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Reproductive and Vegetative Behavior of Four Table Olive Cultivars

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Abstract

Vegetative and reproductive behaviour of four table olive cultivars, 'Conservolia,' 'Manzanilla,' 'Nocellara del Belice' and 'Picholine,' respectively native of Greece, Spain, Italy and France, were studied in Sicily (37° 30' Lat.). All the cultivars proved to be self sterile, showed very similar crop load adjustment, fruit development and shoot growth patterns. 'Picholine' was a good pollinizer for 'Conservolia,' 'Manzanilla' and 'Nocellara del Belice,' while 'Manzanilla' and 'Nocellara del Belice' behaved better as pollinizers for 'Picholine.'

Introduction

The possibility of introducing table olive cultivars native of different growing zones and established on the international market has been studied for several years in the main olive growing countries in Europe (1, 2, 3, 4, 5). Some of these cultivars have stimulated interest in Sicily because of fruit characteristics and the possibility they offer of diversifying the table olive market (1, 2, 3, 4, 5).

On the other hand, when planning agronomical practices aimed at obtaining high yield quantity and quality, it is useful to know vegetative and reproductive behaviour of the tree. The aim of this study was to compare three table olive cultivars, originated in as many European countries, with 'Nocellara del Belice,' the most spread cultivar in Sicily for table purpose, in order to verify the effect of the growing zone on vegetative growth and reproductive behaviour.

Material and Methods

Trials were conducted in 1989 on a varietal plot in Sicily, 37° 41' N. In March 1986, self-rooted plants of 'Nocellara del Belice,' previously established in March 1985, were grafted with the following table olive cultivars: 'Bella di Spagna,' 'Conservolia,' 'Gordales,' 'Manzanilla,' 'Moresca,' 'Nocellara del Belice,' 'Picholine' and 'Tonda iblea.' There were 18 plants per cultivar, arranged in a randomized block design with 3 replications. Within the block, each cultivar was represented by 6 trees. 'Conservolia,' 'Manzanilla,' 'Nocellara del Belice' and 'Picholine' were chosen as representing table olive cultivars from 4 different growing countries in Mediterranean Europe.

Eight one-year old branchlets having 8-13 nodes, with a least 1 cluster each, were tagged at pre-anthesis stage, in April 1989, on 6 heavily blooming trees of each cultivar (2 per block). The number of clusters and the number of flowers/cluster on each branchlet were counted at the same date. The percentage of pistil failure was determined in the laboratory on each of at least 300 clusters per cultivar. The number of clusters, fruits per cluster and the current season's apical shoot growth were recorded 4, 11, 18, 24, 39, 60, 81, 101 128, 143 days after full bloom (FB). Average fruit weight was determined on a 120 fruit sample per cultivar (20 fruits per tree) on the same dates starting from FB + 18.

Pollination trials were carried out on 6 trees per cultivar (2 per block). Ten branches on each tree were selected, totalling not less than 1000 clusters per plant. At the pre-anthesis stage, 8 of these branches were covered by a cloth bag lined with paper.

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Table 1. Number of flowers per cluster, pistil failure percentage, final fruit set, final number of fruits per cluster, final cluster set of four table olive cultivars in Sicily (37°41′ N).

	n. flowers/ cluster	pistil failure (%)	fruit set (%)	°fruits/ cluster	cluster set (%)
Conservolia	23,46 a	47,80 a	1,30 b	1,14 b	26,11 a
Manzanilla	21,34 b	44,75 a	1,66 a	1,19 b	28,92 a
Nocellara del Belice	18,96 c	6,20 c	1,08 b	1,11 b	18,78 b
Picholine	24,14 a	14,80 b	1,20 b	1,28 a	24,83 a

°At FB + 143.
Values denoted by different letters within columns are significantly different at $p < 0.01$ (Tukey 'HSD test).

