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EFFECT OF NUTRIENT MANAGEMENT THROUGH ORGANIC SOURCES ON THE PRODUCTIVITY OF GUAVA (*Psidium guajava* L.)

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ABSTRACT : The experiment was conducted to study the effect of nutrient management through organic sources on guava trees. Results showed that application of various organic substances increased growth of trees, fruit yield and fruit quality as compared to untreated ones (control). The highest values of these parameters were recorded for trees applied with poultry manure followed by the trees applied with FYM. Application of poultry manure on guava trees significantly increased number of fruits per plant and resultantly higher yield (kg/tree) was achieved as compared to control. The recorded values of total soluble solids and total sugar were also found significantly higher with the application of poultry manure.

Keywords : *Guava, nutrient management, organic sources, growth, productivity, quality.*

Guava (*Psidium guajava* L.) is one of the important fruit crops of tropical and sub-tropical regions of India. It is a hardy crop and can be grown satisfactorily on marginal soil with minimum care. It is popularly known as 'Apple of Tropics' and claims to be the fourth most important fruit in area and production after mango, banana and citrus with a production of 2270 thousand MT from an area of 204 thousand hectares with productivity of 11.1 MT/ha. Guava pulp is rich source of vitamin C (75-260 mg/100 g) and pectin (0.5-1.8 %). Guava is also a fair source of vitamin A, iron, calcium and phosphorus. In some countries the leaves are medicinally used against diarrhoea and for dyeing and tanning. Chemical based farming is not sustainable because of many problems such as loss of soil fertility from excessive erosion and associated plant nutrients loss, surface and ground water pollution from fertilizers and sediments, impeding shortages of non-renewable resources and low farm income from high production costs. In view of this there is an increasing awareness worldwide about alternative agricultural systems known as integrated plant nutrient management, which implies the maintenance or adjustment of soil fertility and plant nutrients supply for sustaining desired crop productivity through optimization of benefits from all possible sources of plant nutrients in an integrated manner (Ram *et al.,* 5). The soils of India are impoverished and hungry of plant nutrients. What needed is an optimum use of procured inputs and not of increasing inputs. Considering economy, energy and environment, it is imperative that plant nutrients should be used effectively by adopting proper nutrient management system to ensure high yield and to sustain the availability in soil at the optimum level for getting higher yield and quality fruit production for which nutrient management is necessary (Yadav, 7). Use of organic manures along with biofertilizers and crop residues as a cheap source of available nutrients to plants has resulted in beneficial effects on growth, yield and quality of various fruit crops (Katiyar *et al.,* 1). However, information are lacking on this aspect under semi arid climatic conditions of Vindhayan region.

MATERIALS AND METHODS

Experimental Location :

The experiment was carried out at the Agricultural Research farm of Rajiv Gandhi South Campus, (BHU) Barkachha, Mirzapur which is situated in Vindhyan region of district Mirzapur (25º 10' latitude, 82º 37' longitude and altitude of 427 meters above mean sea level). The climate of Barkachha, Mirzapur is typically semi-arid characterized by extremes of temperature both in summer and winter with low rainfall and moderate

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humidity. Maximum temperature in summer is as high as 39.80°C and minimum temperature in winter falls below 9ºC. The annual rainfall of locality was 209.2 mm in 2010, of which more than 70 per cent is contributed by South West monsoon between July to September. The total rainfall during the experimentation was 161.6 mm; maximum and minimum temperature fluctuated between 32.9ºC and 21.3ºC, and relative humidity between 86.5 and 42.2 per cent.

Soil type :

Table 1: Physical and chemical properties of experimental farm soil used.

Soil character	Value
Sand %	50.1
Silt %	37.2
Clay %	12.7
Texture	Sandy loam
Bulk density (mg M ^{3})	1.45
Particle density (mg M ^{3})	2.65
Maximum water holding capacity (%)	30
Field capacity (%)	19.13
Organic matter %	0.27
pH (1 : 2.5 extract)	6.5
Available nitrogen (kg ha ^{1})	177.72
Available P_2O_5 (kg ha ^{1})	9.01
Available K_2O (kg ha ^{1})	113.31
EC (dS m ^{1}) at 25°C	0.29

The soil of the experimental field was sandy clay loam having medium fertility. Soil colour is generally red due to excess of iron. These soils are rich in available nitrogen and potassium but poor in available phosphorus. Before the start of experiment the soil samples were collected with the help of soil auger and core sampler

Experimental design and treatment :

The experiment was conducted in Randomized Block Design with twelve treatments, which were replicated thrice. These treatments were Poultry manure @ 20 kg /tree (T_1), FYM @ 25 kg /tree (T_2), Egg shell (T_3), Paddy straw (T_4), Green manure @ 100 g/tree (T_5), Wheat straw (T_6), Mung straw (T_7), Til straw (T_8), Maize straw (T_9), Removal of weed and spreading (T_{10}), Interculture (T_{11}) and Control (T_{12}). The variety under study was L-49 having 6 years of age with a plant spacing of 7 7 m. Recommended dose of organic nutrients was applied on 9th July, 2010 as per treatments. Organic nutrients applied between the radial distances 100 to 160 cm away from trunk, 3-5 cm deep and then properly covered with soil (Kotur, 2). The field was depending on rainfall during the study period. Ploughing was done to break the dormancy and to keep the soil loose and check weed growth in rows. The guava field was kept weed free by regular manual weeding and also with the help of tractor mounted implements. Plant protection schedule was applied specially for control of fruit fly and mealy bugs by applying 0.1% dichlorvas at monthly interval.

