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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH CHARACTERS IN SAPOTA

Sheik Roohi Tasleema, S. Kamalakannan*, R. Rajeswari and R. Sudhagar

Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608002 (T.N.) India.

Abstract

The experiment was conducted with twenty-year-old sapota trees of cv. Kirthabarthi which were planted in a spacing of 8 m × 8 m. The principle of Randomized Block Design was followed with eight treatments replicated thrice. The treatments comprised of combinations with FYM, Vermicompost, RDF and inoculation of effective microorganisms along with a control. From the results, it was observed that the plant height, plant spread and canopy volume was found to be markedly influence by various treatments that were tested. The trees which received the application of RDF plus vermicompost @ 12.5 kg tree^{-1} plus EM had recorded the tallest plant height (7.29 m), widest plant spread (7.20 m in North –South direction and 7.19 m in East-West direction) and the maximum canopy volume of 96.49 m^3.

Key words : Sapota, FYM, vermicompost, RDF, EM.

Introduction

Sapota [*Manilkara zapota* (L.) P. Royen] cv. Kirthabarthi is an important commercial fruit crop of the world. Due to the increasing demand for the fresh fruits, the area under sapota has increased in recent years and efforts are being made to increase the yield by adopting improved cultural practices. In this context, proper nutrient management is an important factor to be considered for sustainable productivity and it is necessary to maintain satisfactory soil fertility for the growth and yield of crop plants. Integrated nutrient management favours the maximum use of organic material and discourages the use of synthetically produced agro-inputs. Integrated nutrient management is the best practice for maintenance of soil fertility and of plant nutrient supply at an optimum level for sustaining the desired productivity through optimization of the benefits from all possible sources of organic, inorganic and biological components in an integrated manner. Different organic and inorganic inputs *viz.,* vermicompost, Farm yard manure, Effective microorganisms, and recommended dose of fertilizers are reported to be very effective to improve the growth, yield and quality characters of many crops. The present day emphasis is on the sustaining agriculture which recommends less of chemical fertilizers and pesticides and more of biological inputs including microbial inoculants. Hence, use of beneficial micro-organisms which are cheaper and pollution free for increasing crop productivity has great potential in current day agriculture. Organic manures are the cheap source of nutrients, which are available in enormous quality as biological waste. Application of organic manures plays a major role in improving and maintaining the fertility status of soil. Production of sapota mainly depends on the nutrient status of the soil as this crop is maintained in the field for many years. The fertility status of soil ensures the continuous good yield in this crop. Hence, the present investigation entitled "effect of integrated nutrient management on growth characters in sapota was carried out with application of organic manures, microbial inoculants and recommended dose of fertilizers.

Materials and Methods

The present study was conducted in the orchard, Department of Horticulture, Faculty of Agriculture, Annamalai University during the year 2016-2017. The experiment was conducted with twenty -year-old sapota trees of cv. Kirthabarthi which were planted in a spacing of 8 m × 8 m. The principle of Randomized Block Design was followed with eight treatments replicated thrice. The treatments are T_1-Control, T_2-FYM alone @ 50 kg

Author for correspondence :

tree^{-1}, T_3-Vermicompost alone @ 12.5 kg tree^{-1}, T_4 - RDF alone (1000:1000:1500 g NPK tree^{-1}), T_5-FYM+ RDF, T_6-Vermicompost + RDF, T_7 - FYM+ RDF+ EM and T_8-Vermicompost + RDF+ EM. The recommended dose of fertilizers for sapota in Tamilnadu is 1000:1000:1500 g NPK tree^{-1} was prepared and applied in two split doses in July and February as a basal dose. The activated EM solution @ 1:250 dilution was mixed with the FYM and vermicompost separately and kept for three days. Then the FYM and vermicompost with and without EM inoculation were applied as basal to the trees according to the treatment schedule. Various observations on growth characters *viz.*, plant height, plant spread in East-West and North- South directions and canopy volume were recorded. Canopy of sapota plants was recorded in cubic meters. It was calculated by using the values of North - South and East - West plant spread and following formula suggested by (Garhwal 2015).

$$\text{Canopy volume of plant } (m^3) = \frac{2}{3} \Pi r^3$$

$$\text{Where, } \Pi = \frac{22}{7}$$

$$r = \frac{\text{Plant spread in meters } (N - S) + (E - W)}{4}$$

Standard plant protection measures were done as and when necessary. Uniform cultural practices were adopted for all the trees. The data recorded during the investigation were statistically analyzed following the standard procedures using AGRISTAT software in a personal computer.

