Autogamy Among Selected Peach and Nectarine Cultivars[1]

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Self-compatibility and self-fertility in nectarine and peach [*Prunus persica* (L.) Batsch] are nearly ubiquitous, except for J. H. Hale and some of its derivatives which produce sterile pollen (4, 5). Self-fertility, although essential may be insufficient for fruit set if there is inadequate transfer of pollen from anther to stigma. In a summary of the relevant literature, McGregor (9) states that "pollinating insects are of value even for the self-fertile peach cultivars." Seventeen peach cultivars averaged 40% less fruit set on limbs enclosed in bags to exclude insects vs. limbs exposed to open pollination (2). It is not widely appreciated, however, that these data also indicated considerable differences among cultivars in their degree of dependence on insect-mediated pollen transfer.

The present experiment was performed in Bet Dagan, Israel to clarify the level of dependence of selected early ripening peach and nectarine cultivars on insect-mediated pollen transfer before testing them in enclosed structures. Peach culture in enclosed structures has been initiated (1) to accelerate anthesis and fruit maturation. Cultivars adapted optimally to such culture should have a strong potential for autogamy (i.e., no dependence on insects for pollen transfer). We selected a number of cultivars known to have low winter chilling requirements as our test material. The origin and cultivars tested were: (a) Gainesville, Florida: Maravilla, Fla. 14-55, Flordagold, Earligrande, Sunred and Sunlite; (b) California: Babcock; and (c) South Africa: Rhodes (Swellengreible).

Materials and Methods

Our field plot contained eight cultivars planted in adjacent rows. Two trees of each cultivar were chosen and two uniform limbs were selected on each tree. One limb per tree was enclosed in a 40-mesh nylon, insect-proof bag before anthesis to preclude insect visitation. The other test limb (control) remained accessible to bees. Test limbs carried an average of 70 to 80 flowers, but this varied according to the floral bud density of each cultivar. The occurrence of pollination and fertilization was assumed if the fruit enlarged sufficiently to spilt the 'calyx' cup, and this was termed 'initial set.'

Results and Discussion

Autogamy occurred in all eight cultivars tested, and exclusion of insects did not reduce initial set in any of the test cultivars (Table 1). In several cases (e.g., Flordagold, Rhodes) initial set may have been increased as a result of limb enclosure. Limb enclosure undoubtedly altered the microenvironment of the enclosed blossoms as anthesis of the caged limbs was delayed (vs. open-pollinated) as much as one week in several of the test cultivars. Initial fruit set of Fla. 14-55, although considerably lower than the other seven cultivars (Table 1), was not limited by the exclusion of insects. Fruit set percentages after June drop likewise did not differ between the two treatments in any of the test cultivars (data not presented).

The potential for parthenocarpic fruit set in peach has been reported (7); however, we visually confirmed the presence of embryos in the mature fruit of all test cultivars precluding parthenocarpy (Table 1). All cultivars

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Table 1. Effect of insect exclusion on percentage fruit set and embryo development in selected peach and nectarine cultivars.

Cultivar	Limb treatment	Initial fruit set (%)[z]	Fruit with[y] macroscopically visible kernels (%)
Maravilha	Bagged	88.0 ± 0.0	100
	OP[x]	88.0 ± 0.7	100
Flordagold	Bagged	79.5 ± 0.4	75
	OP	62.5 ± 13.8	70
Fla. 14-55	Bagged	50.0 ± 0.7	100
	OP	52.0 ± 0.0	100
Earligrande	Bagged	89.5 ± 0.4	100
	OP	88.5 ± 1.0	100
Sunred	Bagged	75.5 ± 1.8	100
	OP	74.5 ± 3.9	100
Babcock	Bagged	92.5 ± 1.1	95
	OP	98.0 ± 1.4	100
Rhodes	Bagged	96.0 ± 2.0	100
	OP	65.5 ± 4.6	100
Sunlite	Bagged	92.5 ± 1.1	100
	OP	95.5 ± 1.8	100

[z]Data represent the mean ± standard error of 2 limbs per treatment.
[y]Twenty fruit per treatment were examined at fruit maturity.
[x]Open-pollinated.

exhibited poorly developed embryos characteristic of early-maturing cultivars. Embryos of Sunlite and Flordagold were translucent and often barely visible to the naked eye. (Macroscopic embryos were not detected in 20-30% of Flordagold seeds and a smaller percentage of Babcock seeds, Table 1.)

There have been allusions to the occurrence of cleistogamy in peach (6), but definitive data appear lacking. Cleistogamy is a form of autogamy in which the flowers self-pollinate before blossom opening. We observed some dehiscence in the most advanced stages of unopened blossoms of Maravilha, Flordagold, and Sunred, but actual pollen transfer to the stigmatal surface within the closed flower was not confirmed during this investigation.

The mechanism by which pollen transfer between anther and stigma is effected in the absence of insects remains ill-defined. The role of airborne pollen appears insignificant in peaches (7, 8), but the daily buffeting of branches by winds may be sufficient to dislodge pollen from the anthers and to transfer it to the stigmas particularly in cultivars in which the spatial relationship between pistil and anthers is conducive to pollen transfer. Possible involvement of electrostatic forces in pollen transfer have been suggested recently (3). The extent to which the potential for autogamy is genetically determined and the possibility of environmental influences (i.e., year-to-year variation) has apparently not been studied.

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