

Influence of Fruit Thinning on Yield and Return Bloom of Red Delicious Apple in Kashmir Valley

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Abstract

Apple ranks first in area and production amongst all the temperate fruits grown in the Kashmir valley. For getting the optimum fruit set and higher yields every year an experiment was conducted in Srinagar with twelve treatments replicated three times with two methods of thinnings (hand and chemical thinning with NAA, ethephon and their combinations). The hand and chemical thinning was conducted at the time of full bloom. The results indicate that maximum reduction in fruit drop (27.70%) and higher yield (66.20 kg/tree) with maximum return bloom (8.00 pt.) was achieved by the application of ethephon at 150 ppm. Maximum initial fruit set (81.00%) in the following year was recorded under 60% hand thinning followed by ethephon 150 ppm (80.00%). Hence ethephon 150 ppm is proved to be the best alternative for hand thinning as latter one is time and labor consuming.

Key words : Fruit thinning, Return bloom, NAA, Ethephon, Apple.

A healthy fruit plant produces heavy bloom, sometimes more than double the crop required under an integrated cultural program of pruning, fertilization and soil management. This creates a severe competition between the fruits for nutrients which results to low fruit set, heavy fruit dropping and low yields. To overcome this problem, excess blossom have to be removed, which can be accomplished by thinning of blossom. Blossom thinning by hand has been practiced times mainly to increase the yields (1) however, it is expensive and impracticable. Heavier thinning to achieve higher yields has also promoted dense return bloom the following year which can also be achieved by chemicals that also control vegetative growth (2). To tackle the problem of heavy fruit drop and lower yields proposed study was carried out to find out that the optimum thinning treatment for higher yields.

Methods

Studies were conducted on Red Delicious apple tree growing in the Experimental Farm of the Division of Pomology, SKUAST-K, Shalimar, Srinagar. Trees selected for the studies were of uniform size and vigor

and received uniform cultural practices (manures, fertilizers, tillage). The experiment laid out in randomized block design was replicated thrice. One tree served as a unit of treatment in each replication. Following treatments were applied at the time of full bloom. T₁ : Control (unsprayed), T₂ : Hand thinning treatment where 45% of flowers were removed per cluster, T₃ : Hand thinning treatment where 60% of flowers were removed per cluster per cluster, T₄ : Water spray, T₅ : NAA at 5 ppm, T₆ : NAA at 10 ppm, T₇ : Ethephon at 75 ppm, T₈ : NAA at 5 ppm + Ethephon at 75 ppm, T₉ : NAA at 10 ppm + Ethephon at 75 ppm, T₁₀ : Ethephon at 150 ppm, T₁₁ : NAA at 5 ppm + Ethephon at 150 ppm, T₁₂ : NAA at 10 ppm + Ethephon at 150 ppm. Observations were recorded on fruit set (%), fruit drop (%), yield /tree (kg), yield efficiency (kg/cm²) return bloom or bloom intensity (grade points from 1 to 9) and initial fruit set (%). The analysis of the data was done following standard statistical methods.

Results and Discussion

The data related to different parameters as influenced by different treatments is given in Table 1. Maximum (70 %) fruits were retained in the untreated

Table 1. Effect of different treatments of thinning on fruit set, fruit drop and yield of Red Delicious apple.

Treatments	Fruit set (%)	Fruit drop (%)	Yield (kg/)	Yield efficiency (kg/cm ²)	Return bloom	Initial fruit set (%)
T ₁	70.00	45.15	35.50	1.38	2.50	78.66
T ₂	54.50	38.72	60.00	1.19	5.00	79.00
T ₃	43.00	34.40	63.50	1.10	6.00	81.00
T ₄	61.00	42.30	45.60	1.21	5.00	80.00
T ₅	66.50	31.26	58.50	1.26	5.00	79.00
T ₆	63.50	29.33	60.20	1.28	5.50	78.00
T ₇	57.00	28.25	62.40	1.22	7.00	78.33
T ₈	53.00	29.61	60.40	1.02	6.00	79.50
T ₉	51.00	29.50	61.20	1.10	5.30	78.00
T ₁₀	52.00	27.70	66.20	1.20	8.00	80.00
T ₁₁	36.00	28.42	62.00	0.94	6.00	79.00
T ₁₂	34.00	28.50	61.70	0.90	6.50	79.50
CD 0.05	2.45	1.07	2.79	0.09	0.18	1.03

