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EFFECT OF MICRONUTRIENTS SPRAY ON FRUIT DROP, FRUIT QUALITY AND YIELD OF AONLA CV. BANARASI

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ABSTRACT : An investigation was carried out during 2006 and 2007 to study the effect of boron (0.1, 0.2 and 0.3%), zinc (0.2, 0.4 and 0.6%) and copper (0.1, 0.2 and 0.3%) alongwith a control on fruit drop, physical parameters and yield of aonla fruits cv. Banarasi. There were ten treatments tried in a RBD. All the characters studied were significantly improved by application of different micro-elements and their levels showing varying degree of their efficacy. The minimum fruit drop (56.84 and 50.22%), maximum length of fruit (4.01 and 4.10cm), breadth (4.31and 4.35 cm), weight (46.85 and 47.34 g) and pulp content (44.66 and 45.16 g) were obtained under the foliar spray of zinc. Among the three concentrations, the higher level proved most effective in respect of all the characters. Zinc at its higher concentration proved the best treatment in improving the yield of aonla.

Keywords : *Zinc, boron, copper, yield, fruit drop, aonla.*

Aonla (*Emblica officinalis* Gaertn.) is one of the important fruit crops of Uttar Pradesh and thrives well even in moderate alkaline soil. The fruits are highly nutritive and rich source of ascorbic acid. The micro-elements play vital role in fruit development and yield and their foliar feeding has gained much importance in recent years because nutrient reach directly to the leaves which are site of metabolism. Among the minor elements zinc, boron and copper play pivotal role in aonla nutrition with regard to increase in size and quality of fruit and yield. Although the effect of these micro elements on yield and fruit drop has been established in major fruit crops but aonla has not received the due attention it deserves. Therefore, the present investigation was planned to investigate the role of micro–nutrients on aonla.

MATERIALS AND METHODS

Forty two years old aonla trees of Banarasi cultivar uniform in growth and vigour growing in Horticulture Garden of C.S. Azad University of Agriculture and Technology, Kanpur were selected for the present investigation. The experiment was laid out in a Randomized Block Design (R.B.D.) for two consecutive years i.e. 2006 and 2007. The soil of the experimental field was of medium fertility having a pH of 7.6. Ten treatments of foliar nutrition comprising three levels each of boron (0.1, 0.2 and 0.3%), zinc (0.2, 0.4 and 0.6%) and copper (0.1, 0.2 and 0.3%) along with a control were applied with the respective concentration of the nutrients.Observations were recorded on fruit drop, fruit size(length and breadth) and pulp weight and yield. The data obtained were analysed statistically as per method of Panse and Sukhatme (5).

RESULTS AND DISCUSSION

The fruit drop in aonla varied greatly with the applied micro- nutrients and their concentrations. The minimum premature drop (54.03 and 48.91%) was observed under zinc spray followed by boron and copper. Among the three concentrations, the higher one (56.84 and 50.22%) showed relatively lesser fruit drop during both the years of study. However, the interactive effect of minerals and their concentrations failed to affect the fruit drop in aonla during both the years. Zinc application in the present experiment might have encouraged the endogenous production of auxin thereby reducing the fruit drop (Awasthi *et al.,* 1). Similar observations have been reported by early worker (Babu and Singh, 2; Kachave and Bhosale, 4).

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Table 1: Effect of B, Zn and Cu on fruit drop physical parameters and yield of aonla

Fruit drop (%)

Treatments	2006 Minerals				2007 Minerals			
	Boron	Zinc	Copper	Mean	Boron	Zinc	Copper	Mean
	2006				2007			
Low	65.05	57.89	74.46	65.80	58.08	53.05	67.39	59.51
Medium	61.42	54.18	68.60	61.40	54.90	49.04	61.79	55.24
High	56.20	50.01	64.31	56.84	49.64	44.64	56.39	50.22
Mean	60.89	54.03	69.12		54.21	48.91	61.86	
Control				76.93				72.24
Treated				61.35				54.99
C.D. (P = 0.05)	M	C	M×C	Tr × Cont.	M	C	M×C	Tr × C
	2.15	2.15	NS	2.77	1.66	1.66	NS	2.15

Fruit length (cm)

Low	3.88	4.05	3.58	3.84	3.91	4.15	3.62	3.89
Medium	3.98	4.12	3.72	3.94	3.99	4.19	3.78	3.99
High	4.00	4.20	3.83	4.01	4.08	4.31	3.90	4.10
Mean	3.95	4.12	3.71		3.99	4.22	3.77	
Control				3.65				3.69
Treated				3.93				3.99
C.D. (P = 0.05)	M	C	M×C	Tr × C	M	C	M×C	Tr × C
	0.13	0.13	NS	0.17	0.12	0.12	NS	0.15

Fruit breadth (cm)

