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## Effect of Cytronutri CaB on Physico-chemical attributes of apple cv. Red Delicious

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#### Abstract

The present study was conducted at AARC to determine the response of the Cytronutri CaB on the quality of apple (*Malus × domestica* Borkh) cv. Red Delicious. The study shows that the growth of apple fruit was significantly influenced by plant nutrition product. Among the different treatments maximum Bloom density of 183.44% was observed with T3. The data on flower drop revealed that significantly least flower drop of 19.67% was recorded with T3, whereas, significantly maximum flower drop was observed in untreated control plants. Maximum fruit set of 32.74% was recorded with treatment T3 which was followed by treatment T2 (29.24%) and T1 (28.43%), however, significantly low fruit set of 24.51% was obtained in control. The minimum fruit drop of 7.05% was observed in the treatment T3 however, the fruit drop (9.92%) was comparatively more in control. Maximum fruit weight, breadth and yield was recorded with T3. All the chemical treatments had least fruit colour compared to control. It may be due to reduced senescence caused by calcium. The chemical sprays had significant effect on fruit firmness with 13.29, 13.12 lbs and 13.01 lbs values obtained in T2, maximum TSS of 14.87 °B was observed with T2 followed by 14.87 °B in T2 and 13.72 in T3 respectively. No phytotoxic symptoms were observed.

**Keywords:** Cytronutri, CaB, fruit set, yield, phytotoxicity

#### Introduction

Apple is the principal fruit crop of Kashmir occupying about 45% of total fruit area and 75% of total fruit production. It is the main source of income for more than 70% of rural population either directly or indirectly. However, the cultivation of apple during recent past has encountered various problems which are decreasing the profitability and thereby posing serious threat to its sustainability. One among these limitations is the improper nutrient management especially that of essential nutrients particularly Ca, B etc. These elements are essential for plant growth, yield and fruit quality. Among these nutrients Ca is especially important because apples are stored for longer periods and the deficiency of calcium cannot be substituted by any other factor for the maintenance of fruit quality under storage conditions. Low Ca concentration leads to many physiological disorders like bitter pit, cork spot, water core etc. Likewise, B is essential for proper fertilization and pollen tube. In foreign countries foliar nutrition is an important orchard management practices where 5-6 sprays of different essential nutrients are in vogue. However, till date very little attention was paid towards the importance of these nutrients on apple cultivation in Kashmir valley, but with the development of leaf nutrient analysis in recent years orchardists are now becoming more and more aware about the nutritional profiles of their soils and orchards. Besides during last few years, the not only the apple orchards in valley are showing decline both in quality and quantity but are facing a serious threat from high quality apples imported from New Zealand, USA, China. Although, nutrient deficiency can be overcome by soil application of the particular nutrient but foliar nutrition has several advantages over the soil applications like low application rates, uniform application, immediate response, fixation under unfavorable conditions, mobility problems etc. The deficiency and toxicity problems, apart from time of application have to be considered in developing appropriate programs for managing nutrient sprays. In order to evaluate the bio efficacy of Cytronutri present study was undertaken on apple cv. Red Delicious for a period of two years at farmers field in district shopian.

## Materials and Methods

The present investigation was carried out in district Shopian at Farmers field for a period of two years during 2016 and 2017.

Healthy trees of uniform age (25 years) were selected. Cultural practices and plant protection measures were uniform for all the selected trees, irrespective of treatments. On each tree four branches from four sides were marked, for different flower and fruit observation measures.

The experimental design was RBD with four replications in each treatment. In each treatment three trees were selected and treatments were applied as per the details given in the table (treatment details). Observations were recorded at different stages of fruit development as well as after storage for a specific period of time as follows;

**Bloom density:** The number of floral buds per linear meter of marked shoots was counted on four random branches from all four sides of the tree as a measure of flower density in the month of April.

