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Short communication

Effect of hand and chemical thinning on growth, production and fruit size in nectarine [*Prunus persica* (L.) Batsch var. *nucipersica*] cv. May Fire

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ABSTRACT

The present investigation was conducted on 10-year-old May Fire nectarine plantations at the experimental orchard of Horticulture Research Station, Kandaghat, Himachal Pradesh during 2011-2012. Experimental trees were given the treatments, *viz*. retention of 3, 4 and 5 fruits per fruiting shoot after selective removal of fruits with hand at pea stage, foliar application of ethrel at 200 and 300 ppm, NAA at 40 and 60 ppm and thidiazuron at 20 and 40 ppm two weeks after petal fall and un-thinned control with three replications in randomized block design. Foliar spray of NAA at 40 ppm significantly increased the per cent fruit thinning, the yield of "A" grade fruits, fruit size and rate of photosynthesis. However, the higher increase in shoot growth, tree volume, leaf area, leaf to fruit ratio were recorded under the treatment of hand thinning to retain 3 fruits per shoot. The lowest fruit drop was found with NAA 60 ppm and T_3-Retention of 5 fruits per shoot in 2011 and 2012, respectively.

Key words: Chemical thinning, growth, fruit quality, nectarine.

May Fire is one of the most important among the different cultivars of nectarine grown in the state. Its fruit is an early maturing, attractive coloured, medium sized; having smooth skin of green to white with deep red over colour. For profitable nectarine production, some quality parameters are very important and foremost being the large sized fruit which has strong market demand. However, nectarines invariably bear excessively, resulting in the production of small sized fruits, which are relatively less remunerative. Fruit thinning is necessary for crops such as apples, peaches, nectarines, pears, plums, etc., which have tendency to bear heavily. It is one of the important agro techniques required for the improvement of fruit size, colour and quality, besides reducing limb breakage and promoting general tree vigour (Sefick and Ridley, 7). Thinning lessens the demand on the tree's resources so that it is able to make good growth and develop fruit buds for the following year and thus avoiding the risk of biennial bearing.

The trial was carried out on 10-year-old trees of nectarine cultivar May Fire raised on wild peach seedling rootstocks. The trees had been planted at a spacing of 3 m × 3 m and trained as open centres at the experimental orchard of Horticulture Research Station, Kandaghat during 2011 and 2012 in a randomized block design with ten treatments and three replications. The following were the treatment details T_1 = Retention of 3 fruits per shoot; T_2 = Retention of 4 fruits per shoot; T_{3bv} = bv retention of 5 fruits per shoot; T_4 = ethrel 200 ppm; T_5 = ethrel 300 T_6 = NAA 40 ppm; T_7 = NAA 60 ppm; T_8 = Thidiazuron 20 ppm; T_9 = Thidiazuron 40 ppm; T_{10} = control. The hand thinning was done at pea stage and foliar application was given two weeks after petal fall. The length of these shoots was measured with measuring tape at the end of growing period The volume of the tree was worked out once before the start of the experiment and again after the completion of the experiment in each year with the help of formulae given by Westwood (10). The leaf area was measured with the help of Automatic Leaf Area Meter (Licor model 3100. The rate of photosynthesis was taken with the help of LCA4 portable photosynthesis system (ADC. UK) in mid-June (Hunter and Proctor, 3). Leaf/fruit ratio was worked out by dividing the total number of leaves with total number of fruits. The fruit retained after thinning were taken as yield. Fruit sizes and breadth were recorded with a digital callipers.

The percent fruit thinning was significantly influenced by manual and chemical thinning treatments, during both the years of study. However, NAA applied at 40 ppm induced the maximum fruit thinning during both the years (Table 1). These results are in accordance with those of Brar *et al*. (2) and Sharma *et al*. (9), who found optimum fruit thinning with 40 ppm NAA when applied after petal fall in peaches. Exogenous application of NAA may increase auxin in seeds to supra-optimal level, which interfere in the development of embryo and endosperm, and also stimulate ethylene evolution, causing abscission of young fruit-lets (Krishnamoorthy, 4). Retention of 3

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Table 1. Effect of manual and chemical thinning on per cent response, shoot growth, tree volume, leaf area, photosynthesis and leaf to fruit ratio in nectarine cv. May Fire.

Treatment	Fruit thinning (%)		Shoot growth	Tree volume (m^3)	Leaf area (cm^2)		Photo-synthesis (μ mol $m^{-2}s^{-1}$)	Leaf:fruit ratio	
	2011	2012			2011	2012		2011	2012
T_1	37.25 (37.61)	29.94 (33.17)	170.00	35.50	37.79	36.77	46.74	49.87	43.08
T_2	33.47 (35.29)	26.56 (30.98)	163.70	29.64	36.71	31.29	45.00	43.07	40.89
T_3	30.53 (33.49)	23.34 (28.84)	153.20	26.84	35.26	30.02	44.22	32.43	35.45
T_4	48.70 (44.24)	21.31 (27.48)	163.30	25.45	33.73	25.31	48.52	32.37	32.33
T_5	48.92 (44.38)	24.15 (29.41)	155.00	24.63	31.06	24.63	47.00	34.70	34.68
T_6	60.40 (51.04)	30.47 (33.38)	165.00	28.84	37.52	32.02	62.00	35.60	35.86
T_7	57.45 (49.33)	29.00 (32.56)	167.80	34.86	36.54	29.48	59.00	33.07	32.33
T_8	27.46 (31.55)	19.81 (26.41)	165.30	26.57	34.34	28.75	44.67	25.72	28.92
T_9	30.01 (33.21)	19.18 (25.90)	163.30	32.40	32.57	28.52	45.33	29.51	29.14
T_{10}	21.51 (27.61)	13.49 (21.47)	150.20	23.93	28.74	22.74	40.85	25.50	24.73
$CD_{0.05}$	5.22	4.12	3.64	7.77	4.33	5.74	3.72	8.86	6.23

Figures in the parentheses are Arc Sine transformed values

fruits per shoot with hand thinning caused more shoot growth and tree volume. In this study, the increase in shoot growth of heavily thinned trees might be due to greater availability of photosynthates and nutrients. Similarly, increase in vegetative growth with the increase in the intensity of fruit thinning has been reported in Elberta peachs (Morris *et al*., 5).

