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Effect of different organic sources and biofertilizers on guava (*Psidium guajava* L.) *cv.* Allahabad safeda

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Abstract
An investigation was conducted at Regional Fruit Research Station, Vengurla of Maharashtra, India to standardize the organic nutrient with biofertilizers management protocol for guava. In this experiment, various organic sources along with various biofertilizers combinations were tested on seven year old guava cultivar Allahabad Safeda to study the effect on fruiting and yield. The result obtained showed higher flowering (92.33%) and TSS (10.37^0B) by application of Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree. Maximum average weight of fruits (400.00 g), yield of fruits (29.60 kg/tree and 11.84 t/ha) and minimum acidity (0.19%) was recorded with Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree + Vermi wash foliar spray (dilution with water @ 1:1). Maximum number of fruits produced per plant (85.00 fruit/ plant) was found from plant fertilized with FYM (30 kg/plant). From the present study, it can be concluded that addition of biofertilizers along with organic manures was more effective than use of organic manure alone in enhancing fruit growth and qualitative parameters in guava.

Keywords: Nutrients, guava, yield, quality

Introduction
Guava (*Psidium guajava* L.), the apple of tropics is one of the most common fruit crop in India. Since guava bears almost throughout the year, a proper dose of nutrient application is considered essential for maintaining the productivity and good health of the tree. Emphasis should be as much on improving fertilizer use efficiency as also on its productivity, profitability, sustainability and eco-friendliness. Therefore, without regular application of organic sources and biofertilizers is not possible to maintain and sustain productivity.

Decline in soil health due to excessive dependence on chemical inputs left us with other option of utilizing biological inputs like biofertilizers have been sought to be one of the answers to restore the soil health apart from solving nutrition problem of plants. Biofertilizers are basically carrier-based microorganisms used for maintaining soil health. They play an important role in plant nutrition through dinitrogen fixation (nitrogen fixers) and transformation of different nutrients in available forms (eg phosphorus solubilizers) besides helping plants to survive under water-stressed situation. Use of organic manures has also been recommended in Mango (Munniswami, 1970) [6]. A poor supply of major nutrients seems to be the main cause of tree decline, low yields and poor fruit quality in guava (Kadam and Patil 1993, Shankar *et al.* 2002) [4, 13]. It was therefore considered worthwhile· to study the effect of biofertilizer on fruit characteristics of guava.

Materials and Methods
The field experiment was laid out in randomized block design with three replications on eight year's old plants of guava cv. Allahabad Safeda during 2017-2018 at Regional Fruit Research station, Vengurla, Dr. B.S.K.K.V., Dapoli 416 516, Maharashtra. In order to assess the effect of various treatments, all the trees were managed with uniform cultural practices as per the standard recommendations with respect to irrigation and plant protection measures. The treatment details are as follows.

The observations on number of fruits per plant, fruit weight, Yield per plant were recorded at harvest stage. Quality parameters like total soluble solid (TSS) and titrable acidity content of ripen fruits were analyzed following the methods described by A.O.A.C. (1984). Experimental data were statistically analyzed following the analysis of variance method (Panse and Sukhatme, 1984) [7].

Treatment details

Tr. No.	Treatment details
T_1	FYM (30 kg/plant)
T_2	FYM (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree
T_3	Vermicompost (30 kg/plant)
T_4	Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree
T_5	Vermicompost (30 kg/plant) + *Azotobactor* (250 g/tree) + PSB @ 250 g/tree
T_6	Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree + Vermi wash foliar spray (dilution with water @ 1:1)
T_7	Vermicompost (30 kg/plant) + *Azotobactor* (250 g/tree) + PSB @ 250 g/tree Vermi wash foliar spray (dilution with water @ 1:1)

Result and Discussion

Flowering (%)

The presented data in Table 1, recorded that treatment T_4 showed superiority over rest of treatments. Maximum flowering (92.33%) with Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree. It may due to the *Azospirillum* influenced the increase in length of main root and the number of secondary roots, which enhanced the uptake of mineral elements. The results are in line with Singh *et al*. (2004) [8] where they observed that *Azospirillum* influenced the increase of length of main root and the number of secondary roots, which enhanced uptake of the mineral element uptake to increase the flowering per cent.

