results were expressed as average weight per 100 berries.

Results

Bharat Early (Table 1)

Bunch weight: Pollinations with Pearl of Csaba and Pusa Seedless resulted in significant increase in the weight of bunch as compared to control. Increase in bunch weight by Pearl of Csaba was 60.59 per cent and by Pusa Seedless 49.80 per cent over control.

Average weight of bunch, resulting from supplementary pollinations with self, Perlette, Beauty Seedless and Bhokri pollen did not vary significantly from control.

Berry number: Maximum number (98.75) per bunch was obtained by pollination with Pearl of Csaba, followed by Pusa Seedless (96.91), both resulting in significant increase over control and other pollinizers. The number of berries per bunch following pollination with Perlette (72.00), self (71.87), Bhokri (70.50) and Beauty Seedless (69.75) did not vary significantly from control (59.50).

Shot berries: The bunches in control contained 21.18 per cent shot berries. Supplementary pollination by all the pollinizers including self pollen, significantly reduced the percentage of shot berries as compared to control. Shot berries were least (3.25%) in bunches pollinated with Pearl of Csaba, reduction being significant in comparison to pollination with all other varieties except Pusa Seedless. Bunches pollinated with Pusa Seedless, had 6.47 per cent of shot berries, resulting in a significant decrease in comparison with Bhokri or self pollen. Reduction in shot berries was more by pollination with Perlette, Beauty Seedless and Bhokri than by self pollen.

Berry weight: No significant variation was observed in the weight of berries as a result of supplementary pollination with different pollinizers.

Table 2

Effect of supplementary pollinations with different pollinizers on the bunch and berries of Pusa Seedless

Pollinizer	Weight of bunch		No. of berries		Weight of 100 berries
	av. weight (g)	% increase over control	av. No. per bunch	% increase over control	(g)
Control	269.783	—	240.83	—	108.514
Pusa Seedless	276.952	2.66	260.00	7.96	104.331
Pearl of Csaba	345.293	27.99	272.17	13.01	127.478
Beauty Seedless	375.083	39.03	269.00	11.70	134.862
Bharat Early	383.902	42.30	275.33	14.32	137.599
Hur	321.618	19.21	259.17	7.61	122.527
Bhokri	322.815	19.66	251.67	4.50	125.520
L.S.D. at 5%	66.070	—	N.S.	—	13.931

Pusa Seedless (Table 2)

Bunch weight: Supplementary pollinations with Bharat Early, Beauty Seedless and Pearl of Csaba significantly increased the bunch weight over control or by self pollen. Bharat Early pollen resulted in maximum increase (42.30%) followed by Beauty Seedless (39.03%) and Pearl of Csaba (27.99%) over control.

Berry Number: Number of berries per bunch was not significantly affected by any of the pollinizers.

Berry weight: Supplementary pollinations with Bharat Early, Beauty Seedless, Pearl of Csaba and Bhokri significantly increased the weight of berries as compared to control or pollination with self pollen.

Discussion

Supplementary pollination by brushing with pollen of different varieties was found to be highly effective in increasing the weight of bunches in both Bharat Early and Pusa Seedless. This increase in weight of the bunch was composed of two factors, the number of berries per bunch and the size of berries. In Bharat Early, the increase in number of berries per bunch was very marked, being up to 65.97 per cent by Pearl of Csaba and 62.87 per cent by Pusa Seedless pollen. However, the size of berries was not affected. This probably was due to the competition resulting from the enormous increase, in the number of berries per bunch. In Pusa Seedless which is allied to Thompson Seedless, on the other hand, the increase in the number of berries was not marked, but the berry size was increased by the pollen of Beauty Seedless, Bharat Early and Pearl of Csaba.

In Bharat Early, there was increased number of berries per bunch even by supplementary pollination with its own pollen (20.79%). This suggests lack of adequate pollination under natural conditions, and also some degree of self incompatibility in this variety.

Another interesting feature is the significant reduction in the number of shot berries in Bharat Early, which was most marked with Pearl of Csaba and Pusa Seedless, the effective pollinizers. Olmo (1946) refuting the popular assumption that shot berries are parthenocarpic and result from vegetative development, suggested

that even the restricted growth of the shot berries most probably is the result of ovule fertilization and some degree of seed development. Sharples *et al.* (1965) in their trials with increasing the activity of insect pollination observed that reduction in shot berries though statistically significant, was not appreciable. They thus concluded that lack of pollination is not a major factor in production of shot berries. In the present study supplementary pollination in Bharat Early with its own pollen significantly reduced the shot berries. This suggests that there is inadequate pollination in this variety under natural conditions. Further, supplementary pollination by other varieties reduced the shot berries even more. This indicates that there may be some degree of self incompatibility. As pollinations with Pearl of Csaba and Pusa Seedless gave the highest reduction in shot berries, they appear to be more compatibile with Bharat Early.

Inadequate nutrition has also been suggested as one of the probable causes for the occurrence of shot berries. But in Bharat Early shot berries were the least in bunches, which were given supplementary pollination with Pearl of Csaba, in spite of the large number of berries. The larger number of berries would have created greater competition for nutrients and food material. If nutrition were the cause of shot berry formation, their number should have increased. Therefore, nutrition does not appear to play an independent role in the occurrence of shot berries, but it is likely that the reduction in shot berries may be through the mechanism of greater ability of the hybrid zygote to mobilize food to the developing berries.

Summary

In the variety Bharat Early, the weight of bunch and number of berries per bunch were markedly increased by supplementary pollinations with Pearl of Csaba and Pusa Seedless pollen as compared to control. However, berry weight was not altered. Shot berries were significantly reduced by all pollen including the self as compared to control. Least number of shot berries were obtained by using Pearl of Csaba and Pusa Seedless pollen.

In the variety Pusa Seedless which is allied to Thompson Seedless the bunch weight was increased by Bharat Early, Beauty Seedless and Pearl of Csaba pollen. No significant increase in the number of berries per bunch resulted, but berry size was increased by these pollen.

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