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# Effect of vermicompost on yield and economics of guinea grass (*Panicum maximum*) grown as an intercrop in coconut (*Cocos nucifera*) gardens

**SANSAMMA GEORGE AND G. RAGHAVAN PILLAI**

*College of Agriculture, Kerala Agricultural University, Vellayani 695 522*

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## ABSTRACT

An experiment was conducted during September 1993–August 1995 to study influence of vermicompost on growth, yield and economics of guinea grass (*Panicum maximum Jacq.)* grown as an intercrop in coconut (*Cocos nucifera* L.). Vermicompost alone and in combination with chemical fertilizers stimulated the crop growth. The use of vermicompost @ 5 tonnes/ha saved the recommended NPK through fertilizer up to 25%. The economic analysis of the data emphasized the need for reducing the reliance on purchased organic manures.

***Key words :*** Vermicompost, Guinea grass, Coconut garden, Yield, Economics

The usefulness of organic manures in increasing crop yield is well documented (Muthuswamy *et al.,* 1990). Recently, the use of vermicompost in place of farmyard manure and the potential for reducing the requirement of chemical fertilizer using vermicompost has become a subject of active research. The present investigation was taken up to study the potential of vermicompost use for production of guinea grass grown as an intercrop in coconut gardens. It was also envisaged to compare the response of the forage grass to integrated use of manures and fertilizers with the use of chemical fertilizers alone.

## MATERIALS AND METHODS

The investigation was carried out from September 1993 to August 1995 in the Instructional farm, College of Agriculture, Vellayani, Kerala. The experimental site was a partially shaded coconut garden with palms of 65–70 years age permitting about 70% of the solar radiation to filter through the canopy. The soil was sandy clay-loam with pH 5.0, low in available nitrogen (196 kg/ha), available potassium (98.8 kg/ha), organic carbon (0.448%) and medium in available phosphorus (22.8 kg/ha). The experimental design was randomized block. The experiment consisted of 10 treatments

**Table 1.** Composition of FYM and vermicompost (%)

| Manure | N | $P_2O_5$ | $K_2O$ |
|---|---|---|---|
| FYM | 0.63 | 0.38 | 0.67 |
| Vermicompost | 1.16 | 0.67 | 2.02 |

replicated thrice in microplots of 1m × 1m. The treat ments included were : $T_0$, absolute control; $T_1$, vermicompost @ 5 tonnes/ha alone; $T_2$, vermicompost + 1/4 N + 1/4 P + 1/4 K; $T_3$, vermicompost + 1/2 N + 1/2 P + 1/2 K; $T_4$, vermicompost + 3/4 N + 3/4 P + 3/4 K; $T_5$, FYM @ 10 tonnes/ha alone; $T_6$, FYM + 1/4 N + 1/4 P + 1/4 K; $T_7$, FYM + 1/2 N + 1/2 P + 1/2 K; $T_8$, 3/4 N + 3/4 P + 3/4 K; $T_9$, full NPK as recommended by Kerala Agricultural University (KAU, 1989).

The recommended fertilizer doses of 200 kg/ha N, 50 kg/ha $P_2O_5$ and 50 kg/ha $K_2O$ were supplied through urea, Mussorriephos and muriate of potash respectively. The FYM and vermicompost were applied as basal as per the treatments. Application of manures and fertilizers was repeated during the second year of cropping as well. *Eudrillus eugeniae* was the earthworm species used for making the compost.

## RESULTS AND DISCUSSION

The forage grass responded well to application of manures and fertilizers alone as well as in combination (Table 2). The fodder yield increased progressively with each incremental fertilizer dose in both vermicompost and FYM-treated plants. During the first year, the 100% NPK treatment resulted in the maximum yield and was significantly superior to all the vermicompost treatments, whereas FYM + 75% of the recommended NPK fertilizers recorded comparable response. During the second year, the organically amended treatments showed an improved yield response over the first year. Pooled analysis indicated that 25% of the recommended NPK could be saved through the use of either of the organic source.

