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Effect of Integrated Nutrient Management on Fruit Yield of Aonla (*Emblica officinalis* Gaertn.) cv. Gujarat Aonla -1

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A B S T R A C T

An experiment was carried out to study the "Effect of integrated nutrient management on fruit yield of aonla (*Emblicaofficinalis* Gaertn.) cv. Gujarat Aonla - 1" at Horticultural Research Farm and P.G. Laboratory, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anandduring *Kharif-Rabi* season of the year 2018-19. The experiment was laid out in completely randomized design with three repetitions. Among all the treatments, T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree) treatment was found most effective treatment and recorded significantly maximum fruit length, fruit diameter, fruit weight, fruit volume, number of fruits/tree, Grade A, B and C fruit yield and total fruit yield.

Introduction

Aonla (*Emblica officinalis* Gaertn.) belongs to family Euphorbiaceae and subfamily `*Phyllanthoidae*'. It is native of Tropical South-East Asia, particularly in central and southern India. Aonla being hardy in nature and it is successfully cultivated in wide range of soil and climatic condition. 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 during February and March. The success of aonla cultivation under arid ecosystem is largely based on efficient management of available natural resources. The basic concept of integrated nutrient management is the adjustment of plant nutrient supply to an optimum level for sustaining the desired crop productivity. It involves proper combination of chemical fertilizers, organic manures and bio fertilizers suitable to the system of land use and ecological, social and economic conditions.

Organic manures supply plants nutrients and micronutrients. They improve soil physical properties like soil structure, infiltration rate, porosity, water holding capacity, bulk density etc. and also increases the availability of nutrients. Organic manures act as a buffering

agents and supplies food for beneficial living organisms. Biofertilizers are microbial preparations containing living cells of different microorganisms which have the ability to mobilize plant nutrients in soil from unusable to usable form through biological process. They are environmental friendly and play significant role in crop production.Hence, in order to develop a sustainable integrated nutrient management technology for aonla, the present investigation was undertaken. Keeping the above facts in the mind, the present investigation was undertaken with an objective of finding out the effect of integrated nutrient management on fruit yield of aonla.

Materials and Methods

The present experiment was carried out 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 2018-19. The experiment was laid out in completely randomized design with three repetitions comprising nine treatments. The soil of the experimental plot was sandy loam type. The chemical fertilizers like nitrogen, phosphorus and potash were applied in the form of urea, single super phosphate and murate of potash, respectively as per treatments. Half dose of nitrogen and full dose of phosphorus and potash was given one week after organic fertilizer application and remaining half dose of nitrogen given on 14th September. Well decomposed FYM 100 kg per tree was given as common recommended basal dose of all the treatments, vermicompost and castor cake was applied as per treatments requirement on 10th July. Biofertilizer *i.e.* Anubhav Bio NPK consortium was obtained from department of Agricultural Microbiology, Anand Agricultural University, Anand. It was applied 1 m away from main stem at the time of application of organic manures as mixing with FYM in the soil as per treatments. The mature and uniform sized fruits were harvested from the respective trees and observations were recorded regarding the yield parameters of the fruits.

Results and Discussion

The results obtained from the research experiment on effect of integrated nutrient management on fruit yield of aonla are presented in Table 1 to 3.

The integrated nutrient treatments significantly influenced the yield parameters over the control. The significantly maximum fruit length (3.42 cm) and diameter(3.96 cm)was recorded with the treatment T_9(50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree)which was at par with the treatments T_2, T_3, T_4 and T_8. While, minimum fruit length (3.09 cm) and diameter (3.51 cm) was recorded in control. An increase in fruit length and diameter might be due to reduced NPK doses in association of biofertilizers and vermicompost due to optimum supply of plant nutrients and growth hormones at desired amount during entire period of fruit growth, ultimately resulted in accumulation of more photosynthate responsible for more length and diameter of fruit. These results are in conformity with the findings of Nurbhanej *et al.*, (2016) in acid lime, Dubey and Yadav (2003) in Khasi mandarin, Patel *et al.*, (2009) in sweet orange, Baviskar *et al.*, (2011) in sapota, Yadav *et al.*, (2011) in mango, Ram *et al.*, (2007), Dutta *et al.*, (2009) and Godage *et al.*, (2013) in guava.

The results indicate that treatment T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree) was found significantly maximum in fruit weight (41.96g). It was statistically at par with the

treatments T_2, T_3, T_4 and T_8. However, minimum fruit weight (37.11 g) was recorded with control. An increase in fruit weight is highly correlated with dry matter content and balance level of hormones.