Average leaf area was increased greatly by hand thinning treatments and NAA application at 40 ppm and decreased by Ethrel application at 200 and 300 ppm, during both the years. The increase in leaf area might be due to increased supply of water and nutrient to the developing leaves after reduction of crop load with different thinning treatments (Sharma *et al.*, 9).The maximum photosynthesis was found with NAA at 40 ppm. Leaf /fruit ratio was found to be greatly higher in the trees hand thinned to retain 3 fruits per shoot tree in 2011 & 2012, respectively. Hand thinning reduced the number of fruits per unit area, as a consequence of which the increase in the leaf to fruit ratio in the present study is quite understandable. There are reports to suggest that hand thinning increased the leaf to fruit ratio in peaches (Sharma *et al*., 9).

The fruit drop was observed to be highest in control in both the years and lowest in the NAA 60 ppm and retention of 5 fruits per shoot in 2011 and 2012, respectively (Table 2). The present findings are in conformity with those of Sharma *et al*. (9), who observed that post petal fall application of NAA though caused abscission of young fruitlets, but decreased the drop of the remaining fruits until harvest. Average fruit yield decreased significantly under different thinning treatments when compared with control. However, when yield of graded fruits was taken into account in this study, the production of superior grade fruits was found to be significantly higher under different thinning treatments in comparison to control. Trees under hand thinning treatments of retaining 3 or 4 fruits per shoot and chemical thinning with NAA at 40 ppm produced appreciably higher proportion of “A’’ and “B’’ grade fruits, whereas, trees under control produced only negligible amount of superior grade fruits. The present studies are in line with the findings of Baroni *et al*. (1) who reported that hand thinning of several peach cultivars though decreased the total yield but increased the proportion of better grade fruits. Sharma *et al.* (9) observed a decrease in average yield but an increase in the production of marketable fruits following the application of NAA at 14-15 mm fruitlet diameter stage in Redhaven peach.

Maximum fruit size was found with NAA 40 ppm during both the years. Higher fruit size under these treatments can be attributed to a significant increase in the leaf to fruit ratio and thus more translocation of assimilates to the remaining developing fruits after thinning. Earlier, increased fruit size have been reported with the selective removal of blossom (Saini and Kaundal, 6) or young fruitlets (Sharma *et al*., 8) in different peach cultivars. The findings are also in accordance with those of Sharma *et al.* (9), who observed that application of NAA and ethrel at 14-15 mm fruitlet diameter stage significantly increased fruit size in Redhaven peach.

Table 2. Effect of manual and chemical thinning on fruit drop, fruit yield, graded yield and fruit size of nectarine.

Treatment	Fruit drop (%)		Fruit yield (kg/tree)		A grade fruits (%)	B grade fruits (%)	C grade fruits (%)	Fruit size (Fruit breadth)	
	2011	2012	2011	2012				2011	2012
T_1	2.00 (1.41)	2.91 (1.70)	15.50	9.50	37.10 (37.52)	36.58 (37.22)	26.32 (30.86)	5.15	4.12
T_2	2.10 (1.44)	2.80 (1.67)	16.67	11.88	34.20 (35.79)	35.17 (36.37)	30.63 (33.57)	5.00	4.13
T_3	1.25 (1.11)	2.75 (1.65)	18.00	12.00	31.67 (34.24)	35.00 (36.27)	33.33 (35.25)	5.09	4.09
T_4	2.50 (1.58)	3.54 (1.88)	17.50	13.33	15.00 (22.78)	35.00 (36.27)	50.00 (45.00)	4.98	4.00
T_5	2.52 (1.58)	3.60 (1.89)	16.33	11.67	22.86 (28.55)	31.41 (36.06)	45.73 (42.49)	5.11	4.00
T_6	1.23 (1.10)	3.20 (1.78)	17.33	10.78	48.14 (43.94)	37.05 (37.49)	14.81 (22.60)	5.21	4.33
T_7	1.20 (1.09)	3.22 (1.79)	15.67	10.00	30.00 (33.20)	30.00 (33.20)	40.00 (39.23)	4.89	4.15
T_8	3.11 (1.76)	4.97 (2.22)	17.33	12.00	20.83 (27.15)	30.50 (33.52)	48.60 (44.20)	4.89	4.13
T_9	3.12 (1.76)	5.90 (2.42)	16.17	14.33	13.60 (21.63)	37.50 (36.57)	48.90 (44.37)	4.88	3.98
T_{10}	5.20 (2.28)	7.16 (2.67)	24.50	18.00	5.60 (13.65)	5.60 (13.65)	88.80 (70.50)	4.19	3.33
$CD_{0.05}$	0.05	0.10	4.19	2.49	1.04	2.19	1.98	0.32	0.33

Figures in the parentheses are Arc Sine transformed values

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