Effect of inorganic and organic fertilizers on the yield of banana cv Grand Naine

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ABSTRACT

The field study on effect of inorganic and organic fertilizers on yield of banana cv Graind Naine was conducted at Ganeshkhind, Pune, Maharashtra to find out the suitable and sustainable integrated fertilizer dose for banana. The investigations included eleven treatment combinations replicated thrice. The treatment 75 per cent N + recommended dose of P and K (RPK) + *Acetobactor* 25 g/plant + phosphate solublising bacteria (PSB) 25 g/plant recorded significantly highest gross monitory returns of Rs 7,33,553. The highest net monitory income of Rs 5,31,126) and B-C ratio (3.62) were also obtained under the same treatment. There was a saving of 25 per cent nitrogen through chemical fertilizer. The highest sustainability value index (SVI) was recorded under the same treatment (0.93) followed by the treatment recommended dose of fertilizer (RDF) + *Acetobactor* 25 g/plant + PSB 25 g/plant (0.89); hence these treatments were recommended for banana production in the region.

Keywords: Banana; Grand Naine; sustainability value index; economics

INTRODUCTION

India is the largest producer of banana in the world with 29.7 million tonnes from an area of 0.88 million hectares with a productivity of 37 MT/ha (Anon 2018).

Banana is important fruit crop of Maharashtra state after mango and pomegranate. Maharashtra is now second largest state after Tamil Nadu in respect of area under banana. Now almost all the districts of Maharashtra except Nasik and Nagpur are growing banana crop. Northern districts of Maharashtra viz Jalgaon, Dhule and Nandurbar have been growing banana since 1890. The district likes Pune, Solapur, Ahmednagar and Kolhapur are the new districts which have started growing banana for the last two decades.

Banana is a heavy feeder of nutrients for optimal growth, development and yield. Long term and indiscriminate application of inorganic fertilizers without sufficient integration of organic manures results in depletion of soil organic matter. This ultimately checks the microbial biomass of the soil profile, looses its biological dynamics and often results in extreme situations for the soil, crop and climate involved. Nowadays a new concept has developed for utilization of available resources viz organic, inorganic and microbial cultures with an integrated approach for sustainable yield. This concept of integrated nutrient management helps to maintain pollution level of soil, water and surroundings and also maintains soil fertility at an optimum level.

In the present study different combinations of nitrogen and potassium along with bio-fertilizers were used in order to reduce cost of nutrient inputs without affecting the fruit yield and quality.

MATERIAL and METHODS

The present experiment was carried out at Ganeshkhind, Pune, Maharashtra during 2012-13, 2013-14 and 2014-15.

Eleven treatments on nutrient combination were applied to Grand Naine banana viz T_1 [75% N + recommended dose of P and K (RPK) + *Acetobactor* 25 g/plant + phosphate solubilizing bacteria (PSB) 25

g/plant], T_2 [Recommended dose of fertilizer (RDF) + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_3 [Gross recommended dose of fertilizer (GRDF) + vesicular-arbuscular mycorrhiza (VAM) 25 g/plant], T_4 (GRDF), T_5 [75% N + 75% P + recommended dose of K (RK) + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_6 [Recommended dose of N (RN) + 75% N + RK + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_7 (RDF + *Acetobactor* 25 g/plant), T_8 (75% N + RPK + *Acetobactor* 25 g/plant), T_9 (RN + 75% N + RK + *Acetobactor* 25 g/ plant), T_{10} (RN + 75% N + RK + PSB 25 g/plant), T_{11} (75% N + 75% P + RK + *Acetobactor* 25 g/plant)

The treatments were replicated thrice in randomized block design. The chemical fertilizers, bio-fertilizers and FYM were applied in split as per recommendation at 30, 75, 120, 210, 255 and 300 days after planting. The RDF used in present experiment was 200:40:200 g NPK/plant.