Superior physical fruit quality may be due to fact that, organic manure and microbial fertilizer enhance the nutrient availability by enhancing the capability of plants to better solute uptake from rhizosphere, also these nitrogen fixers are known for accumulation of dry matter and their translocation as well as favour synthesis of different growth regulators.

The result is in conformity with finding of Ram *et al.,* (2012) and Sutariya *et al.,* (2018) in phalsa, Nurbhanej *et al.,* (2016) and Musmade *et al.,* (2010) in acid lime, Baviskar *et al.,* (2011) in sapota, Ram *et al.,* (2007), Dutta *et al.,* (2009) and Godage *et al.,* (2013) in guava.

Table.1 Effect of integrated nutrient management on fruit length, diameter, weight and volume of aonla cv. Gujarat aonla- 1

Sr. No	Treatments	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Fruit volume (cc)
T_1	100 % RDF (1000:500:500 NPK g/tree) (Control)	3.09	3.51	37.11	34.17
T_2	75 % RDF through chemical fertilizer + 25 % RDN through castor cake/tree	3.29	3.81	40.08	37.29
T_3	50 % RDF through chemical fertilizer + 50 % RDN through castor cake/tree	3.32	3.85	40.52	37.07
T_4	75 % RDF through chemical fertilizer + 25 % RDN through vermicompost/tree	3.34	3.87	41.42	37.85
T_5	50 % RDF through chemical fertilizer + 50 % RDN through vermicompost/tree	3.20	3.70	38.93	35.43
T_6	75 % RDF through chemical fertilizer + 10 ml Anubhav Bio NPK Consortium/tree	3.18	3.68	38.76	35.59
T_7	50 % RDF through chemical fertilizer + 20 ml Anubhav Bio NPK Consortium/tree	3.15	3.63	38.68	35.53
T_8	50 % RDF through chemical fertilizer + 25 % RDN through castor cake + 10 ml Anubhav Bio NPK Consortium/tree	3.25	3.77	39.81	36.65
T_9	50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree	3.42	3.96	41.96	39.87
S.Em. ±		0.06	0.09	0.93	1.00
C.D. at 5%		0.18	0.25	2.78	2.98
C.V. %		3.30	3.96	4.08	4.75

Table.2 Effect of integrated nutrient management on number of fruits per tree of aonla cv. Gujarat aonla- 1

Sr. No	Treatments	Number of fruits per tree
T_1	100 % RDF (1000:500:500 NPK g/tree) (Control)	2295
T_2	75 % RDF through chemical fertilizer + 25 % RDN through castor cake/tree	2459
T_3	50 % RDF through chemical fertilizer + 50 % RDN through castor cake/tree	2465
T_4	75 % RDF through chemical fertilizer + 25 % RDN through vermicompost/tree	2455
T_5	50 % RDF through chemical fertilizer + 50 % RDN through vermicompost/tree	2387
T_6	75 % RDF through chemical fertilizer + 10 ml Anubhav Bio NPK Consortium/tree	2203
T_7	50 % RDF through chemical fertilizer + 20 ml Anubhav Bio NPK Consortium/tree	2311
T_8	50 % RDF through chemical fertilizer + 25 % RDN through castor cake + 10 ml Anubhav Bio NPK Consortium/tree	2451
T_9	50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree	2496
S.Em. ±		61.08
C.D. at 5%		181.48
C.V. %		4.42

Table.3 Effect of integrated nutrient management on fruit yield of aonla cv. Gujarat aonla- 1

Sr. No	Treatments	Yield (kg/tree)				Yield (t/ha)
		Grade A	Grade B	Grade C	Total	
T_1	100 % RDF (1000:500:500 NPK g/tree) (Control)	38.97	34.20	11.97	85.17	13.29
T_2	75 % RDF through chemical fertilizer + 25 % RDN through castor cake/tree	45.59	39.62	13.37	98.57	15.38
T_3	50 % RDF through chemical fertilizer + 50 % RDN through castor cake/tree	46.05	40.29	13.58	99.92	15.59
T_4	75 % RDF through chemical fertilizer + 25 % RDN through vermicompost/tree	46.88	40.59	14.24	101.70	15.87
T_5	50 % RDF through chemical fertilizer + 50 % RDN through vermicompost/tree	45.35	34.65	12.91	92.91	14.49
T_6	75 % RDF through chemical fertilizer + 10 ml Anubhav Bio NPK Consortium/tree	39.24	35.03	11.02	85.39	13.30
T_7	50 % RDF through chemical fertilizer + 20 ml Anubhav Bio NPK Consortium/tree	40.62	36.49	12.29	89.38	13.94
T_8	50 % RDF through chemical fertilizer + 25 % RDN through castor cake + 10 ml Anubhav Bio NPK Consortium/tree	47.96	37.69	12.02	97.66	15.24
T_9	50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree	48.08	41.01	15.65	104.74	16.34
S.Em. ±		1.55	1.52	0.57	3.42	0.71
C.D. at 5%		4.62	4.51	1.70	10.15	2.10
C.V. %		6.07	6.97	7.62	6.23	8.25

