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GROWTH, YIELD AND QUALITY OF GUAVA (*PISIDIUM GUAJAVA* L.) AS INFLUENCED BY DIFFERENT LEVELS OF NUTRIENTS UNDER RAINFED REGION OF *KYMORE* PLATEAU

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ABSTRACT

Under rainfed region of *Kymore* plateau in M.P., It was found that fruit yield of guava was increased by 15.64% with the application of 75g N/plant to 25.72% at 150g N/plant as compared to no nitrogen application. The application of phosphorus at the rate of 150g P_2O_5 per plant gave 6.51% higher number of fruit, 2.77% higher fruit weight and 38.63% higher fruit yield/plant as compared to no phosphorus application. The yield of guava due to application of 150g K_2O/plant was not affected significantly but gave 2.44% higher fruit yield as compared to no potash application. The increased dose of nitrogen and phosphorus was significantly correlated with different growth and yield characters of guava for yield maximization NPK requirement were 154.12 g N/plant, 170.75 g P_2O_5/plant and 184.37 g K_2O/plant. Maximum values of 12.03º, 12.23º and 12.00 ºBrix was observed with highest dose of nutrient application.

INTRODUCTION

Guava is an important subtropical fruit of India, which occupies an area of 5,50,00 ha with an average productivity of 11.56 t/ha. The average productivity under rainfed region of *Kymore* plateau (Rewa) is 7.29 t/ha which is very low as compared to national average. It is due to imbalance fertilizer management, decline soil organic matter, over mining of nutrient reserve and non availability of cost effective fertilizer. Fertility management plays a key role in crop cultivation. Crops and varieties exhibit their full potential only when supplied with adequate quantities of nutrients at proper time (Mahajan *et al.,* 2013). Several investigators have reported that increase in nitrogen, phosphorus and potash rates are associated with the increase yield, fruit weight, fruit size, ascorbic acid and TSS of guava (Deshmukh *et al.,* 2013). The positive correlation of NPK on growth rates, flowering, shoots yield and size of guava fruits have also been reported by Bisen *et al.* (2014).The combined effect of NPK on growth and development of guava has not been studied in general under rainfed region of *Kymore* plateau and Rewa region in specific, therefore present experiment has been conducted to investigate the effect of varying levels of NPK on Growth, Yield and Quality of guava.

MATERIALS AND METHODS

The experiment was carried out for two consecutive seasons 2008-09 and 2009-10 at Fruit Research Station, Kuthulia Farm, College of Agriculture, Rewa (M.P.) under All India Coordinated Research Project on subtropical fruits. The experiment was conducted on silty loam soil which was neutral in reaction pH (7.2), high in available nitrogen (341.2 kg/ha) and phosphorus (26.88 kg/ha) and medium in potash (510 kg/ha). The average annual rainfall varied from 900 mm to 1150 mm, which was received mainly from the month of July to September. Three levels of nitrogen 0, 75 and 150 g/plant, three levels of phosphorus 0, 75, 150 g/plant and three levels of potash 0, 50 and 150 g/plant were arranged in randomized block design (RBD) and replicated thrice. All the treatments were applied in first weak of July during both the years. The guava variety *Allahabad Safeda*was taken as test variety. The orchard was planted during the year 2003-04. The planting spacing was 6m´6m and three plants per treatment were marked for taking observations. Fertilizer requirement of all the crops was met through urea, single super phosphate (SSP) and murate of potash (MOP).Total three replication having three trees per replication of each treatment were selected and data were taken from selected plants with respect to growth, yield and quality traits. Ten fruits were randomly harvested from each plant for recording observations. The fruit quality was studied in terms TSS (^{0}B), acidity (%), TSS:acid ratio, ascorbic acid (mg/100g), total sugar (%) and pectin (%). Total soluble solid (TSS) was determined with the help of digital refractometer. Acidity was determined by titrating the juice against N/10 NaOH and expressed as per cent citric acid. Ascorbic acid content of fruit was determined with the help of

the method given in A.O.A.C. 1995 and total sugar was analyzed as per method given by Lane and Eynon, 1943. The total pectin content of guava fruit was estimated as per method given by Ranganna, 1997. The data was statistically analysed by method of analysis of variance using RBD as described by Panse and Sukhatme 1985.