Numerous heavily blooming branches on the remaining 6 trees per cultivar (2 per block) were covered by a paper bag to collect pollen shortly before anthesis. The pollen collected in the bag was mixed with talcum powder. The pollen-talcum mixture of each cultivar was blown on tow of the branchlets isolated by bags on each of the 6 trees per cultivar. The two branchlets without bags served as a control (free pollination). Pollination treatments were carried out 3 times at three-day intervals. Fruit set was recorded at FB + 18, when it was easy to distinguish the parthenocarpic fruitlets from the normal ones.

At the same date, number of fruits/ cluster and cluster set percentage were also recorded.

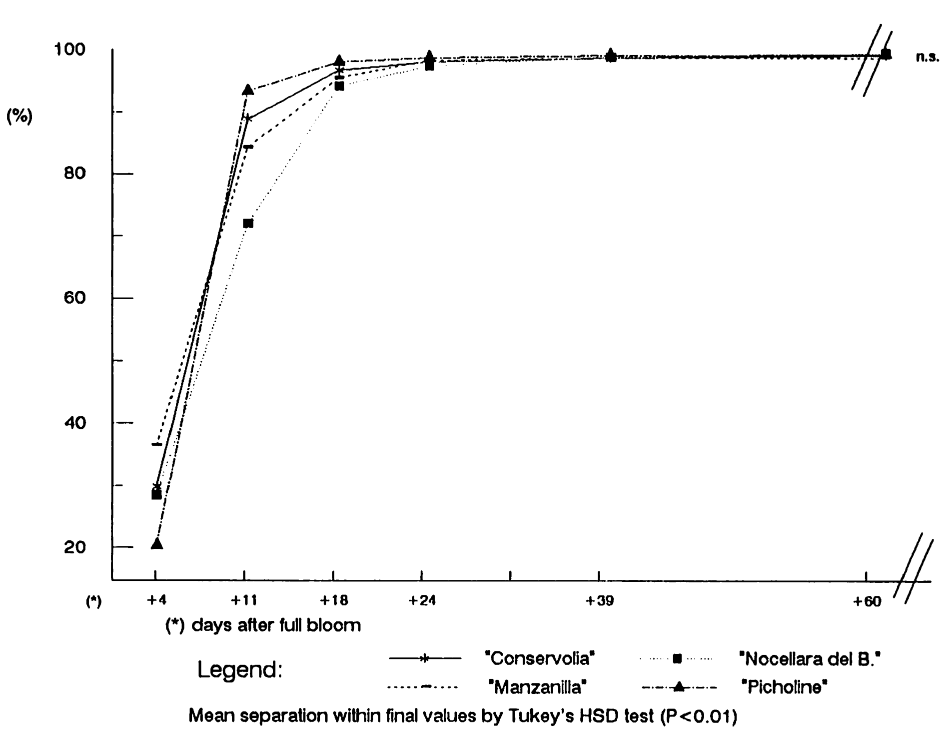


Figure 1. Flower and fruit drop percentage of the four table olive cultivars grown in Sicily (37°41′ N).

Table 2. Vegetative and productive characteristics of the plants of four table olive cultivars in Sicily (37°41′ N).

	plant's height M	canopy diameter M	Trunk cross sectional area (TCSA) cm²	Yield kg	Crop efficiency yield/TCSA kg/cm²
Conservolia	3,65 n.s.	2,56 n.s.	94,87 n.s.	17,72 b	0,19 b
Manzanilla	3,48	2,38	75,87	11,39 b	0,17 b
Nocellara del Belice	3,57	2,44	91,86	11,66 b	0,14 b
Picholine	3,37	2,71	80,66	30,83 a	0,41 a