Sampling and measurement:

One plant of each treatment selected, marked, and kept under observations for recording various observations. The height of plant was measured from ground level to the growing tip in meter at one month interval to 180 days of manuring. The stem girth was recorded with help of tape at 25 cm from base and recorded in millimetres. The plant spread was recorded at maximum and minimum spread and then averaged out. The plant volume of selected plants were computed using Westwood (1963) formula :

$$4/3 \quad 0.5 \quad a^2 \quad 0.5 \; b$$

Where,

a = mean spread and

b = plant height in cubic meter.

The fruits harvested from each plant were counted at each harvest. The total number of fruits of all picking were calculated and recorded fruits harvested per plant. The fruits harvested from each observational plant during each harvesting weighed on electronic balance. The total weight of fruit from all harvesting was calculated and recorded as fruit yield per plant in kilogram. Fruit harvested per

Table 2: Effect of nutrient management through organic sources on growth of trees, fruit yield and fruit quality.

Treatment	Growth of trees		Fruit yield		Fruit quality	
	Plant height (cm)	Stem girth (cm)	Fruits per plant	Yield per plant (kg)	TSS (°Brix)	Total sugar (%)
Poultry manure	3.25	291.67	195.0	35.12	12.45	8.67 (2.94)
FYM	3.06	255.33	170.0	32.11	11.51	8.59 (2.93)
Egg shell	2.85	237.00	155.0	29.25	11.40	8.31(2.88)
Paddy straw	2.65	214.67	145.0	26.45	10.51	8.26(2.87)
Green manure	2.35	220.67	140.0	23.63	10.01	7.63 (2.76)
Wheat straw	2.45	207.33	127	24.12	9.68	7.37 (2.71)
Mung straw	2.19	200.67	115.0	21.75	9.41	7.18 (2.67)
Til straw	2.06	180.33	120.0	20.19	9.10	6.06 (2.46)
Maize straw	2.12	196.00	110.0	18.47	8.50	5.95 (2.13)
Removal of weed and spreading	1.98	175.33	87	15.10	8.40	5.45 (2.10)
Interculture	1.91	165.00	84	12.10	8.15	4.95 (2.02)
Control	1.50	144.33	72.0	11.68	7.50	4.55 (1.95)
CD (P=0.05)	0.25	20.94	22.38	4.17	0.29	0.29

·Figures in parentheses are square root transformed values.

plant was in kilogram divided by plant volume and recorded as fruit yield per cubic meter in kilogram. For determining the significance between the treatment means and to draw valid conclusions, statistical analysis was made. Data obtained from various observations were subjected to statistical analysis by adopting appropriate method of "Analysis of Variance". The significance of the treatment effects was judged with the help of F test (Variance ratio).The difference of the treatments mean were tested against critical difference (C D) at 5% probability level when "F' test was significant.

RESULTS AND DISCUSSION

Growth of trees :

The plant height and stem girth were taken as indicators for the growth of guava trees. The maximum values of these parameters were recorded under poultry manure (Table 2) which was at par with FYM and significantly superior over rest of all the treatments. The minimum plant height was recorded under control. It might be due to high nutrient and mineral content present in poultry manure in comparison to other organic sources. These observations were corroborated with the findings of Maji and Das (3) and Villasurda (6).

Fruit yield:

Significantly maximum number of fruits (Table 2) per plant (195) was harvested with the application of poultry manure and minimum number of fruits in control (72). Maximum fruit yield (35.12 kg/plant) recorded with poultry manure was at par with FYM (32.11kg/plant) which was found significantly superior over rest of the treatments. It might be due to high amount of nitrogen in combination with phosphorus and potassium present in poultry manure in comparison to other organic sources enhanced more growth and metabolic transport which leads ultimately the increased fruit yield. In addition to this potassium act as a catalyst in the formation of more complex substances and act as an accelerator of enzymatic activity which were beneficial in early emergence of flower buds and increased fruit set; resulted in fruit retention and increased yield. These observations were in close conformity with the findings of Naik and Babu (4) and Villasurda (6).

Fruit quality:

The data presented in Table 2 indicates that the maximum total soluble solids (12.45°B) recorded in freshly harvested fruits from the trees received with poultry manure followed by FYM. The recorded values of total sugar with poultry manure (8.67%) was at par with FYM (8.59%) found significantly higher to rest of the treatments. The minimum total soluble solids (7.5°B) and total sugar were recorded in untreated control (4.55%). The effect of organic resources on acidity showed non-significant influences. It might be due to high nutrient and mineral content present in poultry manure in comparison to other organic sources confirming to the findings of Katiyar *et al.* (1).

CONCLUSION

On the basis of obtained results it may be concluded that application of various organic sources of nutrients improved growth of trees and increased fruit yield of high quality. This observation was markedly pronounced in the trees applied with poultry manure. Therefore application of the poultry manure for guava trees is highly recommended to enhance growth of the trees and consequently produce high yield of good quality.

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