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**RESEARCH NOTE**

# Response of Pigeonpea [*Cajanus cajan* (L) Mill sp.] to band application of organic manures

P. S. MANIKASHETTI AND S. B. KALAGHATAGI

Department of Agronomy
College of Agriculture, Vijaypura
University of Agricultural Sciences
Dharwad - 580 005, Karnataka, India
E-mail: pallavimanikshetti@gmail.com

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Investigation was carried out in pigeonpea cv. TS-3R during *kharif* 2016 at Seed Farm, College of Agriculture Vijayapura, Karnataka (Zone -3). The experiment was carried out in a randomized block design with thirteen tratments *viz.,* $T_1$, $T_2$, $T_3$, $T_4$, $T_5$ and $T_6$ band application of vermicompost @0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 t ha$^{-1}$, respectively. The treatments $T_7$, $T_8$, $T_9$, $T_{10}$, $T_{11}$ and $T_{12}$ band application of sieved FYM @ 1, 2, 3, 4, 5 and 6 $T_{13}$: Broadcast application of FYM @ 6.0 t ha$^{-1}$, respectively and were compare with broadcast application of FYM @ 6.0 t ha$^{-1}$, ($T_{13}$). The results revealed that treatment T6: Band application of vermicompost @ 3.0 t ha$^{-1}$ recorded significantly higher plant height (153.67 cm), number of branches (14.29), total dry matter production per plant (162.67 g) at harvest and yield attributes *viz.,* number of pods per plant (116.00), seed yield per plant (37.35 g), seed yield (₹1647 kg ha$^{-1}$), stalk yield (2920 kg ha$^{-1}$) and harvest index (0.36). Significantly higher gross return, net return and benefit cost ratio were realized with the band application of VC @ 3 t ha$^{-1}$ (90,574 ha$^{-1}$, 59410 ha$^{-1}$ and 2.92, respectively) and 2.92, repsectively and were on par with the treatments band application of sieved FYM @4, 5 and 6 tonnes per ha and VC @ 2 and 2.5 tonnes per ha and was on par with $T_{12}$, $T_{11}$, $T_{10}$, $T_5$, $T_4$.

**Key words:** Compost, Pigeonpea, Vermicompost

Pigeonpea [*Cajanus Cajan* (L.) Mill sp.] is an important nitrogen fixing crop and widely grown for enriching the soil. It could fix up to 200 kg N ha$^{-1}$ (Anon., 2010). Pigeonpea is a major protein rich legume grown in India which occupies an area about 3.90 m ha producing 4.30 m t with an average productivity of 840 kg ha$^{-1}$ (Anon., 2016a). In India, it is mainly grown in Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat, Telangana and Tamil Nadu. It is the most important pulse crop of Karnataka having an area of 0.2 m ha with a production of 0.27 mt and average productivity of 740 kg ha$^{-1}$ (Anon., 2016b). Inadequate soil moisture and poor fertility status of the soil are the two major constraints for higher productivity of crops in the drylands of semi-arid tropics. Hence, for simultaneous improvement of the nutrients through copious use of organic manures will be the only solution, but their availability is scare. The biggest constraint is the insufficiency of availability of animal manure. Traditional practice of broadcasting organic manures facilitates more manure available to weeds and requires rainfall or irrigation to move nutrients into the plant root zone. Band application of organic manures improves nutrient use efficiency, requires less organic manures per unit area than broadcasting. Proper placement of manures can lead to more nutrients available to the crops than to the weeds and retain nutrients during soil erosion, releases tied-up nutrients and reduces nutrient binding on clay particles (Shah *et al.,* 2006).

A field experiment was carried out during *kharif* 2016 under rainfed condition at Seed Farm, College of Agriculture, Vijayapura in Northern Dry Zone of Karnataka (Zone-3). During the cropping period, the total rainfall of 497.70 mm in 36 rainy days was received as against the normal rainfall of 598.60 mm. The soils of the experimental site are medium deep black with low available nitrogen & median in phosphors & potash. The experiment was laid out in completely randomized block design consists of thirteen treatments replicated thrice (Table-1). The crop was raised under rainfed condition by dibbling, adopting a spacing of 90 cm x 20 cm. The FYM and vermicompost were applied as per the treatment. Three hand weedings were carried out to keep the plots free from weeds during the crop growth period. The recommended dose of fertilizer (25:50:0 $NP_2O_5K_2O$ kg ha$^{-1}$) was applied commonly to all the treatments. Observation on growth parameters and yield attributes were recorded from the net plot and yield kg ha$^{-1}$ was calculated.

