



# Effect of Nutrient Supplement on Fruit Set, Yield and Quality of Apple cv Red Delicious under Temperate Conditions of Kashmir Valley

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## ABSTRACT

A field experiment was carried out to study the effect of foliar spray of different doses of nutrient supplement containing Boron (3%), Zinc (4% chelated), Copper (0.1% chelated) and Molybdenum (0.02%) on apple fruit during 2016 and 2017 growing seasons. Nutrient supplement (Flower Power) was applied twice during blooming, first spray when 20 per cent flowering occurred and second ten days after first spray, at the rates of 0, 0.06, 0.08 and 1.0 per cent in randomized block design and fruit set percentage, fruit drop percentage, yield and various physical and chemical characteristics were studied. It was found that nutrient supplement @ 1.0 per cent resulted in highest fruit length (8.19 cm), fruit breadth (8.04 cm), fruit weight (203.56 g), total sugars (11.05%), fruit set percentage (39.37%), yield (29.56 MT/ha) and least fruit drop (12.11%) in comparison to other treatments.

**Key Words:** Apple, Fruit Set, Nutrient, Quality, Supplement, Yield.

## INTRODUCTION

Apple (*Malus x domestica* Borkh) is the most popular and widely grown fruit crop throughout the world. In India it is grown in the states of Himachal Pradesh, Jammu and Kashmir and Uttarakhand. The area and production under apple crop in Jammu and Kashmir was 1.65 lakh ha and 18.82 MT, respectively in 2018-19 (Anony, 2019). The productivity and quality of apple crop in Jammu and Kashmir is very low as compared to the major apple producing countries of the world. The reduced yield and quality is attributed to various factors like poor pollination and fruit setting, insect pest and disease incidence, poor management strategies as well as deficiency of micronutrients like boron, zinc, copper etc. during the flowering and fruit development period. It has been observed that in most plant species the boron requirement for reproductive

growth is much higher than for vegetative growth (Loomis and Durst, 1992). Boron may be involved in carbohydrate or phenolic metabolism which is central to pollen tube growth.

Boron and zinc are very essential roles in apple tree growth and productivity. Both nutrients play an important role in the structure of cell wall and the integrity and functions of membranes in plants (Brown *et al*, 2002). Low leaf boron and zinc levels have been found to restrict the proportion of flowers pollination and fruits setting and decrease yield (Roygrong, 2009). Increase in pollen germination rate, fruit yield (Hanson, 1991) and fruit quality have occurred in response to foliar B and Zn applications. In addition, zinc is an essential trace element for the growth and development of plants, being involved in many enzymatic reactions

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**Table 1. Effect of chemical Flower Power (Nutrient Supplement) on fruit length, fruit breadth, fruit weight, fruit firmness and total soluble solids of apple cv. Red Delicious.**

Treatment	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)	Fruit Firmness (kg/cm <sup>2</sup> )	TSS (%)
Flower power@0.06 %	8.02	7.75	199.46	10.09	13.18
Flower power@0.08 %	8.03	7.98	201.68	9.96	13.34
Flower power@1.00 %	8.19	8.04	203.56	9.90	13.36
Control ( No spray)	8.02	7.66	198.31	10.28	13.05
<b>CD(0.05)</b>	0.14	0.17	1.46	0.20	0.13

Molybdenum functions in enzyme nitrate reductase which is responsible for reduction of nitrate to nitrite during nitrogen assimilation in plants. Copper is essential for photosynthesis, for the functioning of several enzymes, in seed development and for the production of lignin which gives physical strength to shoots and stem. Copper is essential for the growth of plant and helps in the formation of vitamin A (Martens and Westermann, 1991). The present study was undertaken to evaluate the effect of spraying Flower Power, a nutrient supplement (compound of Boron: 3%, Zinc: 4% chelated, copper: 0.1% chelated and Molybdenum: 0.02%) with different concentrations to study their effects on fruit set, yield and quality of apple cv. Red Delicious under temperate conditions of Kashmir.

## MATERIALS AND METHODS

Field experiment involving different doses of chemical Flower Power (Nutrient supplement) to evaluate its effect on fruit set and quality of apple cv. Red Delicious was carried out in an orchard in district Ganderbal, Kashmir. Different doses of nutrient supplement (Flower Power ) were sprayed on trees of uniform age of above fifteen years, twice during blooming. First spray when 20 per cent flowering occurred and second twelve days after first spray, at the rates of 0, 0.06, 0.08 and 1.0 per cent in randomized block design with four replications and fruit set percentage, fruit drop percentage, yield and various physical and chemical characteristics

were studied. The data on effect of chemical flower power (nutrient supplement) on fruit set, fruit drop, quality and yield of apple cv. Red Delicious were recorded, pooled and statistically analysed.

