



Ethephon - A Best Alternative for Hand Thinning to Improve Fruit Set, Colour and Shelf Life of Apple

S A Bandy, Javed A. Bhat, F A Ahanger, Aeja A Dar, P A Dar, Bheenish Shakeel

Krishi Vigyan Kendra, Ganderbal, Shuhama, SKUAST- Kashmir.

ABSTRACT

A field experiment was carried out to study the effect of hand and chemical blossom thinning on fruit set, colour development, shelf life and return bloom of Red Delicious apple fruit at the experimental farm, Division of Fruit Science, SKUAST-K, Shalimar. The experiment consisted of twelve treatments replicated three times with a single plot size in a randomised block design. Three methods of thinning viz., hand thinning, chemical thinning (NAA and Ethephon) and water thinning were tried at full bloom. Maximum fruit set (70%) was recorded in control while minimum (34%) was recorded in combined spray of NAA 10 ppm and Ethephon 150 ppm. Maximum pronounced fruit colour (4.0) and return bloom score (8.0) was recorded with fruits obtained from trees treated with 150 ppm Ethephon. Maximum percentage of A grade fruits (83.75%) was recorded with 60per cent hand thinning and with Ethephon 150 ppm (80%) whereas minimum percentage of A grade apples were found with control (59%). Among treatments, Ethephon at 150 ppm and 60per cent hand thinning were most effective in improving fruit quality attributes. Hand thinning being time and labour consuming practice was not possible in commercial horticulture. However, Ethephon 150 ppm was the best alternative for hand thinning and as such can be advocated to the orchardists for getting quality fruit of apple.

Key Words: Apple, Thinning, fruit set, return bloom, shelf life.

INTRODUCTION

Apple occupies a prominent place among all the temperate fruits in Jammu and Kashmir with an annual production of 18.82 Mt from an area of 1.65 lakh hectares (Anonymous, 2018). A healthy apple orchard under an integrated cultural programme of pruning, fertilization and soil management produces heavy bloom, sometimes more than double the crop required. This results in poor quality fruit with unsatisfactory colour development and effect the return bloom. Thinning of blossom reduces fruit set which helps in maintaining a balance between vegetative and reproductive growth to ensure good crop year after year (Kunwar, 1988). Keeping in view the importance of thinning, an experiment was carried to study the effect of hand and chemical thinning on fruit set, colour development, shelf life and return bloom of Red Delicious apple.

MATERIALS AND METHODS

The study was carried at the experimental farm of the Division of Fruit Sciences, SKUAST Kashmir, Shalimar. The orchard is situated at an altitude of 1590 m above mean sea level and is located between 37° 75' N latitude and 74° 50' E longitude. It is surrounded by Himalayan Ranges on Southeast and Northeast side. The climate in general is of temperate type. Winters are severe extending from December to March and temperature often goes below freezing point during this period. The experiment was laid out in Randomized Block Design with three replications. Following treatments were given at full bloom stage, T1: Control (unsprayed), T2: Hand thinning treatment where 45 per cent flowers/cluster were removed, T3: Hand thinning treatment where 60 per cent flowers/cluster were removed, T4: Water

Table 1. Effect of hand and chemical blossom thinning on fruit grade at the time of harvest.

Treatment	Percentage of fruit in different grades		
	A	B	C
T1 (Control)	59.00	26.00	15.00
T2	81.00	10.25	8.75
T3	83.75	11.00	5.25
T4	61.00	26.50	12.50
T5	62.50	26.00	11.50
T6	64.00	28.00	8.00
T7	70.00	25.00	5.00
T8	65.00	29.00	6.00
T9	64.50	28.50	7.00
T10	80.00	15.50	4.50
T11	66.50	26.50	7.00
T12	70.00	25.00	5.00
LSD at 5%	0.94	1.04	0.53
\pm S.E. _(diff.)	0.45	0.50	0.25

A = > 6. cm diameter, B = 5.0 – 6.0 cms and C = < 5.00 cm

spray, T5: NAA@5ppm, T6: NAA@10ppm, T7: Ethephon@75ppm, T8: NAA@5ppm + Ethephon @75ppm, T9: NAA@10 ppm + Ethephon @ 75ppm, T10: Ethephon@150ppm, T11: NAA@5ppm + Ethephon @150ppm, T12: NAA@10ppm + Ethephon @150ppm. Observations were recorded on colour, grading of fruits, fruit set, return bloom and shelf life. Colour of fruit skin was recorded on the basis of 1-4 scale as suggested by Blanpied *et al* (1975). Fruits were graded into A, B and C on the basis of fruit size, colour and defects (Anonymous, 2004). Bloom intensity in the following year was observed by visual assessment on a scale of 1-9.