The Response of NPK he response of NPK was calculated which is given below.

Calculation of Response curve

Quadratic regression equation were worked out by solving the equation

$y = a + bx + cx^2$, Where a, b and c are constant to be estimated out.

Response of N/P/K

The response of N/P/K was computed by following equation.

$$\text{Response of N/P/K} \frac{bx - cx^2}{x} \text{ g fruit/g}$$

NPK maxima

Maximum level of N/P/K were computed by following equation

$$\text{X maxima} \frac{-b}{2c} \text{ x X} = \text{g/plant,}$$

Where, 'x' is the interval between two levels.

RESULTS AND DISCUSSION

Growth attributes

The various growth characters of guava were influenced by different level of nutrients but not to a significant level. The effect of nitrogen was not observed on height of guava, canopy length, root stock and scion girth while spread of plant in N-S and E-W were found significant (Table 1). Similarly, phosphorus and potassium application failed to mark its influence on growth attributes viz: plant height, canopy length, and spread in both the direction, while root stock and scion girth were affected significantly and was maximum up to the application of 75 g phosphorus per plant. The above findings were in line with those of Ahmad *et al*. (2003).

Yield Attributes and Yield

Yield which is the final outcome of yield attributes like number of fruits per plant was affected significantly due to application of nitrogen. The rate of increase was 15.64% at 75g N/plant and 25.72% at 150g N/ plant. Similarly, Fruit weight and yield of guava was increased significantly at 150 g N/plant. The fruit weight was 14.51% higher as compared to no nitrogen application. The yield of guava was maximum145.44 kg/plant at 150 g nitrogen/plant. The yield of guava increased up to 41.5% at 150 g nitrogen/plant. It may be due to higher number of fruits per plant (25.72%) and higher fruit weight (14.5%) as compared to no nitrogen application. The yield is known to be a polygenic character, where genetic makeup, distinct growing condition, management practices and fruiting season has direct influence on yield (Deshmukh *et al.,* 2013). The number of fruits per plant increased by 6.51%, fruit weight increased by 2.77% and yield of guava per plant increased by 38.36% by application of 150 g P_2O_5/plant as compared to no phosphorus application. The yield of guava was not affected significantly but it was increased by 2.44% at 150 g K_2O/plant as compared to no potash application. Patel*et al.* (2007) have reported similar findings while working on guava.

Table 1: Effect of different levels of nitrogen, phosphorous and potassium on growth, yield attributes and yield of guava.(Pooled data of two years)

Treatment	Height (m)	Canopy (m)	Root stock girth(cm)	Scion girth (cm)	Spread (m) N-S	Spread (m) E-W	Number of Fruit/plant	Fruit weight (g)	Yield kg/plant
N levels g/plant									
N_0 0	4.55	3.95	44.28	40.20	5.25	5.19	561.30	182.29	102.78
N_1 75	4.80	4.15	45.21	40.75	5.65	5.37	649.12 (115.64%)*	186.77 (103.04%)	125.84 (122.43%)
N_2 150	4.92	4.31	47.51	42.27	5.92	5.92	705.72 (125.72%)	207.72 (114.5%)	145.44 (141.50%)
CD at 5%.	NS	NS	NS	NS	0.66	0.58	27.08	6.14	15.59
P levels g/plant									
P_0 0	4.72	4.08	45.5	40.66	5.49	5.43	525.30	189.58	93.33
P_1 75	4.73	4.09	56.95	56.95	5.58	5.61	611.10 (116.33%)	191.36 (100.93%)	126.80 (135.86%)
P_2 150	4.82	4.23	55.41	55.41	5.74	5.51	670.00 (127.55%)	194.84 (102.77%)	129.14 (138.36%)
CD at 5%.	NS	NS	9.89	4.15	NS	NS	27.08	6.14	15.59
K levels g/plant									
K_0 0	4.69	4.12	51.5	49.48	5.58	5.53	631.09	190.83	123.05
K_1 50	4.79	4.14	54.96	53.18	5.69	5.59	641.98 (101.735%)	191.83 (100.52%)	124.82 (101.43%)
K_2 150	4.78	4.15	51.4	50.36	5.55	5.43	643.12 (101.91%)	193.12 (101.35%)	126.06 (102.44%)
CD at 5%.	NS	NS	NS	4.15	NS	NS	NS	NS	NS

