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Effect of Foliar Feeding of Urea, Zinc Sulphate and Plant Growth Regulator on Physical Parameter and Yield of Aonla Fruit (*Emlica officinalis* Gaertn) Cv. Chakaiya

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ABSTRACT

The present investigation was carried out to investigate "Effect of foliar feeding of urea, zinc sulphate and plant growth regulators on yield and quality of aonla fruit (Emblica officinalis Gaertn) cv. chakaiya . The experiment was concluded at Main Experiment Station, Department of Horticulture, Narendra Deva University of Agriculture. & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) in India. The experiment was conducted in randomized block design with nine treatments, replication thrice and considering one plant as a unit. The observations were recorded flowering and fruiting behaviour, physical and chemical characters of aonla fruits. The minimum fruit drop and maximum fruit retention, size, weight, volume, pulp: stone ratio, yield, total soluble solids (TSS), total sugar ascorbic acid, reduction of acidity and total phenol were recorded with the foliar application ofT_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea). The fruit yield was also recorded maximum with the application of same treatment. Over all it can be concluded that combined spray of T_9 (20 ppm GA_3 + 0.25% Zinc sulphate+ 50 ppm NAA + 2% urea).Was found to be best for higher yield and better fruit quality.

Key word: *Aonla, urea, Zink Sulphate, NAA, GA_3*

INTRODUCTION

Indian gooseberry is locally known as amla, amlaki, ambola and nelli in different parts of India and botanically name is *{Emblica officinalis* Gaertn); Which belong to family Euphorbiaeceae and sub family Phyllanthaidae. It is native to tropical region of south-East-Asia particularly central and southern India. The wild plantation Indian gooseberry has also been reported from Ceylon, Cuba, Puetrp Rice, Hawaii, Florida. Iran, Iraq, Java, West Indies, Trinidad, Pakistan Malaya and China[4]. In India, its cultivation is practiced sine ancients times which are mention in Vedas, Kadambari ayurvedic and other literatures for its nutritional and medicinal values.

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Aonla is one of the important indigenous fruits which is richest source of vitamin 'C after barbedoscherry it is also rich in minerals particularly-Iron, phosphorus, calcium and magnesium and also contents sugars and acids. The aonla fruit is also valued for its pharma cordials, food processing and cosmetic products. The cultivation of aonla is well spread throughout India varying from arid and semi-arid, waste land, sodic land and drought prone area. Its commercial cultivation is predominantly occupied in Uttar Pradesh and spread over to other states particularly in Rajasthan, Maharashtra, Gujarat, Madhya Pradesh, Haryana, Andhra Pradesh etc. However, the production of aonla under variable soil and climatic condition varied due to lack of well standardized culture thus is need to develop Improved agro-techniques improving the production and quality of fruits in respect to variable range of soil and climatic condition. The aonla is a prolific in being and longer life and were heavy crops every year. Which resulted to heavy low of nutrients from the tree?

MATERIAL AND METHODS

The experiment was laid out in Randomized block design (RBD) replicated thrice with one plant unit. The details of experimental plan and treatment are T_1 -Control, T_2 - 20 ppm GA_3 T_3 - 50 ppm NAA, T_4 - 0.25% Zinc Sulphate. T_5 -2% Urea, T_6 -20 ppm GA_3 +50 ppm NAA, T_7 -20ppm GA_3 + 0.25% Zinc Sulphate, T_8 –GA_3+2% Urea, T_9 -20 ppm GA3 + 0.25% Zinc Sulphate + 50ppm NAA +2% Urea

