REASEARH ARTICLE

Fruit retention and yield is enhanced by application of diammonium phosphate in aonla (*Phyllanthus emblica*) grown on laterite soils

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Abstract: Aonla is prone to severe fruit drop on red and laterite soils in West Bengal (India). Therefore, an experiment was conducted to study the effect of different levels of diammonium phosphate (DAP) on fruit drop in aonla cv. NA-10. DAP was applied at 200, 500, 1000, 1500 and 2000 g/plant/year with constant does of 400 g single super phosphate, 500 g of muriate of potash and 40 kg Farm Yard Manure in two split doses i.e. on 15th March and 15th June every year for three consecutive years. DAP at 500 g /plant/ year resulted in maximum fruit retention (25.3%) with highest fruit yield (26.9 kg/ plant) followed by DAP at 200 g/'plant/year (24.8 kg). The minimum fruit retention was noted with DAP at 2000 g/plant. Fruit quality in respect of total soluble sugar (TSS) and acidity did not differ significantly among the treatments. Ascorbic acid content was maximum (360 g mg/ 100 g pulp) with DAP at 500 g and minimum with DAP at 200 g (lowest does). Foliar nitrogen and potassium status was not affected significantly but, phosphorus content was significantly improved with higher levels of DAP.

Keywords: Fruit retention, diammonium phosphate,aonla (*Phyllanthus emblica*), laterite soils

INTRODUCTION

Aonla (*Phyllanthus emblica*) is one of the most important minor fruits of tropics and sub-tropics for its high nutritive and therapeutic values. The demand for fresh aonla fruits is increasing continuously due to its multipurpose uses. It can be grown in any type of soil under any climatic condition hence considered a good option in maintaining productivity under the present scenario of global warning. In West Bengal, the crop has been popularizing in red and laterite soils of the state (Ghosh *et al*., 2002). In this agro-climatic situation, severe fruit drop and irregular bearing has been observed (Ghosh *et al*., 2009), which seems to be associated with internal and external factors (Mohammad and Ram, 1990). Considering the role of phosphorus in flowering, fruiting and many other physiological processes in plant (Agarwala and Sharma, 1978), an investigation was made to find out the effect of different doses of diammonium phosphate (DAP), a phosphorus rich chemical fertilizer (46% P_2O_5). Among the major nutrients needed for plant growth and development, nitrogen and phosphorus are considered to be the important nutrients for flowering, and fruiting, whose requirements depend on agro-climatic

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situation where the crop is grown. The requirement of nitrogen for aonla grown in laterite soil has already been standardized (Tarai and Ghosh, 2005) but not for the phosphorus.

MATERIALS AND METHODS

A field experiment was conducted for three consecutive years (2010-2012) on 10-year old budded plants of aonla cv. NA-10 planted at a spacing of 5 × 5 m in a private farm at Jhargram, Paschim Medinipur district of West Bengal. The soil of the experimental orchard was laterite having surface soil with 5.9 pH, 0.12 dS m^{-1} E.C. and 165, 83, and 170 kg/ha of available nitrogen, phosphorous and potassium, respectively. Five levels of DAP (200, 500, 1000, 1500 and 2000 g) with constant dose of 400 g single superphosphate (contain 16 % P_20_5), 500 g muriate of potash and 40 kg Farm yard manure/plant/year were applied in a randomized block design with six replications having two plants in each replication. The fertilizers were applied in two splits, i.e. 15th March (after flowering) and 15th June while the farm yard manure was applied only once i.e. 15th March. The FYM and fertilizers were applied in a 2-feet wide 6 inch deep circular trench, which was prepared 3 feet away from the plant. The data on yield per plant, fruit weight and pulp percentage were recorded at fruit maturity stages and analysed statistically. Chemical characteristics of fruits were determined following standard techniques (A.O.A.C., 1990). The leaves were collected during July from middle portion of three-month-old indeterminate shoots for foliar analysis of nitrogen, phosphorous and potassium (Awasthi *et al*., 1993). Leaf nitrogen was determined using micro kjeldahl method, phosphorous by vandomolybodophosphoric acid method and potassium by flame photometer.