Manickam (1993) observed that often there was a slow but steady decline in crop production with continuous use of chemical fertilizers alone. The yield trend obtained in the present study reaffirms their observations. When the soil was amended with organic manures, irrespective of the source used, the yield of guinea grass increased during the second year whereas plants supplied with chemical fertilizers alone recorded a decline in yield. Nambiar and Abrol (1989) observed that the declining trend in productivity caused by continuous use of NPK fertilizers could be checked by the use of organic manure. The beneficial effect of organic manures in terms of sustained production could be related to the enhanced biological activities in the rhizosphere, improved soil structure and increased nutrient availability (Nambiar and Ghosh, 1984; Muthuswamy *et al.*, 1990).

When applied alone as well as with a booster dose of 25% NPK, the growth-stimulating effect of vermicompost @ 5 tonnes/ha was on a par with FYM @ 10 tonnes/ha, while at higher fertilizer levels the FYM treatments were superior. Such a contradictory observation might be because the nutrients in the vermicompost were in a more readily available form as observed by Al-

**Table 2.** Effect of vermicompost on yield-contributing characters and yield of guinea grass

| Treatment | Plant height (cm) | | Tillers/ hill | | Green fodder yield (tonnes/ha) | | | Dry fodder yield (tonnes/ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1993–94 | 1994–95 | 1993–94 | 1994–95 | 1993–94 | 1994–95 | Pooled | 1993–94 | 1994–95 | Pooled |
| Absolute control | 86.67 | 83.00 | 7.33 | 6.67 | 13.79 | 12.81 | 13.30 | 3.35 | 3.20 | 3.28 |
| Vermicompost @ 5 tonnes/ha alone | 91.00 | 88.33 | 9.68 | 9.27 | 16.22 | 17.84 | 17.03 | 4.06 | 4.63 | 4.35 |
| Vermicompost + ¼ N + ¼ P + ¼ K | 97.62 | 95.00 | 12.00 | 11.08 | 24.19 | 26.08 | 25.13 | 6.05 | 6.52 | 6.29 |
| Vermicompost + ½ N + ½ P + ½ K | 101.50 | 98.67 | 13.25 | 12.83 | 29.57 | 30.90 | 30.24 | 7.39 | 7.72 | 7.56 |
| Vermicompost + ¾ N + ¾ P + ¾ K | 107.33 | 106.33 | 14.00 | 14.25 | 34.10 | 36.75 | 35.43 | 8.41 | 9.05 | 8.73 |
| Farmyard manure @ 10 tonnes/ha alone | 88.33 | 86.33 | 8.67 | 8.93 | 14.63 | 16.67 | 15.65 | 3.66 | 4.16 | 3.91 |
| Farmyard manure + ¼ N + ¼ P + ¼ K | 93.83 | 92.33 | 11.17 | 10.50 | 23.51 | 26.87 | 25.19 | 5.88 | 6.72 | 6.30 |
| Famyard manure + ½ N + ½ P + ½ K | 104.67 | 107.00 | 13.50 | 14.17 | 31.34 | 35.55 | 33.45 | 7.84 | 8.88 | 8.36 |
| Famyard manure + ¾ N + ¾ P + ¾ K | 111.00 | 110.00 | 15.83 | 16.33 | 37.57 | 41.36 | 39.50 | 9.13 | 9.93 | 9.53 |
| Recommended NPK (POP treatment) | 113.67 | 108.67 | 15.95 | 14.50 | 38.79 | 36.53 | 37.66 | 9.31 | 9.01 | 9.16 |
| CD (P = 0.05) | 7.78 | 8.99 | 1.99 | 2.15 | 2.43 | 2.69 | 3.26 | 0.56 | 0.64 | 0.68 |