The data presented in Table 1 and 2 revealed that all the growth attributes *viz.,* plant height, number of branches, total dry matter accumulation plant$^{-1}$ of pigeonpea was significantly influenced by band application of organic manures (Table 1). The treatment $T_6$, band application of vermicompost @ 3.0 t ha$^{-1}$ recorded significantly higher plant height (153.67 cm), number of branches (14.29), total dry matter accumulation plant$^{-1}$ (162.67 g), number of pods plant$^{-1}$ (116) and seed yield plant$^{-1}$ (37.35 g), at harvest as compared to other treatments, but it was statistically similar to treatments $T_4$, $T_5$, $T_{10}$, $T_{11}$ and $T_{12}$ which were found on par with $T_{12}$, $T_{11}$, $T_{10}$, $T_5$ and $T_4$. Broadcast application of FYM @ 6 t ha$^{-1}$ recorded significantly lower growth parameter values. This increase in the growth attributes, height of plant might be due to increase in rhizosphere temperature at seed zone and availability of nutrients with the application of FYM and thereby hastened the emergence of seedlings 2 to 3 days earlier to achieve crop growth. Similar results were also reported by Shah *et al.* (2006) who stated that due to band application of organic manures increases soil temperature near seed zone promoting early germination leading to higher vigour of plant for harsh conditions and availability of nutrients for plant uptake is more under seed row application over broadcasting. (Sharma *et al.,* 2009). Application of FYM influence the vigour of the plant which was probably accelerated the nitrogen fixing power of the plant by increasing the activity of nodule bacteria

Table 1. Growth and yield parameters of pigeonpea at harvest as influenced by band application of organic manures

| Treatment | | Growth parameters at harvest | | | | |
|---|---|---|---|---|---|---|
| | | Plant height (cm) | Number of branches plant$^{-1}$ | Total dry matter accumulation (g plant$^{-1}$) | Number of pods plant$^{-1}$ | Seed yield plant$^{-1}$ |
| T | Band application of VC @ 0.5 t ha$^{-1}$ | 140.73 | 10.53 | 103.00 | 85.67 | 19.64 |
| $T^1$ | Band application of VC @ 1.0 t ha$^{-1}$ | 141.60 | 10.90 | 116.00 | 98.00 | 24.01 |
| $T^2$ | Band application of VC @ 1.5 t ha$^{-1}$ | 142.03 | 11.92 | 146.00 | 106.00 | 28.94 |
| $T^3$ | Band application of VC @ 2.0 t ha$^{-1}$ | 148.00 | 12.97 | 153.30 | 109.67 | 35.48 |
| $T^4$ | Band application of VC @ 2.5 t ha$^{-1}$ | 152.33 | 13.69 | 157.33 | 115.33 | 35.59 |
| $T^5$ | Band application of VC @ 3.0 t ha$^{-1}$ | 153.67 | 14.29 | 162.67 | 116.00 | 37.35 |
| $T^6$ | Band application of sieved FYM @ 1.0 t ha$^{-1}$ | 143.17 | 10.80 | 99.33 | 65.67 | 15.54 |
| $T^7$ | Band application of sieved FYM @ 2.0 t ha$^{-1}$ | 144.33 | 11.50 | 103.00 | 71.17 | 17.91 |
| $T^8$ | Band application of sieved FYM @ 3.0 t ha$^{-1}$ | 144.93 | 11.97 | 108.67 | 85.77 | 23.54 |
| $T^9$ | Band application of sieved FYM @ 4.0 t ha$^{-1}$ | 147.67 | 13.10 | 151.33 | 105.33 | 34.74 |
| $T^{10}$ | Band application of sieved FYM @ 5.0 t ha$^{-1}$ | 149.40 | 13.60 | 154.31 | 111.33 | 35.00 |
| $T^{11}$ | Band application of sieved FYM @ 6.0 t ha$^{-1}$ | 152.67 | 14.23 | 158.33 | 113.00 | 36.43 |
| $T^{12}_{13}$ | Broadcast application of FYM @ 6.0 t ha$^{-1}$(RPP) | 139.80 | 10.50 | 101.00 | 99.33 | 24.07 |
| | S.Em± | 2.53 | 0.53 | 4.60 | 3.75 | 1.15 |
| | C.D. at 5 % | 7.38 | 1.54 | 13.40 | 10.95 | 3.35 |

Note: Recommended dose of fertilizer (25:50:0 $NP_2O_3K_2O$ kg ha$^{-1}$) was applied to all the treatments. FYM: Farm yard manure, VC: Vermicompost

