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# Cross-pollination in 'Gordal Sevillana' Olives

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***Abstract.*** **Cross-pollination with 'Manzanillo', 'Lechin de Sevilla', and 'Picudo' increased initial fruit set in 'Gordal Sevillana' (synonymous 'Sevillano') but did not affect final set under favorable conditions for fertilization. However, the results suggest that under other conditions, cross-pollination with 'Picudo' can increase yield. Crop quality was improved with cross-pollination, as there was a reduction in shotberries.**

'Gordal Sevillana' is one of the major table olive cultivars in Spain. It produces large fruit but has a strong tendency to produce shotberries which are small, undesirable, parthenocarpic fruit that decrease the overall crop quality. This cultivar also is characterized by irregular productivity. Self-pollination is a common feature of olive orchards in Spain (1), but some authors have suggested the suitability of cross-pollination in 'Gordal Sevillana' (4, 8). Likewise, low pollen germinability and poor pistil quality have been reported in this cultivar (2, 3). The purpose of this investigation was to evaluate the influence of cross-pollination in the production of fruit and shotberries in 'Gordal Sevillana'.

Two similar experiments were carried out in orchards of 'Gordal Sevillana' during 1981 and 1982. Heavily bloomed, irrigated trees were established in a randomized block experiment consisting of 4 treatments with 6 single-tree replicates. The treatments were self-pollination and supplementary pollination with 'Manzanillo', 'Lechin de Sevilla', or 'Picudo' cultivars, applied at random to 4 different branches of each tree. For each branch, 6 shoots were tagged for observation. All branches were bagged before anthesis with double-thickness nylon cloth bags, which were kept in place until petal fall. For all cross-pollination treatments, the bagged blossoms were sprayed with a mixture of pollen and talcum powder every day or on alternate days during the bloom period.

The pollen had been collected the previous year by bagging branches with heavy paper bags according to Griggs et al. (4), removing the bags the day after anthesis to guarantee highest viability (2), and storing at −20°C.

The number of total inflorescences before anthesis, the number of fertile inflorescences at petal fall, and the number of fruit and shotberries at 15 and 41 days after full bloom (FB) and at harvest were determined (7). Shotberries also were counted at FB + 25. Analysis of variance and Duncan's multiple range test for mean separation were used.

*Fruit-set.* Cross-pollination with pollen of 'Picudo' increased initial fruit-set (at FB + 15) in 'Gordal Sevillana' (Fig. 1). However, there were no significant differences among treatments at FB + 41 or at harvest. These results were consistent for both years. Thus, self-pollination was enough to guarantee a normal yield under these conditions. Competition among young olive fruit (7, 9) seems to be responsible for the differences between initial and final fruit set.

It appears that fertilization would limit the crop only if initial fruit set fell below a productivity threshold, a property which seems to be determined mainly by floral initiation and postanthesis competition among fruit (7). Low floral initiation can be related to insufficient winter chilling in the growing area of 'Gordal Sevillana' in Spain, since this cultivar has high chilling requirements (5). Low fertilization can be caused by pollen quality and unfavorable external factors that affect the effective pollination period. Given the poor quality of 'Gordal Sevillana' pollen (2), it is possible that these factors affect this cultivar more intensely than others. All of these factors can explain its irregular productivity.

*Shotberry production.* Most olive cultivars produce low numbers of shotberries, which usually drop before harvest (1). However, it is common to encounter shotberries at harvest in 'Gordal Sevillana' (Table 1). Although shotberries dropped continuously from FB + 15 to harvest in all treatments, cross-pollination decreased their number at harvest irrespective of the pollen parent. Shotberries represented 40% to 50% of the total fruit at harvest in the self-pollination treatment, whereas in cross-pollination treatments shotberries represented only about 20% (Fig. 2).

Shotberries are parthenocarpic fruit and have a different growth pattern than normal

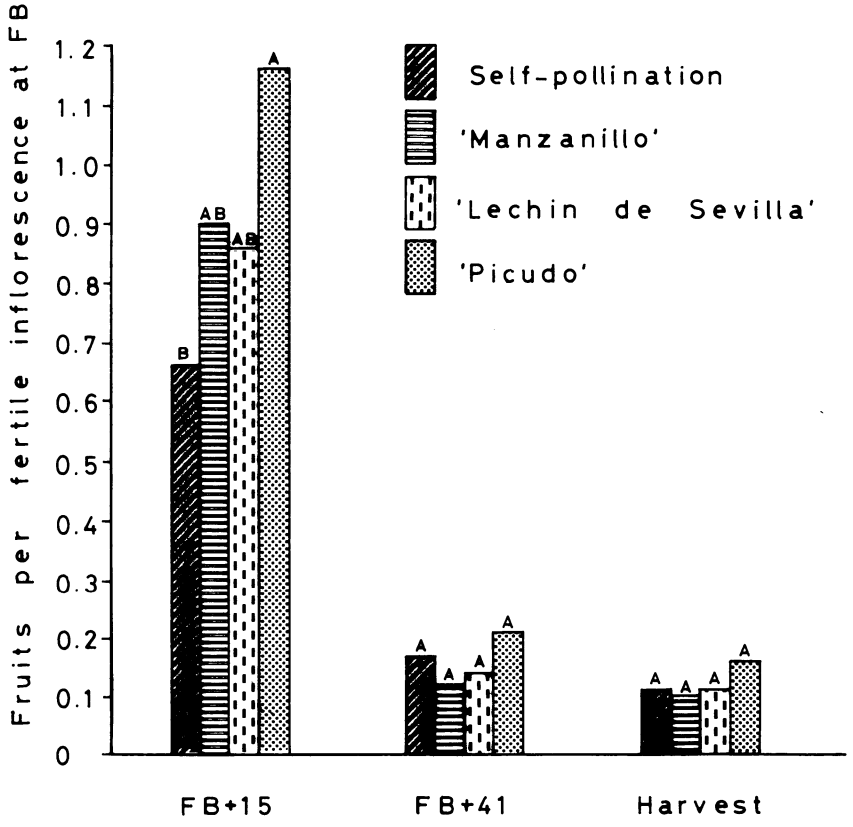


Fig. 1. Normal fruit set at different dates, 1982, when different pollinators were used. (Mean separation within dates by Duncan's multiple range test, 1% level).

