

Effect of Different Levels of N.P.K Fertilizers on the Yield and Quality of Mango (*Mangifera indica* L.)

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Abstract: The data obtained revealed that maximum plant height (422 cm), number of flowers (532), number of fruits per tree (940), fruit length (19.11 cm) and average fruit yield per tree (61.22 kg) were recorded in 1.5-1.5-0.75 NPK kg/plant. Maximum plant girth (78 cm) and maximum fruit weight (133.5 g) was found in 1.5-0.75-00 NPK kg/plant. Whereas, maximum number of inflorescence/ shoot (23.7) was recorded in 00-00-00 NPK kg/plant.

Key words: Mango, *Mangifera indica*, flowers, fruits, yield

Introduction

The present study was undertaken to see the effect of various doses of N.P.K fertilizer on the morphological measurements of mango trees and to record the physical characteristics of fruit of Mango cv. Anwar Ratoul under the agro-climatic conditions of Dera Ismail Khan.

Singh *et al.*, (1984) stated that 13 years old trees when fertilized with horses, cow manure and artificial (N.P.K) fertilizers yielded 395, 293 and 310 fruits per tree respectively as compared to 148 fruits/tree in the non-fertilized control. The respective TSS percentage was 18, 17.6, 17.8 and 17.2. Kanwar *et al.*, (1987) in a long term trials applied N.P.K. to young trees in different rates and combinations. Tree growth was non-significantly affected by the differences in fertilizer treatments and the lowest N rate (100-g N/tree per year of tree age) was sufficient for good tree growth and cropping. P had no appreciable effect but K was highly beneficial with regard to yield. Feungchan *et al.*, (1989) applied 15-15-15 N.P.K. fertilizer at 300 g/tree to cv. Khiewsa weuy at intervals of 7 and 15 days and 1, 3, 6 and 12 months. Application at 15-day interval resulted in the highest rate of flower bud differentiation.

Syamal and Mishra (1989) reported that 17 years old Mango trees cv. Langra were treated with two levels of (N with 90.5 g or 1.0 kg), P (1.0 or 2.0 kg of P₂O₅) and K (0.5 or 1.0 kg of K₂O) singly or combined (N₁P₁K₁ and N₂P₂K₂). N₂P₂K₂ application resulted in the greatest shoot growth, leaf and flower number, fruit set, fruit retention, fruit size, TSS percent, ascorbic acid and sugar contents, but the lowest total fruit acidity and the shortest duration of flowering. Suryapanant (1992) obtained highest yield with 0.5 kg N + 0.4 kg P + 1.5 kg K/tree in mango.

Materials and Methods

The experiment reported herein was conducted in Mango Orchard of the Fruit and Vegetable Development Board, Dera Ismail Khan. The trees of mango cv. Anwar Ratoul were used to study the effect of NPK fertilizer on the yield and quality of mango fruit.

Fifty-four trees of mango cv. Anwar Ratoul of uniform size and vigor budded on local mango seedling rootstock under the similar cultural conditions were selected for this study. The trees were about twelve year's age at the time of fertilizer application. The composite soil sample was analyzed for various physio-chemical determination.

Table 1: Physio-chemical characteristics of the soil

Soil Property	Quantity
pH	8.1
Available Nitrogen	0.053%
Available Phosphorus	6 mg/kg
Available Potassium	135 mg/kg
Organic Matter	1.0%
Soil Texture	Silty Clay

The experiment was laid out in Randomized Complete Block Design, having nine treatments with three replications. Each plot (Treatment) consisted of two trees.

The various doses of fertilizer applied are given below:

		N	P ₂ O ₅	K ₂ O (kg/plant)
T1	N ₀ P ₀ K ₀	----	Control	-----
T2	N ₀ P ₁ K ₁	0.0	0.75	0.75
T3	N ₁ P ₁ K ₁	1.0	0.75	0.75
T4	N ₂ P ₁ K ₁	1.5	0.75	0.75
T5	N ₃ P ₁ K ₁	2.0	0.75	0.75
T6	N ₂ P ₂ K ₁	1.5	0.0	0.75
T7	N ₂ P ₂ K ₁	1.5	1.5	0.75
T8	N ₂ P ₁ K ₀	1.5	0.75	0.0
T9	N ₂ P ₁ K ₂	1.5	0.75	1.5

Fertilizer application: Nitrogen fertilizer was applied in three split doses. First dose of Nitrogen was applied on 25th Jan, before flowering, while the second dose of Nitrogen was applied on 20th March, after flowering and third dose of Nitrogen was applied on 20th April after the fruit setting. Phosphorus and Potash were applied in a single application before flowering on the 20th December. The fertilizers used as a source of Nitrogen, Phosphorus and Potassium were Urea, Single Super Phosphate and Potassium Sulphate, respectively. The fertilizer was broadcast at a distance of one meter from the trunk of the tree under the whole canopy of trees and thoroughly incorporated into the soil with the help of Khurpa. The soil was immediately watered after fertilizer application.