**Flower drop:** Based on the number of flowers that were retained on each labelled branch (per linear meter) the number of flowers were counted as expressed as percent flower drop.

$$\text{Flower drop (\%)} = \frac{\text{Initial number of flowers} - \text{No. of retained flowers}}{\text{Initial number of flowers}} \times 100$$

### Fruit set (%)

It was calculated as the ratio of total number of fruits per spur to the total number of flowers per spur (average of 50 blossoms) as follows.

$$\text{Percentage of fruit set} = \frac{\text{Total number of fruits per spur}}{\text{Total number of flowers per spur}} \times 100$$

**Premature fruit drop:** It was measured after the June drop as

$$\text{Fruit drop (\%)} = \frac{\text{Initial number of fruits} - \text{No. of retained fruits}}{\text{Initial number of fruits}} \times 100$$

**Fruit yield (kg/tree):** It was taken as the total yield/tree (kg) at the time of harvest.

### Fruit Colour

**Fruit size:** It was measured with vernier caliper.

**TSS (°B):** The total soluble solids were determined by using hand refractometer.

**Fruit firmness (kg/cm<sup>2</sup>):** Measured with effigy pressure tester plunger and expressed as kg/cm<sup>2</sup>

### Statistical analysis

The experiment was laid out in a randomized block design with 4 replications. Two-year data was pooled and analysis were conducted following the procedure of Statistical Analysis.

## Results and Discussion

The data on Effect of Cytronutri CaB on Bloom Density, flower drop and fruit set and fruit drop is presented in Table 1. Maximum Bloom density of 183.44 was observed with T3. Untreated and Control plants had least value for bloom density. The data revealed that there is a significant increase

in bloom density with the application of plant agro-chemical Cytronutri during both the years.

The data on flower drop (table 1) revealed that significantly least flower drop of 19.67% was recorded with T3, whereas, significantly maximum flower drop was observed in untreated control plants.

Significant differences were recorded in fruit set percentage among the different treatments. During course of testing, maximum fruit set of 32.74% was recorded with treatment T3 which was followed by treatment T2 (29.24%) and T1 (28.43%), however, significantly low fruit set of 24.51% was obtained in control.

The data depicted in table 1, revealed that the agro-chemical under testing had positive impact on fruit set and thereby there is a positive correlation between the chemical and fruit set.

**Table 1:** Effect of Cytronutri CaB on Bloom Density, flower drop and fruit set and fruit drop

Treatments	Bloom Density (%)	Flower Drop (%)	Fruit Set (%)	Fruit Drop (%)
T <sub>1</sub>	175.14	24.41	28.43	7.89
T <sub>2</sub>	174.40	24.67	29.24	7.32
T <sub>3</sub>	183.44	19.67	32.74	7.05
T <sub>4</sub>	175.79	24.87	24.51	9.92
C.D.	0.747	0.21	0.04	0.15

The minimum fruit drop of 7.05% was observed in the treatment T3 that differ significantly with treatment T1, T2 and control (T4), however, the fruit drop (9.92%) was comparatively more in control. The perusal of data presented in table 1 revealed that there is significant reduction in the fruit drop on the trees sprayed with chemical as compared to control. The gotten results appeared to be in common assentions with those detailed by foliar application of boric acid altogether impact the flowering (Rajput *et al.*, 1976) [9]. Wojocik *et al.*, 1997 watched that Boron sprays after blossom expanded fruit set and apple yield. It was detailed that; boron increments the of all utilized compounds essentially expanded tree yield photosynthetic action and respiration rate in plants of both cultivars compared to the control.

**Table 2:** Effect on various physical parameters of apple cv. Red Delicious

Treatments	Fruit Length (mm)	Fruit breadth (mm)	Fruit Weight(g)	Yield (Kg/tree)
T <sub>1</sub>	72.05	71.26	158.25	176.45
T <sub>2</sub>	73.47	72.54	158.87	177.23
T <sub>3</sub>	75.24	73.56	160.23	179.00
T <sub>4</sub>	68.31	67.98	149.24	159.54
C.D (0.05%)	0.24	2.41	2.34	3.41

The data on effect of Cytronutri CaB on physical parameters of apple is presented in Table 2. The longest fruit of 75.24 mm was recorded with T4, whereas the control (Water spray) had least length 68.31 mm. The data presented in table 3 revealed that all treatment differ significantly from each other and there is significant increase in fruit length with the treatments T3, T2 and T1 during the testing period in comparison with control. Maximum fruit breadth of 73.56 cm was obtained with treatment T3 which was at par with T2 and T1, whereas the control (Water spray) had fruit of least breadth 67.98 mm. The data presented in table 2, revealed that there is significant increase in fruit breadth with the

treatments T3, T2 and T1 during course of testing in comparison with control.

The highest fruit weight of 160.23 g was recorded with treatment T3 which was at par with T1 and T2. All the treatments had significantly higher fruit weight as compared to control which had the least fruit weight (149.24%).