## RESULTS AND DISCUSSION

### Fruit Length

The data (Table 1) revealed that nutrient supplement spray had a significant influence on fruit length. Maximum fruit length of 8.19 cm was recorded with two sprays of Flower Power@ 1.0% and minimum fruit length of 8.02 cm was recorded with control (No spray) and treatment of Flower Power@ 0.06%. The important role of Boron in enhancing cell division, cell enlargement building and transporting the organic foods could explain their effects in improving physical fruit quality parameter of apple (Wojcik *et al*, 1999)

### Fruit Breadth

Maximum fruit breadth of 8.04 cm was recorded in trees under treatment of Flower Power@ 1.0% which was statistically at par with the fruit breadth of 7.98 observed in treatment of Flower Power@ 0.06 %. Minimum fruit breadth of 7.66 cm was observed under control (No spray). The obtained results are in line with Hegagi (2011). Bybordi and Malakouti (2006) who reported that Boron application at the highest rate improved quantitative parameters such as weight, length and the width of the fruit.

## Effect of Nutrient Supplement on Fruit Set, Yield and Quality of Apple

**Table 2. Effect of chemical Flower Power (Nutrient Supplement) on fruit acidity, total sugars, fruit set, fruit drop and yield of apple cv. Red Delicious.**

Treatment	Acidity (%)	Total sugars (%)	Fruit set (%)	Fruit drop (%)	Yield (MT/ha)
Flower power@0.06 %	0.13	10.62	35.84	13.73	27.48
Flower power@0.08 %	0.10	10.86	39.26	12.11	29.18
Flower power@1.00 %	0.11	11.05	39.37	12.09	29.56
Control ( No Spray)	0.14	10.58	31.48	19.67	25.62
<b>CD(0.05)</b>	N.S	0.18	2.89	1.27	1.57

### Fruit Weight

The data (Table 1) revealed that maximum fruit weight (203.56 g) was recorded under treatment of Flower Power @1.0% significantly at par with treatment of Flower Power 0.06% . Minimum fruit weight (198.3 g) was recorded under control (No spray). The results were in line with Kassem *et al* (2016) in case of Anna apples treated with zinc and boron foliar sprays. The Zinc and copper application showed positive correlation with fruit weight. This could be due to their role in plant metabolism especially as activators of enzyme systems leading to quality production. (Mamgain, *et al*,1998 ; Jeyabaskaran and Pandey, 2008).

### Fruit Firmness

It was evident from the data that trees under control (No spray) produced fruits with maximum firmness (10.28 kg/cm<sup>2</sup>) which was statistically at par with the firmness (10.09 kg/cm<sup>2</sup>) of fruits from trees under treatment of Flower Power@ 0.06 %. Minimum fruit firmness (9.90 kg/cm<sup>2</sup>) was recorded in fruits from trees under treatment of Flower Power@ 1.0%.

### Total Soluble Solids

The perusal of data on total soluble solids of fruits showed that maximum TSS (13.36 %) was recorded with treatment of Flower Power@ 1.0% which was significantly at par with treatment of Flower Power@ 0.08 % and minimum TSS (13.05 %) was recorded under control (No control). The results are in line with Hegagi (2011) on Fuji apples.

Kassem *et al* (2016) also found that Fruit soluble solid content and total sugars at harvest time were increased by spraying Zinc and/or Boron either alone or in combination, with the highest values obtained with spraying Zn+ B followed by Boron alone and then Zinc alone.

### Total Sugars

The data pertaining to total sugars indicates that highest total sugar (11.05 %) was recorded in treatment of Flower Power@ 1.0% which was significantly at par with treatment of Flower Power@ 0.08%. Lowest total sugar (10.58 %) was recorded in control (No spray). The results were in accordance with the previous findings of Kassem *et al* (2016) who reported that spraying of B+Zn followed by Boron alone and then Zinc alone had a positive effect on total sugars of Anna apples.

### Fruit Set

The data on the effect of different treatments on fruit set percentage shows that highest fruit set (39.37 %) was recorded in treatment of Flower Power@ 1.0 % which was significantly at par with fruit set of (39.26 %) by treatment of Flower Power@ 0.08%. Lowest fruit set (31.48 %) was recorded under control (No spray). The results were in line with Balesini *et al* (2013) on Fuji apples. Taylor *et al* (1994) found that increased fruit set due to boron may attribute to its role in maintaining high pollen viability and germination.

The data showed that highest fruit drop (19.67 %) was recorded under control (No spray). Lowest

fruit drop (12.09 %) was recorded under treatment of Flower Power@ 1.0 %. The results confirmed the findings of Yadav *et al* (2014) in guava

### Yield

The observation on yield under different treatments showed a significant effect of various treatments. Highest fruit yield ( 29.56 MT/ha) was recorded under treatment of Flower Power@ 1.0%, significantly at par with fruit yield 29.18) obtained by Flower Power@ 0.08% Lowest fruit yield (25.62 MT/ha) was recorded under control (No spray). Obtained results confirmed the earlier findings of Wojcik *et al* (1999) who noted that boron sprays after bloom increased fruit set and apple yield.

### CONCLUSION

On the basis of observations recorded, it was inferred that the present chemical Flower Power (Nutrient Supplement) when sprayed twice during bloom @ 1.0% with an interval of 12 d between two sprays on apple cv. Red Delicious showed a marked increase in fruit set percentage, reduction in fruit drop and improvement fruit quality and yield.

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