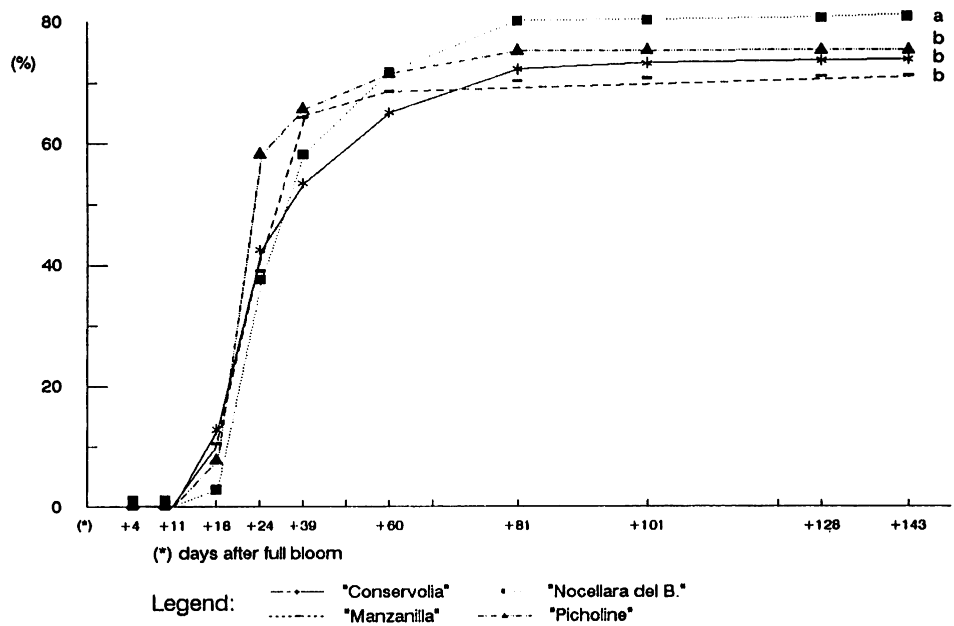
Values denoted by different letters within columns are significantly different at $p < 0.01$ (Tukey 'HSD test).

Results

The average number of flowers per cluster were higher in 'Picholine' and 'Conservolia' (Table 1). Pistil failure percentage was higher in 'Conservolia' and 'Manzanilla.' In the four cultivars, most fruit drop occurred between full bloom and FB + 18 (Figure 1), ranging from 93.3% in 'Nocellara del Belice' to 97.5% in 'Picholine.' The highest fruit set values were found in 'Manzanilla.'

Cluster abscission, which occurred when all the fruitlets in the cluster dropped, was rather intense from FB + 18 and lasted until FB + 81 (Figure 2).

At FB + 143 the average number of fruits/cluster was significantly higher in 'Picholine' than the other cultivars (Table 1), although not correlated to the initial number of flowers/cluster. The percentage of fertile clusters also differed among the cultivars, being significantly lower in 'Nocellara del Belice.'



Mean separation within final values by Tukey's HSD test ($P<0.01$)

Figure 2. Cluster drop drop percentage of the four table olive cultivars grown in Sicily (37°41′ N).

Table 3. Number of fruits per 100 pollinated flowers within the four table-olive cultivars in Sicily (37°41′ N).

	Pollen receiver			
Pollinizer	Conservolia	Manzanilla	Nocellara del Belice	Picholine
Conservolia	0,00 a	0,24 a	0,30 a	0,43 a
Manzanilla	0,00 a	0,05 a	0,19 a	3,51 b
Nocellara del Belice	0.07 a	0,09 a	0,00 a	2,25 b
Picholine	4,95 c	2,26 b	1,65 b	0,06 a
Open pollination	3,05 b	2,85 b	1,29 b	2,92 b

Values denoted by different letters within columns are significantly different at $p < 0.01$ (Tukey 'HSD test).

Increase in fruit weight over the season occurred in all the cultivars according to similar patterns, although fruit weight at FB + 143 was significantly different among the cultivars (Figure 3), independent of the maturity stage reached and the production per plant (Table 2). Indeed, the commercially mature 'Manzanilla' fruits on that date were significantly smaller than those of 'Conservolia' and 'Nocellara del Belice' which would have reached the same stage of maturity 3 weeks later.