The data were collected for plant height (cm), plant girth (cm), number of flowers, number of inflorescence per shoot, number of fruits per treatment, average fruit weight (kg), fruit length (cm) and average fruit yield (kg).

The data of all the above detailed parameters were individually subjected to the analysis of variance technique (Steel and Torrie, 1980). Subsequently, the significant means were

Table 2: Plant height and plant girth as influenced by different levels of fertilizers

Treatments	N.P.K. (kg/plant)	Height (cm)	Girth (cm)
T1	(00--00--00)	369.38	53.50
T2	(00--0.75--0.75)	397.66	66.50
T3	(1.0--0.75--0.75)	380.33	54.00
T4	(1.5--0.75--0.75)	402.50	70.00
T5	(2.0--0.75--0.75)	368.50	59.50
T6	(1.5--00--0.75)	387.50	63.00
T7	(1.5--1.5--0.75)	422.50	69.50
T8	(1.5--0.75-00)	421.50	78.00
T9	(1.5--0.75--1.5)	385.00	64.00
N.S.	= Non-significant.	N.S.	N.S.

Table 3: Number of flowers and Number of inflorescence per shoot as influenced by different levels of fertilizers

Treatments	N.P.K. (kg/plant)	Number of inflorescence per shoot	
		Flowers	Number of inflorescence per shoot
T1	(00--00--00)	322.66 bc	23.70
T2	(00--0.75--0.75)	373.33 bc	21.13
T3	(1.0--0.75--0.75)	261.66 c	17.80
T4	(1.5--0.75--0.75)	444.66 ab	17.40
T5	(2.0--0.75--0.75)	280.00 c	20.66
T6	(1.5--00--0.75)	347.30 bc	21.66
T7	(1.5--1.5--0.75)	532.00 a	21.53
T8	(1.5--0.75-00)	345.00 bc	19.66
T9	(1.5--0.75--1.5)	326.00 bc	19.60
			N.S.

Means sharing common letter(s) are statistically similar at 5% level of probability. N.S. = Non-significant

Table 4: Number of Fruits per Treatment and Average Fruit Weight (g) as influenced by different levels of fertilizers.

Treatments	N.P.K. (kg/plant)	Number of fruits	Fruit wt. (g)
T1	(00--00--00)	710 cde	91.30
T2	(00--0.75--0.75)	660 e	122.90
T3	(1.0--0.75--0.75)	790 b	103.60
T4	(1.5--0.75--0.75)	880 a	117.90
T5	(2.0--0.75--0.75)	680 de	115.60
T6	(1.5--00--0.75)	760 bc	82.40
T7	(1.5--1.5--0.75)	940 a	121.30
T8	(1.5--0.75-00)	752 bc	133.50
T9	(1.5--0.75--1.5)	740 bcd	109.40
			N.S.

Means sharing common letter(s) are statistically similar at 5% level of probability. N.S. = Non-significant.

Table 5: Fruit length (cm) and Fruit yield as influenced by different levels of fertilizers

Treatments	N.P.K. (kg/plant)	Fruit length (cm)	Fruit yield
T1	(00--00--00)	16.45 c	38.95 cd
T2	(00--0.75--0.75)	18.19 ab	31.96 e
T3	(1.0--0.75--0.75)	17.45 abc	52.61 b
T4	(1.5--0.75--0.75)	18.13 abc	57.70 a
T5	(2.0--0.75--0.75)	18.18 ab	34.50 de
T6	(1.5--00--0.75)	16.56 bc	50.51 b
T7	(1.5--1.5--0.75)	19.11 a	61.22a
T8	(1.5--0.75-00)	18.77 a	48.03 b
T9	(1.5--0.75--1.5)	17.90 abc	42.26 c

Means sharing common letter(s) are statistically similar at 5% level of probability.

separated by the Least Significant Difference Test by using the MSTATC computer programme.

