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Studies on the effect of foliar application of nitrogen and phosphorus on growth, flowering and fruiting of Guava (*Psidium guajava* L.) cv. Allahabad Safeda

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Abstract
The present experiment was conducted to determine "Studies on the effect off foliar application of nitrogen and phosphorus on growth, flowering and fruiting of Guava (*Psidium guajava* L.) cv. Allahabad Safeda" under Allahabad agro-climatic conditions in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad, (U.P.) during the year 2016-2017. The field experiment was conducted on three years old plant of guava in Randomized Block Design with 10 Treatments were each treatment replicated thrice, different concentrations of Nitrogen through urea (0.2%, 0.4% and 0.6%) and Phosphorus through SSP (0.2%, 0.4% and 0.6%] were used. The result reveals that Treatment T_9 [(Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)] was effective in improving pre and post-harvest parameters of guava. Treatments influenced significantly Plant height (cm), Number of branches per plant, No of leaves per plant, No. of cluster per plant, No. of Fruit set per plant, Fruit set percent, Yield per plant and yield q/ha and Post-harvest attributes like, TSS, Ascorbic acid%, Total sugar%, Pectin (%), Acidity (%) and P^H was also found maximum in treatment T_9 and minimum was recorded in treatment T_0-control.

Keywords: Guava, nitrogen**,** phosphorus and foliar spray

Introduction
India is the second largest fruit producer in the world followed by China. World horticultural total area (57499432 million ha) with (654449438 million tones) production. Total area in India for fruit production is 6358 million ha with 88819 million tones production and 13.9 ton/ha productivity. Among fruit crops guava share 251 ha area with 4083 tonnes production. In India there is an increasing demand from consumers and marketers for quality guava fruits .fruits of the two most popular cultivars of guava grown in India, Allahabad Safeda and Sardar are intrinsically poor in quality during rainy season. On the contrary, winter season crop bears a quality fruit which fetches high monetary returns (Singh *et al*. 2000).

Guava is a high energy fruit that is called powerhouse of vitamins and minerals. It has a healthy composition of dietary fiber that is essential for the body and can be derived only from food sources. Compared with pineapple guava contain three times more protein, four times more fiber and 30 times more calories. They are excellent source of other nutrients that make it a super nutritious fruit. Nutrition facts per 100 grams Guava contains total fat 1% , saturated fat 0.3% g, polyunsaturated fat 0.4% g, monounsaturated fat 0.1 g, cholesterol 0 mg, sodium 2 mg, potassium 417mg, total carbohydrate 4%, dietary fiber 20%, protein. Guava is rich source of antioxidant vitamin C that helps in immunity. It's also rich in antitumor and cancer controlling properties. Guava balancing electrolyte blood pressure & helps in blood production.

Amongst the various techniques of fertilizer application to fruit tree the foliar application constituents an important breaks through. Although of recent origin it has already become an established practice with many crops. The practices of spray nutrition have tremendously increased and methods have been developed and practiced to make efficient use of fertilizer nutrients.

Oland (1963) has indicated the possible value of utilizing urea foliar sprays as a nitrogen source when applied shortly before leaf fall. The advantages of applying urea in the leaf fall, compared with early in the growing season in that much more leaf surface is present and the N

is not diverted into unnecessary vegetative growth. Foliar application of urea was applied in April-May with concentration ranging from 5 to 20% to eliminate the rainy season crop. It was decided to test urea sprays, not only to avoid double application, but also to see if higher yield could be attained in different cultivars especially during winter season. It was felt that the information generated on the effect of single application of higher urea concentration (25-30%) would be of practical utility for regulation of crop in guava.

In phosphorus deficient trees the anthocyanin pigments develop; stem gets hardy and woody, the foliage becomes dark bluish green in early stage assuming later on a purplish tinge. Being mobile, deficiency symptoms appear first in older leaves. There is restricted new sheet formation, delayed setting and impairment in the qualities of fruit. Excess of phosphorus might result in influenced deficiencies of potassium and iron on heavy soils.

Importance of high density planting (HDP)

Trees of guava (*Psidium guajava*_L.*)* cv. Allahabad Safeda were planted in September 1998 at1.5 x 3.0, 3.0 x 3.0, 3.0 x 6.0 and 6.0 m spacing in replications to determine the effect of planting distance on tree growth, yield, fruit quality and light penetration. Tree growth was significantly influenced by different tree densities. When measured in October 2004, 6 year after planting distance when the tree height was highest (5.76m) at the planting distance of 3.0 x 1.5 m (2222 trees ha) similarly, trunk.

Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, SHUATS, Allahabad on three years old guava trees cv. Allahabad Safeda spaced 2.0 × 1.5m during the year 2016 to 2017. The design of experiment was Randomized Block Design (RBD) with 10 treatments replicated thrice. The plot unit for each treatment consists of two trees.

Climatic condition

The area of Allahabad District comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46º- 48 ºC and seldom falls as low as 4 ºC- 5 ºC. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4mm annually.

Treatment concentration

Fertilizers	Concentration
Nitrogen through urea	0.2%
	0.4%
	0.6%
Phosphorus (SSP)	0.2%
	0.4%
	0.6%

Treatment combinations

Notation	Combination
T_0	Control
T_1	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.2%)
T_2	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.4%)
T_3	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.6%)
T_4	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.2%)
T_5	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.4%)
T_6	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.6%)
T_7	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.2%)
T_8	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)
T_9	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)

Result and Discussion

The observations recorded vegetative growth parameters of guava were statistically analyzed and have been presented in table 1. A perusal of the table clearly shows that there was significant difference among the treatment at successive stage. Among the treatments the maximum plant height, number of branches per plant and number of leaves (155.51, 22.77 and 362.44 respectively) was observed in Treatment T_9 [(Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)], which was significantly superior to rest of the treatments, followed by T_8[Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)], with (152.40, 24.11 and 366.33 respectively) while the minimum plant height (102.74, 15.00 and 291.33 respectively), were recorded in treatment T_0(control).

