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Original Research Article

Studies on effect of application of bio-fertilizers with chemical fertilizers on growth, yield and quality of sapota (Manilkara achras (Mill.) Forseberg). cv. Kalipatti

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A B S T R A C T

The experimentation entitled, "Studies on effect of application of bio-fertilizers with chemical fertilizers on growth, yield and quality of sapota *(Manilkara achras* (Mill.) Forseberg). cv. Kalipatti" was carried out on field of Horticulture Research Scheme (Pomology), V N. M. K. V, Parbhani, Dist-Parbhani during mrig bahar in 2014-15 with an objective to find out influence of Azospirillum and PSB alone on growth, yield and quality of sapota fruits. The experiment was laid out in factorial randomized block design with two factors i.e. bio-fertilizers and chemical fertilizers. These factors consist of four and three levels respectively, twelve treatment combination and three replications. Among the different treatment combination the treatment T10- N_1B_3 (100 % NPK + Azospirillum + PSB) application of Azospirillum and PSB with full dose of chemical fertilizers reported the highest plant growth in respect to days required for sprouting of new shoots(24.30), length of shoot (12.64 cm), Girth of shoots (2.06 cm), No. of leaves per shoots(9.67), leaf area (19.48 cm_2), number of flowers per shoot (9.67), fruit set (44.11%), number of fruits per shoot (4.24), number of fruits per tree (635.67) and yield per tree (53.33 kg) was greatly influenced by combined application of Azospirillum and PSB with 100 percent dose of chemical fertilizer and also reduced the maturity days for harvesting of fruits. In the present experiment the treatment N_1B_3 with application of full dose of chemical fertilizer (100% NPK) combined with Azospirillum (200g) and PSB (200g) performs well in respect of growth and yield of Sapota which followed by treatment with (75% NPK) chemical fertilizers combined with Azospirillum(200g) and PSB (200g) with maximum economical returns.

Keywords

Biofertilizers, Inorganic fertilizers, Growth and yield of sapota

Introduction

Sapota (*Manilkara achras* (Mill.) Forseberg) is one of the important tropical fruit crop belonging to family sapotaceae. It is not known when sapota first introduced in India, but sapota cultivation was taken up for the first time in Maharashtra in 1898 at village Gholwad in district Thane (Chaddha, 1993).

Sapota is a best source of digestible sugar which ranges from 12 to 18 percent. Composition of ripe sapota per 100 g of edible portion is moisture 73.7 g, Carbohydrates 21.4 g, protein 0.7 g, Fat 1.1 g, Calcium 28.0 mg, Phosphorus 27.0 mg (Shanmungavelu and Shrinivasan, 1973).

The biofertilizers are the live or latent cells of efficient strain of Nitrogen fixing, Phosphate solubilizing or cellulitic micro-organism used in soil or seed treatment with the objective of augment the availability and access nutrients to the plant. The some biofertilizer micro- organisms are either free living or symbiotic with plant and some micro-organisms are nitrogen fixing i.e *Rhizobium, Azatobactor, Azospirillium* and other like Phosphate solubilizing and Phosphate mobilizing *i.e.,* PSB and VAM (Phosphate solubilizing Bacteria and Vesicular Arbascular Micorrhizae) Azospirillum and PSB are the main bio-fertilizers for horticultural crops. Bio-fertilizers help in saving 50-70% of the requirement of inorganic nitrogen per hectare (Jitendra Singh 2011).

Materials and Methods

Experiment was conducted on twelve years old orchard of sapota cultivar "Kalipatti" located at Horticulture Research Scheme, (Pomology) Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani district. Experiment laid out in Factorial Randomized Block design with 12 treatments and 3 replication on 12 years sapota cv. Kalipatti.