Results and Discussion

Growth is a multi-dimensional way of many parameters. It is a phenotypic expression with respect to nutrient status. The results of the present investigation revealed that there were significant differences on the growth parameters *viz.,* plant height and plant spread.

The plant height, plant spread and canopy volume was found to be markedly influence by various treatments that were tested. The plant height was the tallest (7.29 m) in the treatment which received the application of RDF plus vermicompost @ 12.5 kg tree^{-1} plus EM. The results of the present study are in agreement with findings of Leopold (1974) who stated that organic manures improve the soil physical conditions and promote microbial and soil organic matter which in turn produce organic acids which inhibits enzymes, particularly IAA oxidase, resulting in enhancing the effect of auxin - IAA which has direct effect on plant growth.

The trees which received the application of RDF plus vermicompost @ 12.5 kg tree^{-1} plus EM had recorded the widest plant spread (7.20 m in North –South direction and 7.19 m in East-West direction) and the maximum canopy volume of 96.49 m^3. The increase in growth parameters due to application of vermicompost may be due to the presence of growth substances (Gavirilov, 1962), nitrogen fixers (Loquet *et al*., 1977) and other essential nutrients (Bano *et al*., 1987). Incorporation of vermicompost promotes the lush growth of plants which may be due to the presence of plant growth promoters like auxins and cytokinins, which are responsible for the cell division and cell elongation. Furthermore, Chaudhary *et al*., (2004) reported that vermicompost contains biologically active substances such as plant growth regulators which enhances sufficient quantity of nutrient flow in the plant system, thereby, stimulating the axillary buds and leading to increase in plant height.

The increase in the growth characters was attributed to the ability of EM to decompose organic materials in the soil, thereby releasing additional available nutrients

Table 1 : Effect of integrated nutrient management on growth characters in sapota (*Manilkara zapota* (L.) P.Royen) cv. Kirthabarthi.

Treatments	Plant height (m)	Plant spread (m)		Canopy volume (m^3)
		N-S	E-W	
T_1- Control	6.05	5.85	5.80	51.20
T_2- FYM alone @ 50 kg tree^{-1}	6.41	6.10	6.05	58.08
T_3- Vermicompost alone @ 12.5 kg tree^{-1}	6.46	6.14	6.08	59.09
T_4- RDF alone (1000:1000:1500 g NPK tree^{-1})	6.56	6.29	6.22	63.40
T_5- FYM+ RDF	6.73	6.44	6.41	68.70
T_6- Vermicompost+ RDF	6.87	6.60	6.57	73.97
T_7- FYM+ RDF+ EM	6.91	6.64	6.62	75.50
T_8- Vermicompost + RDF+ EM	7.29	7.20	7.19	96.49
SEd	0.04	0.07	0.06	-
CD (p=0.05)	0.08	0.14	0.12	-

for plant growth. It may also due to the ability of EM to change the conditions of the rhizosphere to a zymogenic state and thereby providing a more favourable environment for plant growth (Higa, 1988). The results of the present study confirmed the earlier findings of Sangakkara (1991) who reported increased leaf area in sweet potato.

Lee and Sung (1999) reported improved plant height in tomato due to application of EM along with organic manures. Similar trend in increase of plant growth characteristics under INM using vermicompost were recorded by Muhammad *et al*., (2000) and Shukla *et al.,* (2009) in guava and Sharma and Bhatnagar (2014) in custard apple.

The next best treatment was the one which received the application of RDF plus FYM @ 50 kg tree^{-1} plus EM which recorded a plant height of 6.91 m, plant spread of 6.64 m in North –South direction and 6.62 m in East-West direction and canopy volume of 75.50 m^3. This result is similar to the findings of Hayworth *et al*. (1996) who stated that FYM, being a bulky organic material releases the soil compaction and improves the aeration in addition to the supply of essential plant nutrients and organic matter, thereby increasing the soil biological activities. FYM provides room for better microbial establishment along with accumulation of excess humus content and also the phytohormones extracted from FYM helps the plant to grow more luxuriantly as suggested by Gupta *et al*., (1983).

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