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Effect of Multimicronutrient on Fruit Quality and Shelf Life of Aonla (*Emblica officinalis* Gaertn.) Cv. Gujarat Aonla-1

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A B S T R A C T

The research experiment was carried out on **"**Effect of multimicronutrient on fruit quality and shelf life of aonla (*Emblica officinalis* Gaertn.) cv. Gujarat Aonla-1**"**. The experiment was conducted during *kharif – Rabi* season of the year 2017-18 at Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand. There were three levels of soil application of multimicronutrient (Grade-V) *viz.*, S_1 - Control, S_2 - 250 g/tree and S_3 - 500 g/tree and three levels of foliar application of multimicronutrient (Grade-IV) *viz.*, F_1-Control, F_2-1 % spray and F_3 - 2 % spray. Multimicronutrient (Grade-V) was given as soil application at onset of monsoon and multimicronutrient (Grade-IV) was foliar sprayed at pin head and pea stage. Among all the treatments, F_2 (1 % spray of multimicronutrient Grade-IV) treatment was most effective treatment and which was recorded significantly maximum total soluble solids, shelf life, ascorbic acid and minimum acidity and internal necrosis affected fruits. There were non-significant effect of soil application of multimicronutrient (Grade-V) on total soluble solids (TSS), acidity and shelf life whereas, there were significant effect of soil application of multimicronutrient (Grade-V) on ascorbic acid and internal necrosis affected fruits. Among all the treatments, S_3 (500 g/tree multimicronutrient Grade-V) treatment was recorded significantly maximum ascorbic acid and minimum internal necrosis affected fruits.

Introduction

Aonla tree is small to medium in size. It is evergreen in tropics and as deciduous in sub-tropical conditions. Aonla is drought hardy fruit crop which is characterized by deep root system and exhibits deciduous nature due to abscission and shedding of determinate shoot. The chemical composition of aonla is found to be influenced by environmental factors. It has been found that the chemical parameters *viz.* total soluble solids, acidity, sugars, ascorbic acid, *etc.*, change during growth and development of fruits. Total soluble solids, sugars and ascorbic acid gradually increased reaching the maximum at maturity, whereas acidity, phenol and tannin content decreased up to the minimum at maturity. The fruit weight, length and diameter showed a constant increased till the time of maturity (Ojha and Pathak, 1993). Internal necrosis of fruit is major problems in reducing yield and quality

of aonla fruit.The shelf-life of aonla fruit is 12-15 days under normal conditions. It becomes difficult to process entire fruit production in short span of time. At the peak harvest season, the availability of the fruits exceeds whereas the demand and the market price falls very low. Micronutrients also help in the uptake of major nutrients and play an active role in the plant metabolism process starting from cell wall development to respiration, photosynthesis, chlorophyll formation, enzyme activity hormone synthesis, nitrogen fixation and reduction (Das, 2003). Soil and foliar application of multimicronutrient is important for recover the trees from noticed deficiency for healthy growth of tree and could achieve a good quality fruit. Foliar application is based on the principle that the nutrients are quickly absorbed by leaves and transported to different part of the plant to fulfill the functional requirement of nutrition. Foliar application of the nutrient is obviously an ideal way to avoiding the problem of nutrient availability.

Materials and Methods

The experiment was conducted on "Effect of multimicronutrient on fruit quality and shelf life of aonla (*Emblica officinalis* Gaertn.) cv. Gujarat Aonla -1" at Horticultural Research Farm and P. G. Laboratory, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during*Kharif-Rabi* season of the year 2017-18.For conducting the study, 23 year old uniform tree of aonla were selected and experiment was laid out in Completely Randomized Design with factorial concept (FCRD). There were three levels of soil application *viz.,* S_1 - Control, S_2 - 250 g/tree multimicronutrient (Grade-V) and S_3 - 500 g/tree multimicronutrient (Grade-V) and three levels of foliar application *viz.*, F_1-Control, F_2-1 % Spray of multimicronutrient (Grade-IV) and F_3 - 2 % Spray of multimicronutrient (Grade-IV). Multimicronutrient (Grade-V) was soil application at onset of monsoon and multimicronutrient (Grade-IV) was foliar sprayed at pin head and pea stage. Multimicronutrient (Grade IV) is combination of 4.0 % Iron, 1.0 % Manganese, 6.0 % Zinc, 0.5 % Copper and 0.5 % Boron and multimicronutrient (Grade V) is combination of 2.0 % Iron, 0.5 % Manganese, 5.0 % Zinc, 0.2 % Copper, and 0.5 % Boron. Multimicronutrient (Grade-IV) was sprayed at pin head and pea stage whereas, soil application of multimicronutrient (Grade-V) was given at onset of monsoon. The soil of experiment site was sandy loam. Recommended dose of farm yard manure and NPK fertilizers were given as common dose in all the treatments. The mature and uniform sized fruits were harvested from the respective trees where observations were recorded regarding the quality parameters of the fruits.

Results and Discussion

The results obtained from the research experiment on effect of multimicronutrient on fruit quality and shelf life of aonla are presented in Table 1 and 2.

There was non-significant effect of soil application of multimicronutrient (Grade-V) on quality parameter *viz.* total toluble solids (TSS), acidity and shelf life whereas, there were significant effect of soil application of multimicronutrient (Grade-V) on ascorbic acid and internal necrosis affected fruits. Among all the treatments, S_3 (500 g/tree multimicronutrient Grade-V) treatment was recorded significantly minimum internal necrosis affected fruits (4.4 %) and maximum ascorbic acid (827.15 mg/100 g pulp). The significantly minimum internal necrosis affected fruits was recorded with the soil application of 500 g/tree multimicronutrient (Grade-V) might be due to incorporation of boron in the soil that is proved beneficial

effect to minimize the internal necrosis physiological disorder of aonla by affecting the activities of several enzyme oxidase and sucrose. These findings are in accordance with the findings of Singh *et al.,* (2001), Patel *et al.,* (2003) and Katiyar *et al.,* (2010) in aonla.