Results and Discussion

The days required for sprouting of new shoots were minimum in the treatment T10 - N_1B_3 (100 % NPK + Azospirillum +PSB) i.e. 24.30 days followed by treatment T11 (N_2B_3) i.e. 25.66 days. The treatment T10 (N_1B_3) recorded maximum length of shoot (12.64 cm). The present findings are in agreement with the Fawazi, *et. al.*(2010) in pear and Osman and Abd El-Rhman, (2010) in fig. The maximum girth of shoot in treatment T10 (N_1B_3) 2.06 cm, followed by T11 (N_2B_3) 1.88 cm. The similar result had been reported by Manjunath *et al.,* (2001) in papaya, Samanata *et al.,* (2003) in plam, Kumar *et al.,* (2014) in aonla , Kavino *et al.,* (2010) in banana, Bankar *et al.,* (2009) in kagazi lime who reported that the stem girth after day shown significant results by application of azospirillum. The treatment T10 (N_1B_3) recorded maximum number of leaves per shoot (9.67). The results obtained are in agreement with the findings reported by Verma and Rao (2013) and Hazarika *et al.,* (2007). The treatment T10 (N_1B_3) recorded the maximum leaf area i.e. 19.48 cm^2, followed by T4 (N_1B_1) 19.45 cm. The present findings are in agreement with Verma and Rao (2013). Early flower initiation was found in treatment T10 (N_1B_3) i.e. 80.51 days, followed by T4 (N_1B_1) 81.08 days. These results are in conformity with the findings of Sharma *et al*., (2009). Godage *et al.,* (2013) in guava cv. Allahabad safeda, Verma and Rao, (2013) (Table 1 and 2).

Application of treatment T10 (N_1B_3) recorded more number of flowers per shoot (9.67). Sharma *et al*., (2009), Godage *et al.,* (2013) in guava cv. Allahabad safeda, Verma and Rao, (2013) in strawberry observed same result. The treatment T10 (N_1B_3) increased fruit set (44.11%), while in treatment T3 (N_3B_0) recorded minimum fruit set (36.84%). The similar result also found by Singh and Singh (2009) in strawberry, Gogai *et al.,* (2004) in banana. The treatment T10 (N_1B_3) recorded maximum number of fruits per shoot 4.24, followed by T11 (N_2B_3) 4.20. The treatment T10 (N_1B_3) recorded

maximum number of fruits per tree 635.67 followed by T11 (N_2B_3) 608.74. The fruit came to harvest earlier with the application of T10 (N_1B_3) 248.00 days and T7 (N_1B_2) 247.49 days. Singh and Singh (2009) in strawberry, Godage *et al.*, (2013) in guava and Verma and Rao (2013) in strawberry observed similar results for hastening fruit maturity.

Table.1 Treatment details

Treatment details (I)			
Factor	**Sr. No.**	**Symbol**	**Treatment**
Factor:1	1	B0	Control
Bio-fertilizer	2	B1	Soil application of Azospirillum 200 g / plant
	3	B2	Soil application of PSB (Phosphate Solublizing bacteria) 200 g / plant
	4	B3	Soil application of Azospirillum and PSB. 200g / plant each
Factor:2 Inorganic fertilizer	1	N1	100% of NPK (Whole RDF i.e. 1000:500:500 g per Plant)
	2	N2	75% of NPK (RDF)
	3	N3	50% of NPK (RDF)

Table.2 Effect of bio-fertilizers and inorganic fertilizers on growth, yield and quality of Sapota

Sr.No.	Treatment No.	Treatment Combination	Treatment Details
1	T_1	N_1 B_0	(100%RDF) 1000:500:500 g NPK / Plant.
2	T_2	N_2 B_0	(75% RDF) 750:375:375 g NPK / plant.
3	T_3	N_3 B_0	(50% RDF) 500:250:250 g NPK / plant.
4	T_4	N_1 B_1	(100% RDF) + Azospirillum 1000:500:500 g NPK + 200 g Azospirillum /Plant.
5	T_5	N_2 B_1	(75% RDF)+ Azospirillum 750:375:375 g NPK + 200 g Azospirillum / Plant.
6	T_6	N_3 B_1	(50% RDF)+Azospirillum 500:250:250 g NPK +200 g Azospirillum / Plant
7	T_7	N_1 B_2	(100%RDF)+PSB 1000:500:500 g NPK + 200 g PSB / plant.
8	T_8	N_2 B_2	(75% RDF)+PSB 750:375:375 g NPK + 200 g PSB / Plant.
9	T_9	N_3 B_2	(50% RDF)+PSB 500:250:250 g NPK +200 g PSB / Plant.
10	T_{10}	N_1 B_3	(100% RDF) + Azospirillum + PSB 1000: 500: 500 g NPK + 200g Azospirillum+200g PSB /Plant
11	T_{11}	N_2 B_3	(75% RDF)+ Azospirillum + PSB 750:375:375 + 200g NPK Azospirillum+200g PSB / Plant.
12	T_{12}	N_3 B_3	(50% RDF)+ Azospirillum + PSB 500:250:250+ 200g NPK Azospirillum+200g PSB / Plant.

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