Significantly maximum fruit volume (39.87cc) was recorded with the treatment T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree)which was statistically at par with treatmentsT_2, T_3 and T_4.While, significantly minimum fruit volume (34.17cc) was recorded in control. A continuous supply of nutrients and induction of growth promoting substances which stimulate cell division, cell elongation in fruits during the period at rapid rate. Continuous increase volume of fruits is in accordance with the findings of Ram *et al.,* (2012) and Sutariya *et al.,* (2018) in phalsa, Thakkar (2015) in guava, Patel *et al.,* (2017) and Baviskar *et al.,* (2011) in sapota, Nurbhanej *et al.,* (2016) in acid lime.

It is clear from the results that treatment T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree) was most effective treatment and which was recorded significantly maximum number of fruits per tree (2496). It was statistically at par with the treatmentsT_2, T_3,T_4, T_5 and T_8. However lower number of fruits per tree (2295) was recorded with control. An increase in number of fruits per tree might be due to the fact that biofertilizers encourage better growth and accumulated optimum dry matter with induction of growth hormones, which stimulated cell division, cell elongation, activated the photosynthesis process, enhanced translocation of water and nutrients, growth and development of roots as well as energy transformation which in turn increased the number of fruits and other physical characters. The present findings are in accordance with the results reported by Patel *et al.,* (2017) and Baviskar *et al.,* (2011) in sapota, Kumrawat *et al.,* (2018), Thakkar (2015) and Godage *et al.,* (2013) in guava, Sharma *et al.,* (2016) in mango, Nurbhanej (2016) in acid lime and Mahindra *et al.,* (2009) in ber.

Significantly maximum Grade-A fruit yield (48.08 kg/tree), Grade-B fruit yield (41.01kg/tree), Grade-C fruit yield (15.65kg/tree), total fruit yield(104.74kg/tree) and (16.34 t/ha) was recorded with T_9 (50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree). While, in case of Grade-A fruit yield obtained under treatment $T_9$was at par with treatments T_2, T_3, T_4, T_5 and T_8. Grade-B fruit yield obtained under treatment T_9 was at par with treatmentsT_2, T_3, T_4, T_7 and T_8. Grade-C fruit yield obtained under treatment $T_9$was at par with treatment T_4. Total fruit yield(kg/tree) with treatment $T_9$was at par with treatmentsT_2, T_3,T_4,and T_8 and fruit yield (t/ha) with treatment $T_9$was at par with treatments T_2, T_3,T_4,T_5 and T_8.However, minimum Grade-A fruit yield (38.97 kg/tree), Grade-B fruit yield (34.20 kg/tree), Grade-C fruit yield (11.97 kg/tree), total fruit yield(85.17 kg/tree) and (13.29 t/ha) was recorded in control. An increase in fruit yield per tree might be due to increased continuous supply of nutrients which stimulated cell division, cell elongation and increased the number of fruits. This might be attributed due to improved fertilizer use efficiency with application of organic sources of nutrients and biofertilizers and also helped in increasing fruit volume, diameter and weight ultimately the fruit yield per tree was obtained maximum. Similar types of results were also obtained by Ram *et al.,* (2012) and Sutariya *et al.,* (2018) in phalsa, Musmade *et al.,* (2010) in acid lime and Ramamurthy *et al.,* (2006) in mandarin, Reddy and Swami (1986), Dheware and Waghmare (2009) and Patel *et al.,* (2009) in sweet orange, Baviskar *et al.,* (2011) in sapota.

The result obtained from research experiment, it can be concluded that50 % RDF through chemical fertilizer + 25 % RDN through vermicompost + 10 ml Anubhav Bio NPK Consortium/tree was found beneficial to

increases the fruit length, fruit diameter, fruit weight, fruit volume, number of fruits per tree and fruit yield in aonla cv. Gujarat Aonla-1.

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