The data on growth, duration and yield attributes were recorded and subjected to statistical analysis as suggested by Panse and Sukhatme (1985). Cost of production, gross monetary and net monetary income, B-C ratio and sustainability value index (SVI)

were computed. SVI was calculated by using the formula given by (Singh et al 1990):

$$SVI = \frac{V - SD}{V_{max}}$$

where V= Estimated average net monetary income from economic produce, SD= Estimated standard deviation, V_{max}= Maximum net monetary income from economic produce

RESULTS and DISCUSSION

The data pertaining to the yield and economics of banana are depicted in Table 1. Among the treatments the treatment T_1 (75% N + RPK + *Acetobactor* 25 g/pl + PSB 25 g/plant) recorded significantly highest gross monitory returns of Rs 7,33,553. The treatment T_2 (RDF + *Acetobactor* 25 g/plant + PSB 25 g/plant) and T_7 (RDF + *Acetobactor* 25 g/plant) recorded gross monitory returns of Rs 7,11,907 and 6,81,020 respectively and were at par with each other. The highest net monitory income was obtained under T_1 which was statistically at par with treatment T_2. The net monitory income from T_1 and T_2 was Rs 5,31,126 and 5,08,846 respectively. The

Table 1. Economics of banana production as influenced application by different *Gluconacetobactor diazotrophicus* (pooled mean for 2012-13, 2013-14 and 2014-15)

Treatment	Average yield (MT/ha)	Cost of production (Rs/ha)	Gross monetary income (Rs/ha)	Net monetary income (Rs/ha)	B-C ratio	SVI
T_1	122.26	2,02,427	7,33,553	5,31,126	3.62	0.93
T_2	118.65	2,03,061	7,11,907	5,08,846	3.51	0.89
T_3	111.71	2,74,165	6,70,267	3,96,102	2.44	0.67
T_4	110.72	2,03,061	6,64,320	4,61,259	3.27	0.80
T_5	112.36	2,01,998	6,74,173	4,72,175	3.34	0.82
T_6	112.81	2,02,632	6,76,847	4,74,215	3.34	0.82
T_7	113.50	1,98,617	6,81,020	4,82,403	3.43	0.84
T_8	110.74	1,96,345	6,64,427	4,68,082	3.38	0.81
T_9	112.36	1,98,188	6,74,147	4,75,959	3.40	0.82
T_{10}	109.73	1,98,188	6,58,400	4,60,212	3.32	0.80
T_{11}	101.62	1,97,554	6,09,740	4,12186	3.09	0.70
SE	2.71	-	16,236	16,236	-	-
$CD_{0.05}$	7.65	-	45,930	45,930	-	-

T_1 [75% N + recommended dose of P and K (RPK) + *Acetobactor* 25 g/plant + phosphate solubilizing bacteria (PSB) 25 g/plant], T_2 [Recommended dose of fertilizer (RDF) + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_3 [Gross recommended dose of fertilizer (GRDF) + vesicular-arbuscular mycorrhiza (VAM) 25 g/plant], T_4 (GRDF), T_5 [75% N + 75% P + recommended dose of K (RK) + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_6 [Recommended dose of N (RN) + 75% N + RK + *Acetobactor* 25 g/plant + PSB 25 g/plant], T_7 (RDF + *Acetobactor* 25 g/plant), T_8 (75% N + RPK + *Acetobactor* 25 g/plant), T_9 (RN + 75% N + RK + *Acetobactor* 25 g/ plant), T_{10} (RN + 75% N + RK + PSB 25 g/plant), T_{11} (75% N + 75% P + RK + *Acetobactor* 25 g/plant)
SVI: Sustainability value index, Average selling price of banana fruits= Rs 6,000/MT

highest B-C ratio (3.62) was also recorded under treatment T_1 showing the saving of 25 per cent nitrogen through chemical fertilizer.

The highest SVI was recorded under T_1 (0.93) followed by T_2 (0.89) hence these treatments are recommended for banana production. Similar findings have been reported by Pujari et al (2010), Venkatarayappa et al (1979), Badgujar and Deshmukh (2013) and Badgujar et al (2018a, 2018b) in banana.

CONCLUSION

It is concluded that the application of 75 per cent recommended dose of nitrogen along with recommended doses of P_2O_5 and K_2O through chemical fertilizers with 10 kg farm yard manure + 25 g *Acetobactor* + 25 g PSB per plant was beneficial to save 25 per cent of chemical nitrogen and to get highest sustainable returns from banana crop.

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