Results

Plant Height: The data regarding the plant height as affected by different doses of fertilizers shows that the result was statistically non-significant. However, maximum plant height of 422.50 cm was recorded in case of 1.5-1.5-0.75 NPK kg/plant, whereas the minimum plant height of 368.5 cm was noted in case of 2.0 -0.75- 0.75 NPK kg/plant. Malhi *et al.*, (1988) also reported the similar results, in which they stated that different fertilizers doses had a non-significant affect on the plant height of mango tree.

Plant Girth: The data regarding the plant girth as affected by different doses of fertilizers clearly indicates that various levels of Nitrogen, Phosphorus and Potassium had non-significant effect on the plant girth. The maximum measurement was taken in 1.5-0.75-00 NPK kg/plant with 78.00cm plant girth whereas the minimum of 53.50cm plant girth was noted in 00-00-00 NPK kg/plant. This result is in conformity with those of Malhi *et al.*, (1988) who also observed the non-significant effect of different fertilizer doses on the Mango plant girth.

Number of Flowers: The data pertaining to the number of flower per panicle as affected by different doses of fertilizers clearly indicates that the various levels of nitrogen, phosphorus and potassium had statistically significant effect upon the number of flowers per panicle. Maximum number of flowers was recorded in 00-00-00 NPK kg/plant, followed by 1.5-0.75-0.75 NPK kg/plant with 444.66 flowers per panicle. Whereas the minimum of 261.66 flowers per panicle was recorded in 1.0-0.75-0.75 NPK kg/plant. Syamal and Mishra (1989), also stated that higher fertilizer application would result in greater number of flowers. Shafqat *et al.* (1989) also reported that number of flowers per panicle were highly influenced by the different levels of complete fertilizers.

Number of Inflorescence per Shoot: The data obtained shows the non-significant results regarding the number of inflorescence per shoot as effected by different doses of fertilizers. Maximum number of inflorescence per shoot was produced from Control treatment, while the minimum of 17.40 inflorescence per shoot was observed in 1.5-0.75-0.75 NPK kg/plant. The most number of inflorescence was badly damaged by the Hazard/ heavy rainfall. The results obtained, clearly shows that the fertilizers have no such effect on number of inflorescence per shoot.

Number of Fruits per Tree: The data obtained showed that different level of N, P and K had significant effect on the number of fruits per tree at 5% level of probability. The data showed that maximum number of 940 mango fruits per tree were produced in 1.5-1.5-0.75 NPK kg/plant, which was at par with that of 1.5-0.75-0.75 NPK kg/plant with 880 mangoes. Whereas the minimum of 660 mango fruits were obtained in 00-0.75-0.75 NPK kg/plant. The results showed that not only Nitrogen, but also Phosphorus (in relatively higher amount) is important for the fruiting of mango trees.

Average Fruit Weight (g): The non-significant data regarding the average fruit weight of mango depicted that the maximum weight of fruit of 133.5 g was observed in 1.5-0.75-00 NPK kg/plant, while the minimum weight of 82.4 g was recorded in 1.5-00-0.75 NPK kg/plant.

Ahmed *et al.*: NPK effect on Mango

Fruit Length (cm): According to the data, the NPK fertilizers had markedly significant effect on the fruit length. The results showed that the maximum length of 19.11 cm was recorded in 1.5-1.5-0.75 NPK kg/plant, which was at par with 1.5-0.75-0.0 NPK kg/plant with 18.77 cm. Whereas the minimum fruit length was observed in Control (00-00-00 NPK kg/plant) with 16.45, which was at par with that of 1.5-0.0-0.75 NPK kg/plant. This obtained result clearly shows that increase in amount of NPK will result in high fruit length. Syamal and Mishra (1989) also stated that application of fertilizer had markedly influence the fruit length.

Average Fruit Yield (kg) per tree: The result obtained revealed that average fruit yield (kg) of mango was significantly affected by different doses of N, P and K. Maximum average mango yield of 61.22 kg per tree was reported once again in 1.5-1.5-0.75 NPK kg/plant, closely followed by 1.5-0.75-0.75 NPK kg/plant with an average fruit yield of 57.70 kg. The minimum average fruit yield of 31.96 kg was recorded in 0.0-0.75-0.75 NPK kg/plant, which was at par with 2.0-0.75-0.75 NPK kg/plant with an average of 34.50 kg fruit. These results are similar to that of Feungehen *et al.* (1989). They noted that the yield was increased markedly with the increased application of NPK fertilizers.

It can be concluded that NPK fertilizers at the rate of 1.5 -1.5 - 0.75 kg per plant may be applied to obtain optimum yield and for good quality fruit of Anwar Ratoul.

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