Table 2. Seed yield, stalk yield, harvest index, net returns and benefit cost ratio of pigeonpea as influenced by band application of organic manures

| Treatment | | Seed yield (kg ha$^{-1}$) | Stalk yield (kg ha$^{-1}$) | Harvest index | Net returns ( ha$^{-1}$) | Benefit cost ratio |
|---|---|---|---|---|---|---|
| $T_1$ | Band application of VC @ 0.5 t ha$^{-1}$ | 866 | 2235 | 0.28 | 26065 | 2.21 |
| $T_2$ | Band application of VC @ 1.0 t ha$^{-1}$ | 1059 | 2400 | 0.31 | 33669 | 2.39 |
| $T_3$ | Band application of VC @ 1.5 t ha$^{-1}$ | 1276 | 2654 | 0.32 | 42613 | 2.55 |
| $T_4$ | Band application of VC @ 2.0 t ha$^{-1}$ | 1564 | 2820 | 0.36 | 55475 | 2.82 |
| $T_5$ | Band application of VC@ 2.5 t ha$^{-1}$ | 1647 | 2825 | 0.36 | 55432 | 2.80 |
| $T_6$ | Band application of VC@ 3.0 t ha$^{-1}$ | 1647 | 2920 | 0.36 | 59410 | 2.92 |
| $T_7$ | Band application of sieved FYM @ 1.0 t ha$^{-1}$ | 685 | 1980 | 0.26 | 16414 | 1.80 |
| $T_8$ | Band application of sieved FYM @ 2.0 t ha$^{-1}$ | 790 | 2120 | 0.27 | 19458 | 1.79 |
| $T_9$ | Band application of sieved FYM @ 3.0 t ha$^{-1}$ | 1038 | 2450 | 0.30 | 30420 | 2.14 |
| $T_{10}$ | Band application of sieved FYM @ 4.0 t ha$^{-1}$ | 1532 | 2852 | 0.35 | 54871 | 2.87 |
| $T_{11}$ | Band application of sieved FYM @ 5.0 t ha$^{-1}$ | 1543 | 2845 | 0.35 | 52812 | 2.65 |
| $T_{12}$ | Band application of sieved FYM @ 6.0 t ha$^{-1}$ | 1606 | 2795 | 0.36 | 53586 | 2.54 |
| $T_{13}$ | Broadcast application of FYM @ 6.0 t ha$^{-1}$ (RPP) | 1061 | 2461 | 0.30 | 25401 | 1.78 |
| | S.Em± | 51 | 87 | 0.02 | 2785 | 0.11 |
| | C.D. at 5 % | 148 | 255 | 0.05 | 8129 | 0.33 |

Note: Recommended dose of fertilizer (25:50:0 $NP_2O_5K_2O$ kg ha$^{-1}$) was applied to all the treatments.
FYM: Farm yard manure, VC: Vermicompost

and resulting in more dry matter accumulation. The yield attributes of pigeonpea differed significantly by band application of organic manures (Table 2). The treatment $T_{6,}$ band application of vermicompost @ 3.0 t ha$^{-1}$ recorded significantly higher seed yield (1647.00 kg ha$^{-1}$), stalk yield (2920.00 kg ha$^{-1}$) and harvest index (0.36) which was found to be on par with $T_{12,}$ $T_{11,}$ $T_{10,}$ $T_5$ and $T_{4.}$ This might be due to improvement in the yield attributes which in turn dependent on higher availability of nutrients for uptake and favourable soil moisture content due to band application of organic manures. These results are supported by the findings of Sharma *et al.* (2009). The microbial population in soil enriched by application of organic manures secretes a number of organic acids which may form chelates resulting in effective solubilization of bound phosphate, favoured higher nitrogen fixation, higher absorption and utilization of phosphorous and other plant nutrients and ultimately positive effect on growth and finally yield attributes. These results are in line with the findings of Mosaddeghi *et al.* (2000) who reported that band application of 2.5 tonnes of FYM increased nutrient availability for plant uptake which increases economic and biological yield.

Band application of VC @ 3 tonnes per ha recorded

significantly higher net returns of ₹ 59,410 $ha^{-1}$ and benefit cost ratio of 2.92 and were at par with treatments $T_{10}$, $T_4$, $T_5$, $T_{11}$ and $T_{12}$ (Table 2). Higher net returns in band application of VC @ 3 tonnes per ha were due to improvement in the yield and yield attributes. These results are in conformity with findings of Ahlawat (2009).

Growing of pigeonpea with band application of VC @ 2, 2.5 and 3 tonnes per ha and FYM @ 4 and 5 tonnes per ha noticed optimum productivity through localized placement that encouraged the yield parameters with efficient use of organic manures as to achieve sustained yield levels by saving 1 tonne VC and 2 tonne FYM $ha^{-1}$.

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