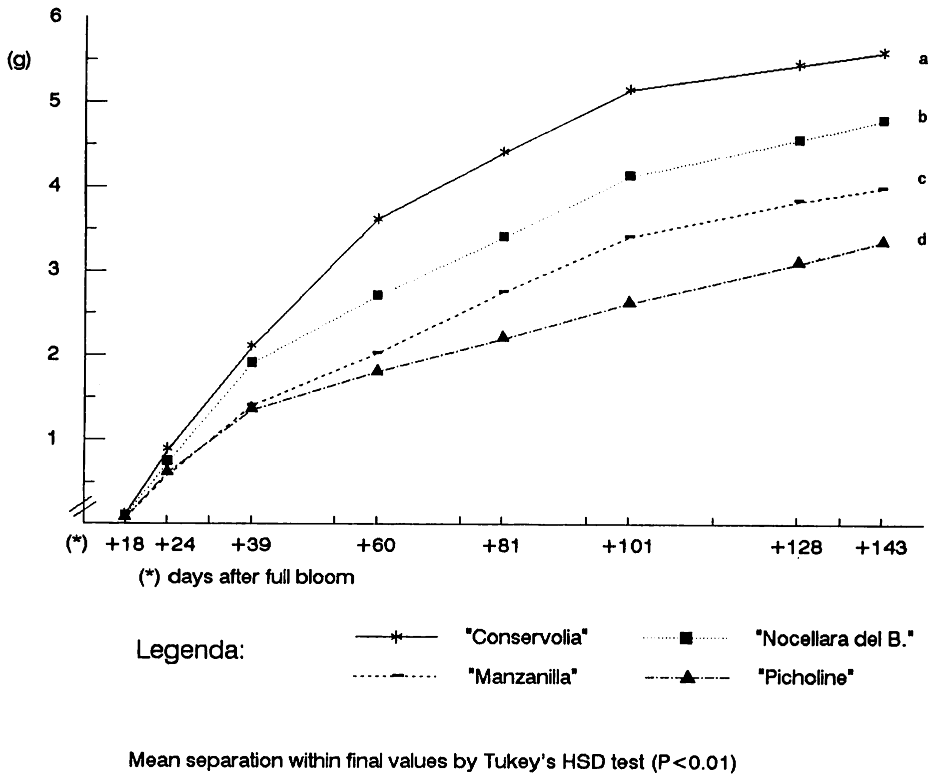


Figure 3. Fruit weight growth in the four table olive cultivars grown in Sicily (37°41′ N).

Average shoot length recorded at FB + 143 was significantly higher in 'Manzanilla' (Figure 4).

In the pollination trials, the four cultivars under examination proved to be nearly self-incompatible (Table 3). 'Picholine' was the best pollinizer, assuring fruit set in the other three cultivars. Both 'Monzanilla' and 'Nocellara del Belice' worked very well as pollinizers for 'Picholine' (Table 3).

Conclusion

Shortly before anthesis, self-regulating processes of the flower population have a compensating effect and minimize eventual initial differences in the average number of flower per cluster and the amount of pistil failure (5). Although following the same pattern, these processes occur at different times and different intensities according to the variety.

If flower initiation and development ecological requirements are met, the yield of olive cultivars outside their native area, while dependent on the number of flowers and pistil failure, is determined by the presence of cultivars which guarantee a sufficient degree of pollination. Indeed, a higher fruit set can be compensated by a more marked fruit drop. In our tests, cross pollination proved indispensable to all four cultivars taken into consideration, including 'Manzanilla' which, in its native areas, has a satisfactory fruit set even without pollinizer (1, 5).