It was calculated as number of fruit set divided by number of flowers appeared and expressed in percentage. The percentage fruit drop was calculated. Total number of fruits reached till maturity. Ten fruit were sampled to measure the size of fruit. The length and breath of fruit were recorded with the help of vernier calipers. The average ten fruits were taken for record of fruit size and expressed in cm. en fruits were taken to measure the weight of fruits. The weight of ten fruits was weighed with the help of physical balance. The average weight of fruit were calculated and expressed in gram. The volume was determined by water displacement method and the average volume of fruit was calculated and expressed in (cm). Fruit were blanched in water and their segment were separated from seed (stone) thoroughly washed with boil water and their fibers were separated with help of knife and stone weight was obtained with help of physical balance and expressed in gram. Pulp weight obtained by deducing the stone weight from total fruit weight and expressed in gram. The pulp stone ratio was calculated in relation to pulp weight and stone weight. The weight of fruit/plant recorded at harvesting time and total yield (kg/tree) was calculated. Statistical analysis of the data obtained in the different set of experiment was calculated, as suggested by Panse and Shukhatme[7].

RESULTS

A. Flowering and fruiting behaviour:

A perusal of data recorded on per cent fruit drop and fruit retention have been presented in which clearly indicated that was significant effective all the treatments and most of the treatments were found at par except treatment T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea). The minimum fruit drop was recorded with the spray ofT_9 (20 ppm GA_3 + 0.25%o zinc sulphate + 50 ppm NAA + 2% urea), where as maximum fruit drop was found in control. The similar trends fruit retention was also noted same treatment. The reason for reduction in percentage fruit drop and increasing of fruit retention might be due to combine treatment T_9 (20 ppm GA_3 + *0.25%* zinc sulphate + 50 ppm NAA + 2%> urea).Which might be increase the endogenous level of auxine and other metabolites. The synthesis of endogenous plant growth substances and their translocation to growing of fruit bud similar observation on fruit drop

and fruit retention in number of fruit crops have been also recorded by Brahmachari and Rani have also reported appreciable decreased fruit drop and increase fruit retention.

B. Physical character of fruit:

It is evident from the data indicated that significantly increased in fruit size. The maximum fruit size in term of fruit length and breadth were recorded with combined spray of T_9 (20 ppm GA_3 + 0.2 5% zinc sulphate + 50 ppm NAA + 2% urea). The other treatments i.e., T_7 (20 ppm GA_3 + 0.25% zinc sulphate) and T_4 (0.25% zinc sulphate) were also effective increase of fruit size. The reason for increase in fruit size due to spraying of urea, zinc and plant growth regulators, might be attributed move efficient absorption and consequently more luxriant vegetative growth in the initial stage. Which influenced the more activity of metabolism in plant was attributed to better development of fruits. The present findings have also been confirmed with the recorded by Randhawa and Sharma by spraying of NAA at 25, 50, 75 ppm an increased of fruit size of citrus yar. Jaffa pineapple and musumi. Rajput and Singh ber cv. Varanasi karaka, and Dixit et al. kinnow with the spray of (1.0% $ZnS0_4$).

Observation recorded an average fruit weight depicted clearly indicated that application of T_9(20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) was found to be significant increase of fruit weight followed by T_7 (20 ppm GA_3 + 0.25% zinc sulphate). Whereas, minimum fruit weight was observed in control. Similar findings have also reported an increase of fruit weight with spray of NAA, GA_3 2,4, 5-T (10, 20, 40 ppm) in mango by (Veena and Das, 1971), (Joon et a!., 1984) was also found to be increase of fruit weight in ber cv. Gola with the foliar application of (2% urea + 0.8% zinc sulphate) likewise. The increased fruit weight and fruit volume increased in ber cv. Banarsi Karaka, by application of nutrients.

Significant effect in increase of Pulp weight, stone weight and pulp: stone ratio were also observed due to foliar application of urea, zinc and plant growth regulators The maximum pulp weight and pulp: stone ratio were recorded with the spray of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea). However, minimum pulp stone ratio was obtained under control treatment. There better development of physical character of fruit may be attributed due to supply of above concentration of chemical arid there are very little information are available. The results are closed conformity by finding of Singh *et al.*[13] foliar feeding of nutrients increase the pulp: stone ratio of aonla fruits.