RESULTS AND DISCUSSION

The best results in terms of percentage of 'A' grade fruits were obtained in case of 60 per cent hand thinning which recorded 83.75 per cent 'A' grade fruits as compared to 59.0 per cent in case of control. Thinning with Ethephon 150ppm resulted in corresponding decrease in B and C

grade fruits. The highest (15 %) C grade fruits were recorded under control. Hand thinning and Ethephon treatments increased the quality of A grade fruits. These findings were in agreement with the results of Mekjell and Lars (2011). The trees treated with Ethephon 150ppm and 60 per cent hand thinning were significantly higher in colour scoring with 4.00 and 3.66 pts, respectively as against 1.66 pts recorded under control. However, there was not significant difference in colour development between untreated and NAA treated trees. These findings were in agreement with those of Greene (1976); Jones *et al* (1988) and stopar *et al* (2004). Larrigaudiere *et al* (1996) also reported that application of Ethephon was quite effective in the activity of Phenylalanine- ammonia lyase enzyme in Ethephon treated fruits seems to be the determining factor for colour development. All the thinning treatments increased bloom intensity in the next year. Maximum return bloom (8.00 pt on scale of 1-9). This pronounced effect of all the thinning

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Table 2. Effect of hand and chemical blossom thinning on fruit bloom intensity and initial fruit set in the next year of Red Delicious.

Treatment	Red colour score	Return bloom (1-9)	Initial fruit set (%)
T1 (Control)	1.66	2.50	78.66
T2	3.33	5.00	79.00
T3	3.66	6.00	81.00
T4	2.00	5.00	80.00
T5	2.00	5.00	79.00
T6	2.33	5.50	78.00
T7	3.00	7.00	78.33
T8	2.33	6.00	79.5
T9	2.66	5.30	78.00
T10	4.00	8.00	80.00
T11	2.33	6.00	79.00
T12	2.66	6.50	79.50
LSD at 5%	0.58	0.18	NS
\pm S.E. _(diff.)	0.27	0.08	-

treatments could be attributed to that in control, the seeds of young developing fruits produce gibberellins which are known to inhibit 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 fruit assumes priority over all other functions, the flower buds for the following year suffers and tree is likely to produce fewer blossoms the next year. These findings were in agreement with the findings of Schupp (2003) and McArteny *et al* (2007). The maximum physiological loss in weight (9.60%) was observed in fruits treated with Ethephon 150 ppm under ambient conditions whereas the minimum (8.30%) was recorded in NAA 10 ppm and control. Similar trend in case of percentage loss in firmness and shrinkage was found at the end of 30 days. This could be attributed to the fact that softening of fruits from Ethephon treated fruits involve hydrolysis of cellulose cell walls and cell wall degradation and

attacking pectins cementing the middle lamella and cellulosic walls may be responsible for soft consistency of Ethephon treated fruits (Rai et al. 1987). Similar findings were observed by Macartney and Wells (1995).

CONCLUSION

The findings revealed that hand thinning and Ethephon 150 ppm proved to be most effective in improving fruit set, colour, A grade fruits and return bloom. Hand thinning being time and labour consuming practice is not possible in commercial horticulture. Therefore, Ethephon 150 ppm was best alternative for hand thinning and as such can be advocated to the orchardists.

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Table 3. Effect of hand and chemical blossom thinning on shelf life of Red Delicious.

Treatment	Per cent loss reduction at the end of 30 days storage		
	Loss of weight	Firmness	Size (diameter)
T1 (Control)	8.30	21.96	6.60
T2	9.50	25.43	7.20
T3	9.50	26.50	7.40
T4	8.50	23.71	6.70
T5	8.70	23.31	6.80
T6	8.30	22.25	7.00
T7	9.00	26.00	7.00
T8	9.20	25.25	7.20
T9	9.25	24.36	7.30
T10	9.60	27.08	7.60
T11	9.25	26.63	7.20
T12	9.30	26.80	7.40
LSD at 5%	0.05	0.13	0.10
± S.E. (diff.)	0.02	0.06	0.05

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