International Journal of Horticulture and Floriculture Vol. 1 (3), pp. 021-022, December, 2013. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Short Communication

Impact of bio-inoculants on seed germination and plant growth of guava (*Psidium guajava*)

D. V. Pathak*, Surender Singh and R. S. Saini

Chaudhary Charan Singh Harayana Agricultura University (CCSHAU) Regional Research Station, Bawal (Haryana), India.

Accepted 21 October, 2013

An experiment was conducted to study the impact of bio-inoculants on seed germination and plant growth of guava at CCSHAU Regional Research Station, Bawal, during the period 2007 to 2008. The bio-inoculants tested were *Azotobacter chroococcum*, phosphate solubulising bacteria (PSB), plant growth promoting bacteria (PGPR) and mycorrhiza. Their impact on seed germination, plant height and other plant growth parameters was studied in presence of farmyard manure (FYM) as well as vermicompost. During the 2007 period, maximum percent seed germination (34.2) was observed in the treatment having FYM + PGPR or FYM + *A. chroococcum* at 40 days (DAS); followed by PGPR (29.2) and vesicular arbuscular mycorrhizae (VAM) (25.8) treatments. While during the 2008 period, highest seed germination (51.1%) was observed in the treatment having FYM + PGPR or FYM + *A. chroococcum* at 40 DAS; followed by the treatments having FYM + PGPR + PSB + *A. chroococcum* or vermicompost + PSB + *A. chroococcum* (48.9%). Number of leaves per plant observed at 150 DAS were maximum in the treatment having FYM + VAM (18.8). Plant height at 150 DAS was maximum in FYM treatment having all the three bio-inoculants (31.5 cm). However, these values were quite comparable to each other in FYM as well as in vermicompost filled plastic bags.

Key words: Bio-inoculants, seed germination, guava (*Psidium guajava*), phosphate solubulising bacteria (PSB), plant growth promoting bacteria (PGPR), vesicular arbuscular mycorrhizae (VAM), *Azotobacter chroococcum.*

INTRODUCTION

Due to rising cost of chemical fertilizers and their adverse effects on soil health, an economically attractive and alternate potential source of plant nutrients should be exploited. The excessive use of these chemical fertilizers adversely affects human health resulting in dreadful diseases like cancer, hypertension and other abnormalities. Further, to sustain the productivity, the bio-inoculants can supplement them to certain extent in various food crops. But it is not the common practice in various horticultural crops. The seed coat of most of the fruit crops is very hard. To break the seed dormancy, either some chemical treatment or long incubation period is required. These bio-inoculants can be helpful in breaking the seed dormancy by producing various plant growth substances. Hence, the present investigations were undertaken to study the response of different bio-inoculants in combination with either farmyard manure (FYM) or vermicompost on seed germination and plant growth in guava (*Psidium guajava*).

MATERIALS AND METHODS

The experiment was conducted at the Experimental Farm, CCSHAU Regional Research Station, Bawal, during the years 2007/2008 and 2008/2009. The experiment was laid out in randomized block design with six replications of each treatment

*Corresponding author. E-mail: pathak_dv@rediffmail.com.

Table 1. Effect of bio-inoculants on seed germination and plant height in guava.

Treatment	Seed germination (%)		Plant height (cm)	
	2007	2008	2007	2008
FYM alone	20.8	37.7	18.8	27.5
FYM + PGPR	25.8	51.1	29.7	28.7
FYM + VAM	29.2	45.5	28.0	29.2
FYM + PSB	20.0	44.4	18.3	27.9
FYM + *Azoto*.	24.0	51.1	22.3	28.2
FYM + PSB+ *Azoto*. + PGPR	34.2	48.9	19.2	31.5
VC alone	21.0	23.3	15.5	20.3
VC + PGPR	22.5	46.6	27.7	25.0
VC + VAM	21.7	37.5	26.3	26.7
VC + PSB	26.3	37.7	16.3	23.3
VC + *Azoto*.	25.2	48.9	18.0	27.4
VC + PSB+ *Azoto*. + PGPR	26.7	28.9	25.2	28.4
Mean	24.8	41.8	22.1	27.0
CD at 5%	2.04	3.41	1.87	2.17

both with vermicompost as well as farm yard manure. For filling up of polythene bags, the loamy sand soil and vermicompost/ FYM were mixed together in 1:1 ratio. The different treatment combinations were T_0: uninoculated treatment; T_1: *Azotobacter chroococcum*; T_2: phosphate solubilizing bacteria (PSB); T_3: vesicular arbuscular mycorrhizae (VAM); T_4: plant growth promoting bacteria (PGPR) (*Pseudomonas maltophilia* PM4); T_5: PGPR+PSB+ *A. chroococcum*. In total, there were twelve treatments; six each of vermicompost + soil and FYM + soil. The seeds of guava were surface sterilized with 0.2% mercuric chloride solution for five minutes and then washed 2 to 3 times with sterilized distilled water, coated with charcoal based inoculants and then, twenty seeds per replication for each treatment were impregnated into the polythene bags. The bio-inoculants used in the study were collected from Department of Microbiology, CCSHAU, Hisar, and grown in their respective media under aseptic conditions.