Whereas, the significantly maximum ascorbic acid (mg/100 g pulp) was recorded with the soil application of 500 g/tree multi micronutrients (Grade-V). It might be due to higher level of sugar due to micronutrient application including boron might be the possible cause behind increase in ascorbic acid content which is synthesized from sugar. Similar trend was also observed by Saraswathy *et al.,* (2002) in sapota and Singh *et al.,* (2003) in mango.

The foliar application of multimicronutrient was significantly influenced on internal necrosis affected fruits. Among all the treatments, F_2 (1 % spray of multimicronutrient Grade-IV) treatment was recorded significantly minimum internal necrosis affected fruits (2 %). It might be due to the fact that boron has significant role in mobilization of food material from source to sink as a result accumulate the photosynthates which control internal necrosis affected fruits. The results are also in accordance with the findings of Singh *et al.,* (2001) in aonla.

Table.1 Effect of soil and foliar application of multimicronutrient on internal necrosis affected fruit and ascorbic acid of aonla Cv. Gujarat Aonla-1

Treatments	internal necrosis affected fruit (%)	Ascorbic acid (mg/100 g pulp)
A. Soil application (S)		
S_1 : Control	7.11	789.51
S_2 : 250 g/tree multimicronutrient (Grade-V)	6.00	810.63
S_3 : 500 g/tree multimicronutrient (Grade-V)	4.44	827.15
S.Em. ±	0.19	4.84
C.D. at 5%	0.57	14.39
B. Foliar application (F)		
F_1 : Control	9.89	749.11
F_2 : 1% Spray of multimicronutrient (Grade-IV)	2.00	854.86
F_3 : 2% Spray of multimicronutrient (Grade-IV)	5.67	823.33
S.Em. ±	0.19	4.84
C.D. at 5%	0.57	14.39
S × F interaction		
S.Em.±	0.33	8.39
C.D. at 5%	NS	24.93
C.V. %	9.87	1.80

Table.2 Effect of soil and foliar application of multimicronutrient on Total Soluble Solids (^{0}Brix) acidity and shelf life of aonla Cv. Gujarat Aonla-1

Treatments	TSS (^{0}Brix)	Acidity (%)	Shelf life (Days)
A. Soil application (S)			
S_1 : Control	14.97	1.87	17.62
S_2 : 250 g/tree multimicronutrient (Grade-V)	15.10	1.85	18.44
S_3 : 500 g/tree multimicronutrient (Grade-V)	15.41	1.83	18.71
S.Em. ±	0.23	0.02	0.56
C.D. at 5%	NS	NS	NS
B. Foliar application (F)			
F_1 : Control	14.51	1.93	16.80
F_2 : 1% Spray of multimicronutrient (Grade-IV)	15.89	1.74	19.82
F_3 : 2% Spray of multimicronutrient (Grade-IV)	15.08	1.87	18.15
S.Em. ±	0.23	0.02	0.56
C.D. at 5%	0.69	0.07	1.67
S × F Interaction			
S.Em.±	0.40	0.04	0.97
C.D. at 5%	NS	NS	NS
C.V. %	4.66	4.01	9.26

The foliar application of multimicronutrient was significantly influenced on Total Soluble Solids and acidity. Among all the treatments, F_2 (1 % spray of multimicronutrient Grade-IV) treatment was recorded significantly maximum Total Soluble Solids (15.89 ^{0}Brix) and minimum acidity (1.74 %). The significantly maximum total soluble solids was recorded with foliar spray of 1 % multimicronutrient (Grade-IV) might be due to zinc increased the synthesis of tryptophan that is a precursor of auxin. It plays a key role in protein synthesis, sugar metabolism and maintains the integral structure. On the other hand, boron may be associated with the cell membrane where it could be complex with sugar molecules and facilitates its passage across the membrane. The significantly minimum acidity was recorded with foliar spray of 1 % multimicronutrient (Grade-IV) might be due to zinc increase the synthesis of tryptophan that is a precursor of auxin. It plays a key role in protein synthesis, sugar metabolism and maintains the integral structure. On the other hand, boron may be associated with the cell membrane where it could be complex with sugar molecules and facilitates its passage across the membrane that might be the reason for increased acidity. Similar results were found by Singh *et al.*, (2001), Verma *et al.*, (2008), Vishwakarma *et al.*, (2013), Shukla *et al.*, (2009), Singh *et al.*, (2009) and Chandra and Singh (2015) in aonla.

There were significant effects of foliar application of multimicronutrient on shelf life. Among all the treatments, F_2(1 % spray of multimicronutrient Grade-IV) treatment was most effective treatment and it was recorded significantly maximum shelf life (19.82 day) and It might be due to increase in concentration of boron of middle lamella of cell wall which provide physical strength to

cell wall and improved fruit colour development and appearance. These findings are in accordance with the findings of Bhatt *et al.,* (2012) and Singh *et al.,* (2012) in mango.

The interaction effect between soil and foliar application of multimicronutrient was found non-significant effect on internal necrosis affected fruit, shelf life, total soluble solids and acidity whereas, there was significant effect on ascorbic acid.

The result obtained from research experiment concluded that, 1% foliar spray of multimicronutrient (Grade-IV) at pin head and pea stage recorded minimum internal necrosis affected fruit and acidity whereas, maximum total soluble solids, ascorbic acid and shelf life in aonla fruit cv. Gujarat Aonla-1.

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