According to our trials, 'Conservolia' should not be used as pollinizer for the other 3 cultivars as it does not ensure satisfactory production. In the

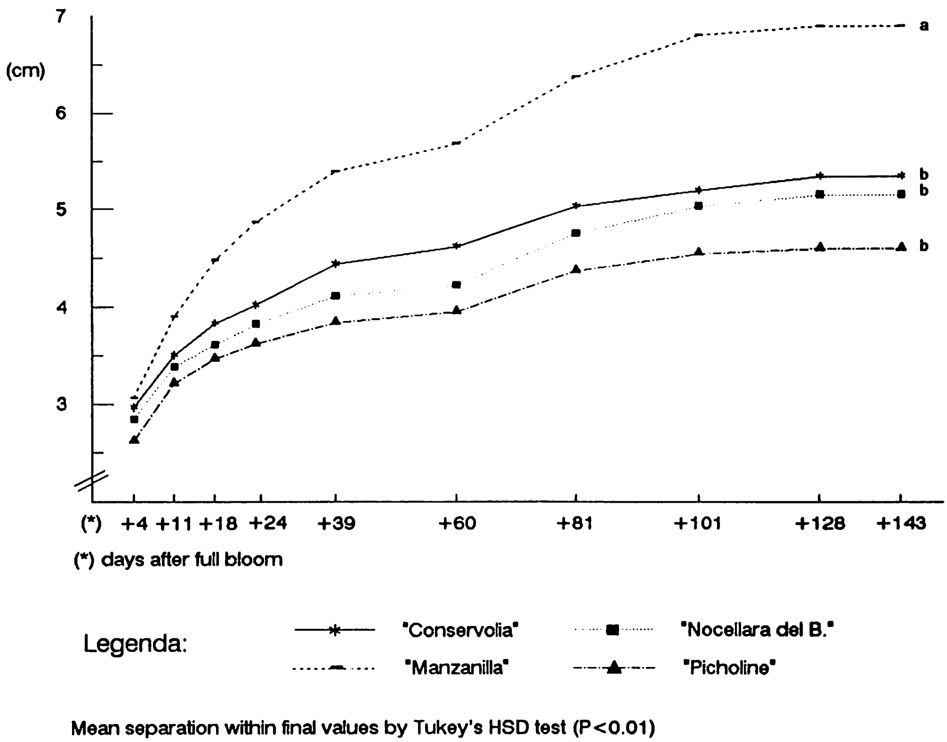


Figure 4. Shoot growth in the four table olive cultivars grown in Sicily (37°41′ N).

prevailing condition we carried out the trials pollen of 'Conservolia' showed a low germination capacity and/or viability. Moreover this study pointed out that both shoots' and fruits' growth and fruit load regulation of the four cultivars originated in as many as Mediterranean areas can be represented by a unique model, at least when they are grown under the same environmental conditions.

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Greenhouse Forced and Field Growing of 'Maravilha' Peach

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Abstract

Ownrooted 'Maravilha' potted peach trees were investigated under field and greenhouse conditions to determine the effect of the environment on the development of fruits and apical shoots. Higher greenhouse temperatures soon after bloom hastened fruit growth rate and shortened the fruit development period without influencing harvested fruit size. Field temperatures during the Stage I of fruit growth were likely to be cooler than the optimum. Furthermore, Stage II of fruit growth was prolonged under field conditions thus fruits grown in the greenhouse from bloom onward reached harvest maturity 9 days earlier than those growing in the field. Absolute and relative shoot growth was enhanced by higher greenhouse temperatures.

Introduction

Environmental conditions, chiefly temperature, substantially affect the length of the fruit development period (FDP) by advancing or delaying maturity time (13, 17, 23, 26). Forecasting models, based on temperature have been formulated to predict the ripening time of different fruit trees (7, 19, 21). Blake (6) found that FDP in peach was influenced by the prevailing temperatures during March and April. Other authors have confirmed that, in stonefruit, warm temperatures during bloom and soon after fruit set resulted in a shorter FDP and increased fruit size during Stage I of fruit development (2, 8, 16, 23, 24, 26). The larger fruit size reached at the end of Stage I has been associated with enhanced cell division (17) earlier foliation and larger leaf size (2). The interaction between temperature and fruit growth lasts throughout the growing season. Cool temperatures during Stage III of FDP reduce fruit growth while those above the optimal delay ripening and might result in a smaller fruit size at harvest (2, 17, 20). The earlier fruit ripening of peaches growing in the

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