Highest fruit yield of 179.00 kg/tree was obtained with the treatment T3, followed by treatment T2 which recorded fruit yield of 177.23Kg/tree and T1 (176.45 kg/tree), while the control recorded the yield of 159.54 kg/tree. Further the information displayed in table 2 uncovered that all the treatment varies altogether from control w.r.t yield. These comes about were within the same side of findings by Chen *et al.* (1998) who specified that applying calcium alone as foliar expanded berry fruit size. Moreover, Baghdady *et al.* (2014) [2] said that, foliar application of calcium, chelated zinc and boron on Valencia orange trees particularly progressed fruit weight and yield in comparing with other treatments. These increases may be ascribed to upgrade calcium union by boron possibility, which diminishes respiration rate, that might keep up fruit moisture substance (Muazzam *et al.*, 2012) [7]. Moreover, moving forward physical parameters of fruits may be referred to the improvement of fruit development rate and take-up of both Ca and/or B supplements that expanding Metabolic processes rates. These discoveries were within the same line of what detailed by Desouky *et al.* (2007) [3] and Harhash and Abdl-Nasser (2010) [5].

**Table 3:** Effect of Cytonutri on fruit colour, firmness and TSS (<sup>0</sup>B) of Apple cv. Red Delicious

Treatment	Fruit Colour (%)	Fruit firmness (lbs)	TSS ( <sup>0</sup> B)
T <sub>1</sub>	85.11	13.01	14.74
T <sub>2</sub>	83.18	13.29	14.87
T <sub>3</sub>	83.29	13.12	13.72
T <sub>4</sub>	87.01	12.09	13.26
CD 0.05	2.05	0.80	NS

The data on effect of Cytonutri on fruit colour, firmness and TSS(<sup>0</sup>B) of Apple cv. Red Delicious is presented in Table 3. Maximum fruit colour was observed with control (87.01%) which was significantly different from all the treatments. All the chemical treatments had least fruit colour compared to control. It may be due to reduced senescence caused by calcium. The data revealed that the chemical sprays had significant effect on fruit firmness with 13.29, 13.12 lbs. and 13.01 values obtained in T2, T3 and T1 respectively, whereas, control had low fruit firmness of 13.09lbs.

The perusal of data revealed that no significant effect on TSS was observed with chemical treatments. However, maximum TSS of 14.87 <sup>0</sup>B was observed with T2 followed by 14.87 <sup>0</sup>B in T2 and 13.72 in T3 respectively. However low TSS was obtained in control (13.26<sup>0</sup>B). Current results are in harmony with that found by Plichand Wojcik (2002) on plum who mentioned that, calcium treatments were more beneficial for fruit total solublesolids than control. Also, Wójcik and Lewandowski (2003) [14] mentioned that strawberry fruits treated with calcium alone or in combination with boron had higher T.S.S. than control. Besides, both of Sajida and Hafeez-ur-Rehman (2000) [11] on sweet orange and Abd El-Razik and Abdrabboh (2008) [1] on Clementine detailed that TSS % was expanded by boron applications. Present comes about came within the same trend with already said by Plich and Wojcik, 2000 who expressed that applying calcium resulted in fruit firmness and subsequently delaying softening amid long-term capacity. Boron is fundamental component in a few forms for instance protein synthesis, transport of sugars and carbohydrate (Ferguson, 1984) [4]. Additionally, Muazzam *et al.* (2012) [7] detailed that, boron feasibility increments calcium metabolism which expires respiration rate that reflect on accumulation of sugar and TSS in fruit. Calcium in blocking physiological disorders, respiration rate diminishing, delaying advancement and decaying fruit tissues (Magee *et al.*, 2002) [6].

**Table 4:** Phytotoxicity – No symptoms were observed

	Wilting				Vein Clearing				Necrosis			Epinasty			Hyponasty					
	1	3	7	10	1	3	7	10	1	3	7	10	1	3	7	10	1	3	7	10
T <sub>1</sub>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T <sub>2</sub>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T <sub>3</sub>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T <sub>4</sub>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Conclusion**

Pooled data indicated that the chemicals had significant impact on increasing bloom density, fruit set, yield fruit, size. That the chemicals had positive impact on reducing flower drop and fruit drop. That, though both the concentrations had a positive impact on yield and fruit quality characteristics but when low conc. was used along with Aura XL had much significant impact.

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