Table 1: Effect of foliar application of nitrogen and phosphorus on plant height, number of branches per plant and number of leaves per plant of Guava (*Psidium guajava* L.) cv. Allahabad Safeda.

Treatments		Plant Height (cm)	Number of branches per plant	Number of leaves per plant
T_0	Control	102.74	15.00	291.33
T_1	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.2%)	123.66	16.88	286.22
T_2	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.4%)	124.04	19.77	301.66
T_3	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.6%)	128.2	18.88	293.11
T_4	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.2%)	136.25	20	312.88
T_5	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.4%)	146.81	19.44	310.44
T_6	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.6%)	143.37	20.66	341.11
T_7	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.2%)	149.22	21.66	350.66
T_8	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)	152.4	22.77	362.44
T_9	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)	155.51	24.11	366.33
	F- test	S	S	S
	S. Ed. (±)	4.654	0.711	22.303
	C. D. (P = 0.05)	9.605	1.468	46.034

The observations recorded yield attributes parameters of guava were statistically analyzed and have been presented in table 2. A perusal of the table clearly shows that there was significant difference among the treatment. Among the treatments the maximum no of cluster per plant, no of fruit per plant, fruit set percent ,yield per plant (g) and yield (q/ha) (6.11, 6.22, 45.00, 780.33 and 78.03 respectively) was observed in treatment T_9[(Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)], which was significantly superior to rest of the treatments, followed by treatment T_8[Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)], with (5.66, 6.22, 44.00, 713.22 and 71.33 respectively) while the minimum (3.00, 5.21, 36.00, 559.99 and 56.00 respectively) were recorded in treatment T_0(control).

Table 2: Effect of foliar application of nitrogen and phosphorus on no. of cluster per plant, no. of fruit per plant, fruit set percent ,yield per plant (g) and yield (q/ha) of Guava (*Psidium guajava* L.) cv. Allahabad Safeda.

Treatments		No of Cluster Per Plant	No of Fruit Per Plant	Fruit Set Percent	Yield per Plant (g)	Yield (q/ha)
T_0	Control	3.00	5.21	36	559.99	56
T_1	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.2%)	4.44	5.22	37	562.22	56.23
T_2	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.4%)	4.66	5.78	39	568.78	56.87
T_3	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.6%)	4.89	5.22	40	600	60
T_4	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.2%)	5.00	5.1	42.67	583.33	58.33
T_5	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.4%)	5.11	5.55	41.33	617.77	61.77
T_6	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.6%)	5.22	5.65	43.33	653.33	65.3
T_7	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.2%)	5.55	5.77	43.67	653.33	65.33
T_8	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)	5.66	6.22	44	713.22	71.33
T_9	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)	6.11	6.77	45	780.33	78.03
	F- test	S	S	S	S	S
	S. Ed. (±)	0.561	0.248	0.747	17.745	1.762
	C. D. (P = 0.05)	1.158	0.511	1.542	36.626	3.636

The observations recorded Quality parameter of guava was statistically analyzed and have been presented in table 3. A perusal of the table clearly shows that there was significant difference among the treatment. Among the treatments the maximum TSS, ascorbic acid (%), total sugar (%), pectin (%), acidity (%) and pH (%) (10.18, 230.44,, 8.11, 0.74, 0.27 and 4.35 respectively) was observed in treatment T_9[(Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)], which was significantly superior to rest of the treatments, followed by treatment T_8[Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)], with (10.07, 223.55, 7.99, 0.73, 0.26 and 4.31 respectively) while the minimum (7.31, 158.74, 5.14, 0.37, 0.22 and 3.13 respectively) were recorded in treatment T_0(control).

Table 3: Effect of foliar application of nitrogen and phosphorus on TSS, Ascorbic acid, total sugar, Pectin, Acidity and P^H of Guava (*Psidium guajava* L.) cv. Allahabad Safeda.

Treatments		TSS	Ascorbic Acid (%)	Total Sugar (%)	PECTIN (%)	Acidity (%)	pH (%)
T_0	Control	7.31	158.74	5.14	0.37	0.22	3.13
T_1	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.2%)	7.36	175.52	6.38	0.4	0.23	3.16
T_2	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.4%)	7.48	185.16	6.61	0.43	0.23	3.18
T_3	Nitrogen through urea (0.2%) + Phosphorus through SSP (0.6%)	8.27	186.23	6.86	0.56	0.23	3.53
T_4	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.2%)	8.97	185.93	7.24	0.66	0.24	3.79
T_5	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.4%)	8.92	189.88	7.19	0.68	0.25	3.99
T_6	Nitrogen through urea (0.4%) + Phosphorus through SSP (0.6%)	9.37	194.33	7.64	0.7	0.24	4.05
T_7	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.2%)	9.88	214.66	7.98	0.72	0.25	4.12
T_8	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.4%)	10.07	223.55	7.99	0.73	0.26	4.31
T_9	Nitrogen through urea (0.6%) + Phosphorus through SSP (0.6%)	10.18	230.44	8.11	0.74	0.27	4.35
	F- test	S	S	S	S	S	NS
	S. Ed. (±)	0.136	2.222	0.146	0.02	0.004	3.764
	C. D. (P = 0.05)	0.281	4.586	0.301	0.042	0.008	7.77

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