**Table 3.** Effect of vermicompost treatments on economics of guinea grass cultivation

| Treatment | 1993–94 | | | 1994–95 | | | Pooled | |
|---|---|---|---|---|---|---|---|---|
| | Cost of cultivation | Net income (Rs) | Benefit : cost | Cost of cultivation | Net income (Rs) | Benefit : cost | Net income (Rs) | Benefit : cost |
| Absolute control | 6,175 | 2,069 | 1.44 | 5,330 | 2,357 | 1.34 | 2,213 | 1.39 |
| Vermicompost @ 5 tonnes/ha alone | 8,675 | 1,057 | 1.36 | 7,830 | 2,873 | 1.12 | 1,965 | 1.24 |
| Vermicompost + ¼ N + ¼ P + ¼ K | 9,160 | 5,353 | 1.88 | 8,315 | 7,333 | 1.58 | 6,343 | 1.73 |
| Vermicompost + ½ N + ½ P + ½ K | 9,643 | 8,097 | 2.11 | 8,798 | 9,730 | 1.84 | 8,914 | 1.98 |
| Vermicompost + ¾ N + ¾ P + ¾ K | 10,128 | 10,333 | 2.28 | 9,283 | 11,893 | 2.02 | 11,113 | 2.15 |
| Farmyard manure @ 10 tonnes/ha alone | 9,175 | 103 | 1.20 | 8,330 | 1,670 | 1.01 | 887 | 1.11 |
| Farmyard manure + ¼ N + ¼ P + ¼ K | 9,660 | 4,447 | 1.83 | 8,815 | 7,307 | 1.46 | 5,877 | 1.65 |
| Famyard manure + ½ N + ½ P + ½ K | 10,143 | 8,753 | 2.29 | 9,298 | 12,030 | 1.86 | 10,392 | 2.08 |
| Famyard manure + ¾ N + ¾ P + ¾ K | 10,628 | 11,913 | 2.54 | 9,783 | 15,037 | 2.12 | 13,475 | 2.33 |
| Recommended NPK (POP treatment) | 7,266 | 15,163 | 3.02 | 8,111 | 14,653 | 2.87 | 14,908 | 2.95 |
| CD (P=0.05) | | 1434 | 0.24 | | 1,803 | 0.16 | 19,16 | 0.14 |

banell *et al.* (1988). Manickam (1993) reported instances where FYM did not reveal its superiority when used alone. Thus with FYM, its usefulness in terms of crop yield was more pronounced when combined with chemical fertilizers, whereas vermicompost stimulated crop growth alone as well. However, in both cases the fodder yield increased progressively with each incremental dose of fertilizers indicating that a judicious combination of manures with fertilizers was more desirable for enhancing crop production. Since in terms of nutrient content 5 tonnes of vermicompost was more or less equivalent to 10 tonnes of FYM, the superiority of the FYM treatments at 50 and 75% NPK levels could be attributed to increased carbon supply, effect on physical properties of soil etc.

Economic analysis of the treatments revealed that during the first year the net income recorded with full dose of chemical fertilizers was higher than that from all other treatments (Table 3). During the second year, FYM + 75 % NPK fertilizers recorded the maximum profit which was on par with the chemical fertilizer treatment and both the treatments were significantly superior to the vermicompost treatments. The benefit : cost ratio recorded was consistently better under the recommended fertilizer treatment.

Application of full dose of chemical fertilizers resulted in the maximum income to the farmers on a short-term basis but for sustained production and profit the integrated use of manures and fertilizers was recommendable. The economics pointed out that purchasing the organic manures at the present market rate makes organic farming techniques less remunerative and emphasized the need for reducing the reliance on purchased inputs. Thus farmers should be trained in vermicompositing techniques right in their own field utilizing all farm waste which would make the technology less costly and thus more attractive and practical. As observed by Ismail (1993) the excellence of vermitechnology was that it could be used even at homes in a simple domestic recycling unit.

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