Data recorded on fruit yield (kg/tree) as influenced by various treatments have been clearly indicated that all the treatments were found significantly better over control treatment. The highest fruit yield was recorded with the spray of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) minimum fruit yield was observed in control. The increased fruit yield due to foliar feeding of nutrients and plant growth substances, might be attributed to more uptake of nutrients because efficient absorption and consequently more luxuriant vegetative growth to the initial stage which later on resultant more metabolites for developing fruits. A similar pattern was noted by Avery and Johnson[3] and it was found the plant hormones applied exogenously rapidly absorbed though tissue part and recorded the deficient of endogenous level of plant growth present in according to observation reported by Joon. The combined application of (2% urea + 0.8%) $ZnSO^4$ produced highest fruit yield in Ber. cv. Gola. The fruit production Guava could be increased with the application of 0.4%) zinc sulphate[2] and Shawky *et al.*[12] also observed with the foliar application of 1% urea increased fruit yield in mango.

Table 1: Effect of foliar feeding of urea, zinc sulphate and plant growth regulator, physical characters and yield of aonla fruit *(Emlica officinalis* Gaertn) cv. chakaiya

Treatments	Average fruit size in (cm)		Average fruit weight in (g)	Average fruit volume (cm^3)	Average Pulp Weight in (gram	Average stone Weight in (gram	Average Pulp stone ratio	Average fruit yield in kg per tree
	length	breadth						
T_1 (Control)	3.60	3.38	34.15	24.5	32.33	1.88	17.10:1	50.00
T_2 (20 ppm CA_3)	3.81	3.84	36.83	25.91	34.47	1.86	18.16:1	60.41
T_3 (50 ppm NAA)	3.66	3.73	37.18	27.33	35.33	1.85	18.59:1	64.76
T_4 (0.25% Zinc sulphate)	3.75	3.75	36.25	25.48	34.40	1.85	18.12:1	65.16
T_5 (2% Urea)	3.75	3.83	36.13	25.91	34.62	1.84	18.23:1	66.41
T_6 (20ppm GA_3 + 50 ppm NAA)	3.76	3.73	37.26	27.41	35.43	1.83	18.60:1	68.15
T_7 (20ppm GA_3 + 0.25% Zinc sulphate)	3.80	3.93	38.30	29.41	36.47	1.82	19.16:1	64.18
T_8 (20ppm GA_3 + 2% Urea)	3.73	4.17	39.96	29.88	37.17	1.80	19.98:1	71.00
T_9 (20ppm GA_3 + 0.25% Zinc sulphate + 50 ppm NAA + 2% Urea)	3.81	4.35	41.96	30.25	39.30	1.78	20.54:1	75.41
SEm ±	0.12	0.15	1.04	0.69	0.44	0.006	0.26	1.46
C.D. at 5%	0.38	0.47	3.13	2.07	1.32	0.018	0.83	5.88

CONCLUSION

The minimum fruit drop was obtained with the use of T (20 ppm GA_3 + *0.25%* zinc sulphate + 50 ppm NAA + 2%> urea) followed by T (2oppm GA_3 + *0.25%* zinc suilphate). All the nutrients and plant growth regulators reduced fruit drop over control treatment.

The maximum fruit retention was recorded with the spray of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) followed by T_7 (20 ppm GA_3 + 0.25% zinc. All the treatment significantly increased fruit retention of aonla fruit over control treatment.

The maximum fruit weight and volume was recorded with the use of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) followed by T_8 (20ppm GA_3 + 2% urea).

The highest pulp stone ratio was observed with the application of T_9 (20 ppm GA_3 + 0.25%o zinc sulphate + 50 ppm NAA + 2% urea) followed by T_8 (20ppm GA_3+ 2% urea).

The higher fruit yield per plant was recorded with the spray of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) followed by T_8 (2oppm GA_3 + 2% urea). All the treatment significantly increased fruit yield over control treatment.

Therefore, foliar application of T_9 (20 ppm GA_3 + 0.25% zinc sulphate + 50 ppm NAA + 2% urea) can be recommended to aonla grower.

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