RESULTS AND DISCUSSION

The data presented in Table 1, clearly indicated that application of different levels of DAP had a significant effect on fruit retention and fruit production. A significant effect on fruit retention was observed due to the application of different levels of DAP. The highest retention (25.3%) was observed in the plants with DAP at 500 g and minimum (2.17%) in the plants with DAP at 2000 g. The highest retention of fruits resulted in significant yield improvement in aonla. Fruit yield was highest with 500 g of DAP/plant/year in all the three successive years. The fruit yield drastically fell when the dose was increase over 500 g DAP/plant/year and lowest yield was recorded in the plants which received highest does of DAP (2000 g /plant/year). After calculation of P_2O_5 supply to the plants through DAP and SSP, it was revealed that 294 g of P_2O_5/plant/year was the appropriate requirement for aonla plant grown in laterite soil. However, Mishra, (2011) recommended 1.5 kg nitrogen, 1.0 kg potassium and 0.7 – 0.8 kg phosperous annually for an adult aonla plant grown in sodic soils of Uttar Pradesh (India).

The leaf nitrogen and potassium content did not vary significantly with different doses of DAP (Table 1). The leaf phosphorus content significantly increased with DAP levels till the highest DAP level (2000 g/plant). It is clear from the results (Table 1), that phosphorus levels of leaves was not the yield indicator for aonla. The results are in agreement with the findings of Tarai and Ghosh (2005) who observed that yield response of aonla was related with the nitrogen concentration in the leaves and not with the phosperous or potassium.

Application of DAP increased the fruit weight with highest fruit weight in the plants receiving 1500 g. The pulp recovery was not significantly improved with application of DAP. The TSS, acidity and reducing sugar

Table 1. Effect of Diammonium phosphate (DAP) on fruit yield and foliar nitrogen, prosperous and potassium status of aonla cv. NA-10.

Treatment (g/ Plant/year)	Fruit re-tention (%)	Yield (kg)/plant				Foliar content (dry weight basis)			Plant received P_2O_5 (g/plant/ year)		
		2010	2011	2012	Average	Nitrogen (%)	Phospho-rus (mg %)	Potassium (%)	Throug h DAP	Throug h SSP	Total
DAP – 200	20.2 (26.71)	23.7	27.5	23.3	24.8	1.35	66.0	0.55	92	64	156
DAP – 500	25.3 (30.20)	24.7	32.2	23.7	26.9	1.45	71.0	0.70	230	64	294
DAP – 1000	14.5 (22.38)	23.7	23.9	22.9	23.5	1.40	82.0	0.60	460	64	524
DAP – 1500	4.8(12.66)	22.7	23.8	21.9	22.8	1.40	85.0	0.60	690	64	754
DAP – 2000	2.1(8.33)	21.7	21.5	22.6	21.9	1.40	86.0	0.64	920	64	984
LSD at 5%	2.2	1.4	1.7	1.3	1.5	N.S.	2.1	N.S.	-	-	-

DAP – Diammonium Phosphate (46% P_2O_5 and 18% N)

SSP – Single Super phosphate (16% P_2O_5)

Figures in the brackets are angular transformed values.

Table 2: Effect of Diammonium phosphate on physico-chemical composition of fruits of aonla cv. NA-10

Treatment (g/ Plant/year)	Fruit weight (g)	Pulp (%)	TSS (^{0}B)	Acidity (%)	Reducing sugars (%)	Ascorbic acid (mg/100 g pulp)
DAP – 200	24.2	93.9	11.6	1.2	5.3	230.6
DAP – 500	26.0	94.1	11.6	1.3	5.6	360.0
DAP – 1000	25.9	94.5	11.9	1.2	6.2	350.0
DAP – 1500	29.3	95.0	11.6	1.1	6.0	310.0
DAP – 2000	28.6	94.6	11.6	1.1	6.0	280.0
LSD at 5%	0.7	N.S.	N.S.	N.S.	N.S.	8.1

content were also not improved with application of DAP. However, significant improvement in ascorbic acid content was noted due to application of DAP. The maximum ascorbic acid content (360 mg/100 g pulp) was recorded from the anola plants receiving 500 g DAP.

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