Low	4.10	4.28	3.96	4.11	4.19	4.31	4.02	4.16
Medium	4.16	4.37	4.10	4.21	4.23	4.44	4.19	4.29
High	4.28	4.45	4.21	4.31	4.34	4.48	4.25	4.35
Mean	4.18	4.37	4.09		4.25	4.41	4.15	
Control				3.79				4.01
Treated				4.21				4.27
C.D. (P = 0.05)	M	C	M×C	Tr × C	M	C	M×C	Tr × C
	0.11	0.11	NS	0.51	0.12	0.12	NS	0.52

Fruit weight (g)

Low	39.99	45.07	39.97	41.68	42.17	45.12	39.89	42.39
Medium	41.03	46.85	40.23	42.64	42.68	47.54	41.21	43.81
High	42.38	48.64	41.20	44.07	43.11	49.37	42.57	45.02
Mean	41.13	46.85	40.40		42.65	47.34	41.22	
Control				37.26				38.30
Treated				42.80				43.74
C.D. (P=0.05)	M	C	M×C	Tr × C	M	C	M×C	Tr × C
	1.39	1.39	NS	0.85	1.67	1.67	NS	2.15

Fruit pulp weight (g)

Low	37.85	42.88	37.80	39.51	40.01	42.95	37.72	40.23
Medium	38.88	44.65	37.85	40.46	40.52	45.35	39.03	41.63
High	40.21	46.46	39.03	41.90	40.95	47.19	40.38	42.64
Mean	38.98	44.66	38.23		40.49	45.16	39.04	
Control				35.14				36.15
Treated				40.62				41.67
C.D. (P=0.05)	M	C	M×C	Tr × C.	M	C	M×C	Tr × C
	1.46	1.46	NS	1.89	1.61	1.61	NS	2.09

Fruit yield (kg/tree)

Low	149.64	161.46	142.93	151.34	150.35	162.38	143.50	152.08
Medium	157.72	168.40	148.27	158.13	157.92	166.97	149.97	158.95
High	160.23	174.13	155.58	163.31	161.67	175.36	156.62	164.99
Mean	155.86	167.99	148.93		156.64	168.90	150.03	
Control				130.34				131.17
Treated				157.60				158.53
C.D. (P=0.05)	M	C	M×C	Tr × C	M	C	M×C	Tr × C
	7.69	7.69	NS	9.93	7.93	7.93	NS	10.23

The size of aonla fruit in terms of length and breadth, in the present study was promoted by the foliar feeding of micro nutrients and their concentrations. The effect of zinc in enhancing the fruit size in terms of length (4.12 and 4.22cm) and breadth (4.37 and 4.41cm) was more pronounced as compared to rest of the treatments. On increasing the concentrations of minerals the fruit size was significantly improved and the maximum fruit length (4.01 and 4.10 cm) and breadth (4.31 and 4.35cm) was noticed at higher level during respective yeas. The interactive effect of minerals and their concentrations failed to influence the fruit size of aonla. The increase in fruit size can be attributed to greater translocation of food materials from source to sink under the influence of applied micronutrients (Babu and Singh, 2).

The foliar application of micro-elements caused significant improvement on the fresh weight of aonla fruit and relatively heavier fruits (46.85 and 47.34 g) were harvested under zinc treatment followed by boron and copper. Among the different levels of minerals, the higher concentration produced heavier fruits (44.07 and 45.02g). However, the fruit weight remained unaffected due to interaction of nutrients and their concentrations during both the years of experimentation. The trees receiving foliar nutrition produced fruits weighing 42.80 and 43.74g against 37.42 and 38.30g. recorded under control during 2006 and 2007, respectively. The application of zinc and boron might have caused rapid synthesis of protein and translocation of carbohydrate which ultimately led to increase fruit weight (Babu and Singh 2).

The fresh weight of aonla pulp was significantly influenced by different minerals and their concentrations. The maximum pulp weight (44.66 and 45.16 g) was observed under the foliar application of zinc followed by boron and copper. On increasing the concentrations of different minerals significant improvement on pulp content was noticed and the higher level proved most effective (41.90g) when compared with the rest of concentrations during first year of trial. However, the higher and medium concentrations, in the following year were at par with each other in this

regard. The treated trees produced higher amount of pulp (40.62 and 36.15 g) when compared with control (35.14 and 41.67 g) during both the year of study. Foliar application of zinc and boron might have made rapid synthesis of metabolites particularly carbohydrate and their translocation to the fruits causing relatively greater pulp content (Babu and Singh, 2; Dutta, 3).

The yield of aonla trees was significantly influenced by the preharvest foliar sprays of different micro-elements and their levels. The foliar treatment of zinc (167.99 and 168.99 kg /tree) proved more effective than boron and copper. The increase in concentration of minerals improved the yield of aonla significantly and the yield of 163.31 and 164.99 kg/ tree was observed under higher concentration during both the years of study. The trees under control produced the minimum yield (130.34 and 131.17 kg/tree) and an improvement up to 158.60 and 158.53kg /tree was registered by treated trees. The improvement in yield due to micro-elements may be ascribed to better photosynthesis, less fruit drop, improved fruit size and fruit weight. Similar findings have been recorded in litchi (Babu and Singh, 2) and (Panwar *et al.,* 6) in aonla.

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