Glomus fasciculatum, species of VAM fungi was used as VAM inoculant. The inoculum consisted of soil, spores, hyphae from chopped root fragments of pearl millet. Ten gram of the inoculum was mixed with the top soil in each polythene bag before sowing of guava seeds. The observations were recorded in terms of percent seed germination at different time intervals up to 40 days of sowing. Then, plant saplings were thinned down to one healthy sapling per bag and observed for plant height, number of leaves per plant and dry shoot weight at 150 days of sowing.

RESULTS AND DISCUSSION

During the period 2007/2008, maximum percent germination (34.2) was observed in the treatment having FYM + PSB + *Azotobacter* + PGPR; followed by FYM + VAM (29.2). Percent seed germination was slightly better in the treatments having FYM over their respective vermicompost treatments; however, the difference between them was non-significant. During 2008/2009, the maximum germination (51.1) was recorded in FYM + PGPR and FYM + *Azotobacter*; closely followed by FYM + PSB + *Azotobacter* + PGPR and vermicompost+ *Azotobacter* (48.9%) (Table 1). Plant height was also stimulated by different bio-inoculants in combination with farm yard manure as well as vermicompost during the period of investigation. However, PSB alone did not contribute much on different plant growth parameters.

VAM inoculation with FYM as well as with vermicompost positively affected number of leaves per plant during both years (Table 2). The similar trends were followed when dry weight of shoot was recorded after 150 days (DAS). In general, VAM culture and coinoculation of PSB, PGPR and *Azotobacter* stimulated plant growth parameters more positively as compared to single inoculation or untreated control. The response with FYM was slightly better over their respective vermicompost treatments.

Various reports in horticultural crops indicated that bio-inoculants either individually or in combination had synergistic effect on plant growth. The dual inoculation of *Azotobacter* and *G. fasciculatum* had more positive response in peach seedlings as compared to single inoculation or control (Godara et al., 1998). Sharma et al. (2002) reported that VAM fungi enhanced nutrient uptake and level of plant growth substances in apple seedlings. Subbiah (1990) also reported that when adequate amount of farmyard manure added to the soil with biofertilizers, it improved biofertilizer efficiency and ultimately nutrient status of the soil. Similar increase in growth of fruit plants with biofertilizers has also been reported by Sharma and Bhutani (1998). Increase in the growth of pecan seedlings could be attributed to the combined effect of biofertilizers on nutrient uptake and plant growth (Joolka et al., 2004). The possible reason for better plant growth and germination can be attributed to maximum and early bacterization near root zone which induce germination by inducing root inducing substances (Wani et al., 1988). Similar reports have been made by

Table 2. Effect of bio-inoculants on other plant growth parameters in guava.

Treatment	Number of leaves/plant		Dry shoot weight (g)	
	2007	2008	2007	2008
FYM alone	11.5	15.42	0.38	0.56
FYM + PGPR	21.8	17.17	1.17	0.77
FYM + VAM	22.5	18.80	0.95	0.83
FYM + PSB	15.5	15.75	0.53	0.79
FYM + *Azoto*.	17.2	18.20	0.48	0.67
FYM + PSB + *Azoto*. + PGPR	14.8	17.75	0.95	0.92
VC alone	13.3	14.24	0.42	0.48
VC + PGPR	19.0	17.33	1.25	0.62
VC + VAM	20.5	15.67	1.08	0.68
VC + PSB	15.0	18.20	0.59	0.72
VC + *Azoto*.	14.0	16.50	0.57	0.84
VC + PSB + *Azoto*. + PGPR	14.5	17.83	0.82	0.82
Mean	16.6	16.9	0.76	0.72
CD at 5%	1.49	1.35	0.12	0.17

Nath and Korla (2000) in ginger.

REFERENCES

Godara RK, Awasthi RP, Kaith NS (1998). Interaction effect of VA-mycorrhizae and Azotobacter inoculation on growth and macronutrients of peach seedlings. Hary. J. Hort. Sci. 27:235-240.

Joolka NK, Singh RR, Sharma MM (2004). Influence of biofertilizers, GA3 and their combinations on groth of pecan seedlings. Ind. J. Hort. 61:226-228.

Nath B, Korla BN (2000). Studies on effect of biofertilizers in ginger.Ind. J. Hort. 57:168-171.

Sharma SD, Bhutani VP (1998). Response of apple seedlings to VAM, Azotobacter and inorganic fertilizers. Hort. J. 11:1-8.

Sharma SD, Bhutani VP, Awasthi RP (2002). Effect of vesicular-arbiscular mycorrhizae and phosphorus on leaf and soil mineral nutrient status of apple seedlings. Ind. J. Hort. 59:140-144.

Subbiah K (1990). Nitrogen and Azospirillum interaction on fruit yield and nitrogen use efficiency in tomato. South Ind. Hort. 38:342-344.

Wani SP, Chandrapalaiah S, Zambre MA, Lee KK (1988). Association between N2 fixing bacteria and pearl millet plants-Response, mechanisms and resistance. Plant Soil 110:284-302.