*Figures in parentheses are percent over lower doses (0 g/plant)

Table 2: Correlation coefficient (r) in between NPK levels and different characters of guava. (Pooled data of two years)

Characters	Nitrogen	Phosphorous	Potassium
Tree Height	0.980**	0.908**	0.693
Canopy Height	0.998**	0.894*	0.929*
Root Stock	0.971**	0.797	-0.213
Scion	0.965**	0.820*	0.040
Spread N→S	0.994**	0.987**	-0.385
Spread E→W	0.960**	0.444	-0.756
No of fruits	0.992**	0.950**	0.809*
Average weight/fruit	0.947**	0.983**	0.993**
Yield	0.999**	0.894*	0.958**

** Significant at 1%, * Significant at 5%

Correlation studies and Response of N.P.K. on guava

Correlation co-efficient is an important statistical constant,

Table 3: Response of N, P and K on yield of Guava (Pooled data of two years)

Regression equation	X Maxima g/plant	Response g fruit/g
Response of N, $Y = 102.78 + 24.79$, X-$1.73x^2$	154.12	208.06
Response of P_2O_5, $Y = 93.23 + 49.15$, X-$15.6x^2$	117.75	880.4
Response of K_2O, $Y = 123.04 + 2.06$, X-$0.28x^2$	184.37	16.06

Table 4: Effect of different levels of nitrogen, phosphorous and potassium on quality parameters of guava. (Pooled data of two years)

Treatments	TSS^0 (Brix)	Acidity(%)	Pulp seed ratio	Number of seeds per fruit	100 seed weight (g)	Storagelife offruit atroom temperature (days)
N levels g/plant						
N_0 0	11.70	0.50	71.77	301.00	1.05	4.00
N_1 75	11.90	0.53	73.66	319.00	1.15	5.60
N_2 150	12.03	0.56	73.77	341.00	1.26	6.30
CD at 5%.	0.39	NS	NS	26.95	0.12	NS
P levels g/plant						
P_0 0	11.66	0.48	73.84	330.00	1.16	4.00
P_1 75	11.83	0.53	74.36	335.00	1.21	4.60
P_2 150	12.23	0.57	74.40	347.66	1.27	5.00
CD at 5%.	0.39	NS	NS	26.95	0.12	NS
K levels g/plant						
K_0 0	11.50	0.47	71.12	304.66	1.12	4.30
K_1 50	11.70	0.48	72.82	308.00	1.17	5.00
K_2 150	12.00	0.51	73.29	337.33	1.27	5.30
CD at 5%.	0.39	NS	NS	26.95	0.12	NS

which indicates the degree of association among the various characters. The increasing dose of nitrogen on different characters of guava was significantly correlated. Similarly increasing rates of phosphorus have significant influence on tree height, canopy height, scion girth, plant spread, number of fruit, fruit weight and yield of guava (Table 2). The application of increasing dose of potash had significant influence on canopy height, fruit weight and yield of guava. The response of N.P.K. on guava has been given in Table 3. The requirement of maximum nitrogen was 154.12 g/tree, maximum phosphorus requirement was 117.75 g P_2O_5/tree and maximum K requirement was 184.37g K_2O/tree for yield maximization. The response of nitrogen was 208.06 g fruit/g of nitrogen, 880.4 g of fruit/g P_2O_5 and 16.06 g fruit/g of K_2O.

Quality

It is evident from result (Table 4) that different nutrient application has significantly affected the total soluble solids.Maximum values of 12.03 ^{o}, 12.23 ^{o} and 12.00 ^{o} Brix was observed with highest dose of application of nitrogen, phosphorous and potassium, respectively. The result on acidity%, Pulp seed ratio and Storage life of fruit at room temperature (days) clearly showed that these parameters were not influenced with varying rate of nutrient application but increased linearly with increase in dose of different nutrients. Number of seeds per fruit and test weight of guava were significantly influenced with different dosed of nutrient application and maximum values of these parameters were recorder under highest doses of nutrient application. The results are in line with the findings of Ram *et al*. (2007), who reported the fruit quality being superior with application of inorganic fertilizers.

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