trees. However, significant thinning effect was pronounced under different treatment with lowest fruit set of 34% under combined sprays of naphthalene acetic acid at 10 ppm and ethephon at 150 ppm. The hand thinning treatment where 60% flowers were removed per cluster recorded minimum fruit set of 43%, whereas 45% hand thinning recorded a fruit set of 54.50%. Similarly, among ethephon treatments (75 and 150 ppm) maximum fruit set of 52% was recorded in trees treated with ethephon at 150 ppm, whereas both NAA treatments were significantly at par with each other. The effect of different concentrations of ethephon (75 and 150 ppm) and NAA (5 and 10 ppm) and their combinations on reducing the fruit set in Red Delicious were markedly pronounced. With the increase in the concentrations of growth regulators there was corresponding increase in the thinning effect. The thinning effect of the growth regulators at full bloom stage is attributed to the prevention of fertilization by interfering with pollen tube growth and damage caused to different flower parts which include anthers, stigma and style (3).

A significant reduction in total fruit drop was observed in all the treatments except T₁ (control) and T₄ (water spray). Maximum reduction in fruit drop (27.70%) was observed in treatments when ethephon was applied at 150 ppm which was followed by treatments T₇ i.e. ethephon 75 ppm (28.25%), T₁₁ i.e. NAA at 5 ppm + ethephon 150 ppm (28.42%) and T₁₂ i.e. NAA 10 ppm + ethephon 150 ppm (28.50%). All these four treatments i.e. T₇, T₁₀, T₁₁, T₁₂ were statistically at

par with each other. However, maximum (45.15%) fruit drop was recorded under control. This reduction of total fruit drop was partly attributed to its effect in curtailing endogenous levels of auxins which further reduced the rate of ethylene production and thus resulted in a lower fruit drop (4). Reduction in the fruit drops with the application of ethephon alone and combined with NAA might be due to the thickening of pedicel of the fruit (5).

Although higher yield/tree was recorded in all treatments except control and water spray. Maximum (66.20 kg) yield per tree was registered in T₁₀ treatment i.e. ethephon at 150 ppm which was statistically at par with 60% hand thinning however, other treatments were statistically at par with each other. Minimum (35.50 kg) yield per tree was recorded under control. The high yields in the T₁₀ treatment (ethephon 150 ppm) was due to less fruit drop. All the thinning treatments tended to reduce the yield efficiency over control. The highest yield efficiency (1.38 kg/cm²) was recorded over control. Among various chemical treatments NAA at 10 ppm did not affect yield efficiency significantly and recorded highest yield efficiency of 1.28 kg/cm² whereas the lowest yield efficiency (0.90 kg/cm²) was observed in trees treated with combination spray of NAA 10 ppm + ethephon 150 ppm. Various thinning treatments reduce yield efficiency which can be attributed to the reason that the percentage of fruits retained at the time of maturity was low compared to control as such there was no appreciable increase in fruit yield. Hand thinning and ethephon

treatments reduced the yield efficiency, whereas, NAA treatments did not affect yield efficiency (4, 6).

Hand thinning, ethephon (75 and 150 ppm), NAA (5 and 10 ppm) and combination spray of NAA and ethephon increased bloom intensity in the next year. The maximum return bloom (8.00 pt on scale of 1—9) was recorded in trees treated with ethephon 150 ppm in the previous year and the minimum (2.50 pt) return bloom was noticed in control. Among other treatments 45% hand thinning, control and NAA 5 ppm were statistically at par with each other. The initial fruit set in the next year reveals that all the treatments are significantly higher over control except T₆ i.e. NAA 10 ppm and T₉ i.e. NAA 10 ppm + ethephon 75 ppm. Maximum initial fruit set (81%) was observed in 60% hand thinning which was statistically at par with T₄ treatment i.e. water spray (80.00%) and T₁₀ treatment i.e. ethephon 150 ppm (80.00%). The effect on return bloom could be attributed to the reason that in control the seeds of young developing fruits produce gibberellins which are known to inhibit the flower bud formation for the following year. Further, a heavy crop is a drain on the tree and consumes all the available nutrients. Since feeding the fruits assumes priority over all other functions, the flower bud for the following year suffers and the tree is likely to pro-

duce fewer blossoms the next year (7,8). Based on the present study it may be concluded 60% hand thinning and ethephon 150 ppm proved to be the most effective for getting higher yield every year. However, hand thinning is time and labor consuming therefore ethephon 150 ppm is best for thinning and as such can be advocated to the orchardists for getting higher yields.

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