Average fruit weight (g)

The treatment T_1 recorded significantly superiority over the rest of treatment. The results revealed that the average fruit weight per plant was increased significantly over untreated control (Table 1). However, among different combinations organic and biofertilizers, Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree + Vermi wash foliar spray (dilution with water @ 1:1) produced maximum average fruit weight (400.00 g/fruit). The increase in average fruit weight may be due to the integration of organic sources of nutrients occurred due to accelerated mobility of photosynthates from source to sink as influenced by the growth hormones, released or synthesized due to organic sources of nutrients. Similar results were also observed by Yadav *et al*. (2011) [5].

Application of organic manures with different biofertilizers significantly added as well as native phosphorus making more available to fruits result to increase the fruit weight. These results are in agreement with Patidar and Mali (2004) [8] and Dey *et al*. (2005) [2].

Number of fruits per tree

The data on number of fruits are presented in Table 1. Maximum number of fruits (85.00/ tree) was recorded in the treatment T_1 with application of 30 kg FYM per plant. FYM favoured mineralization of organic sources of nitrogen in the soil and also due to increased microbial activities which could have stimulated the nitrification process. A build up of nitrogen and organic carbon in soil with different organic sources and levels combined with bio-fertilizers has also been reported by Mishra *et al.* (2011) [5]. Similar types of results were also obtained by Pereira and Mitra (1999) [9]. Higher fruit number was mainly due to better vegetative growth and improvement in the physiological condition which caused higher percentage of flowering, fruit set and retention.

Yield (kg/tree and t/ha)

The data on fruit yield presented in Table 1. Maximum fruit yield (29.60 kg/tree, 11.84 t/ha) was recorded with application of Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree + Vermi wash foliar spray (dilution with water @ 1:1), which improved the availability of nutrient in presence of compost to the plants and resulted that yield increase and improvement in fruit quality of guava. Similar results were also reported by Ram and Rajput (1998) and Ram and Pathak (2006) [11] in guava cv. Allahabad Safeda. Similar types of results were also obtained by Pereira and Mitra (1999) [9]. Higher fruit yield was mainly due to better vegetative growth and improvement in the physiological condition which caused higher percentage of flowering, fruit set and retention. Application of nutrients irrespective of their sources and doses, markedly enhanced yield and quality of guava fruits over untreated control. In the present investigation similar types of results were also obtained by Prasad (1989) [10], Vilasurda and Baluyat (1990) [15] and Pereira and Mitra (1999) [9].

Table 1: Effect of organic package of practice treatments on yield parameters of guava.

Sr. No.	Treatments	Flowering (%)	Average fruit weight (g)	No. of fruits (fruits/tree)	Yield (kg/tree)	Yield (t/ha)	TSS (^{O}B)	Acidity (%)
1	T_1	88.33	167.06	85.00	14.20	5.68	9.27	0.20
2	T_2	80.00	259.68	62.00	16.10	6.44	10.23	0.21
3	T_3	80.00	210.17	59.00	12.40	4.96	10.23	0.20
4	T_4	92.33	361.11	72.00	26.00	10.40	10.37	0.24
5	T_5	84.00	222.95	61.00	13.60	5.44	9.17	0.26
6	T_6	71.67	400.00	74.00	29.60	11.84	10.20	0.19
7	T_7	81.00	264.61	65.00	17.20	6.88	9.13	0.27
S.Em±		1.82	13.16	3.20	1.02	0.35	0.06	0.01
CD at 5%		5.61	40.55	9.87	3.17	1.08	0.18	0.05

Total soluble solid (TSS) and acidity (%)

Plant treated with Vermicompost (30 kg/plant) + *Azospirillum culture* (250 g/tree) + PSB @ 250 g/tree recorded maximum TSS (10.37 ^{0}B) and acidity (0.19) in Table 1. It was observed that nitrogen stimulates the functioning of enzymes in the physiological processes, which have improved the total soluble solids content of the fruits. Similar results are in agreement with Gautam *et al.* (2012) [3].

These studies thus concluded that organic source along with biofertilizer when applied in integrated manner can be replaced with chemical fertilizers for increasing the yield, quality and nutrient status of guava.

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