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Table 1. Effect of self and cross-pollination on shotberry set of 'Gordal Sevillana' olives.

| Pollinator cultivar | Shotberry set[z] at intervals following full bloom (FB) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FB + 15 | | FB + 25 | | FB + 41 | | Harvest | |
| | 1981 | 1982 | 1981 | 1982 | 1981 | 1982 | 1981 | 1982 |
| Self-pollination | --- | 2.67 a[y] | 0.30 a | 0.54 a | 0.19 a | 0.22 a | 0.09 a | 0.14 a |
| 'Manzanillo' | --- | 1.28 b | 0.11 bc | 0.11 a | 0.06 a | 0.09 a | 0.03 a | 0.05 b |
| 'Lechín de Sevilla' | --- | 1.99 ab | 0.18 ab | 0.26 a | 0.11 a | 0.10 a | 0.05 a | 0.04 b |
| 'Picudo' | --- | 1.24 b | 0.07 c | 0.14 a | 0.04 a | 0.07 a | 0.03 a | 0.05 b |
| CV (%) | | 52.0 | 30.6 | 56.7 | 70.5 | 44.8 | 92.4 | 53.4 |

[z]Expressed as number of shotberries per fertile inflorescence at FB.
[y]Mean separation within columns by Duncan's multiple range test, 5% level.

fruit (6). Shotberry abscission is continuous during the growth period (Table 1), whereas normal fruit abscission ends 35 to 45 days after full bloom (7). Competition among fruit in olive seems to be triggered by fertilization and by the subsequent initial rapid growth of fertilized fruit (6). This competition can explain the different abscission pattern of both kinds of fruits; i.e., normal fruit abscise earlier than shotberries. Furthermore, there is no competition between normal fruit and shotberries. In the experiments reported here, there were no differences between treatments in setting of total fruit (normal and shotberry) at FB + 15, whereas there were significant differences for each kind of fruit (Fig. 1 and Table 1). Therefore, reduction of shotberries by cross-pollination could be caused by an initially higher proportion of normal fruit due to a higher level of fertilization. Afterwards, many of these normal fruit abscise because of competition. In the self-pollination treatment, the proportion of shotberries was high due to low fertilization. These results therefore suggest that the lower the fertilization, the higher the shotberry production. This relationship can explain the variability in shotberries produced in different years and growing areas (4).

This study demonstrates that cross-pollination can improve crop quality in 'Gordal Sevillana' olives by reducing the proportion of shotberries. Although in these experiments cross-pollination did not increase fruit production at harvest, the results suggest that under unfavorable conditions for fertilization, cross-pollination with 'Picudo' can increase production of normal fruit.

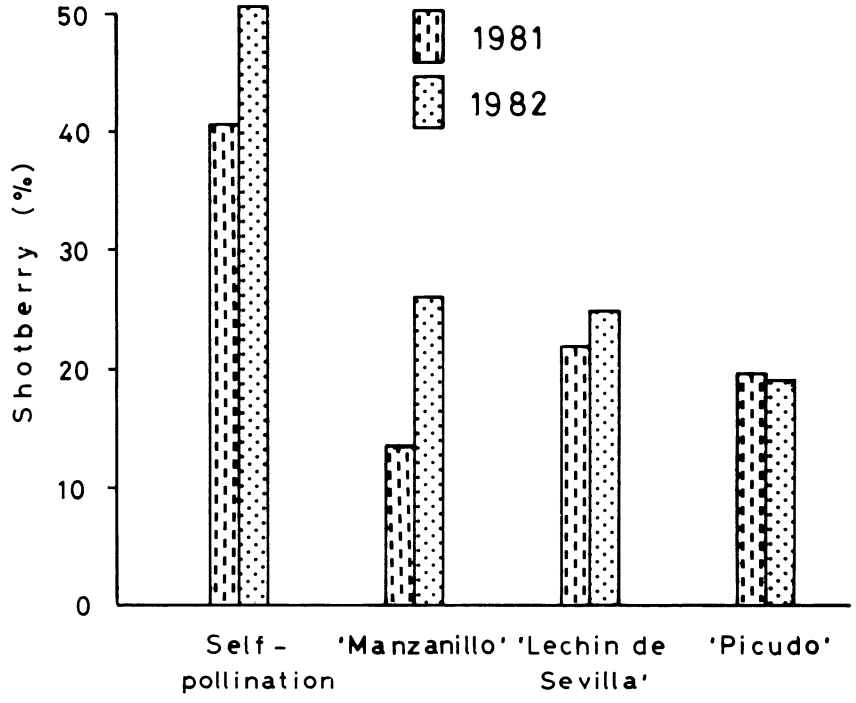


Fig. 2. Percentage of shotberries at harvest when different pollinators were used.

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