

**INVESTIGATION OF YIELD PERFORMANCE OF VEGETABLE
COWPEA (*Vigna unguiculata*) WITH ANIMAL MANURE
APPLICATION AT KALUWANCHIKUDY AREA**

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Abstract: The Field experiment was conducted to investigate the yield performance of vegetable cowpea with animal manure application at Kaluwanchikudy area. The Randomized Complete Block Design (RCBD) was used for this experiment. Poultry manure, cattle manure and goat manure were evaluated with and without agriculture department recommended level of inorganic fertilizer for vegetable cowpea. The highest crop yield was obtained by the application of poultry manure combined with the recommended inorganic fertilizer. The lowest yield was obtained by the application of goat manure only applied. In addition the results revealed that goat manure and cattle manure were inferior to poultry manure as a source of organic manure for vegetable cowpea cultivation. The animal manures combined with chemical fertilizer gave a higher yield than treatment which was applied only animal manure. The soil analysis after each crop showed that the nitrogen content and phosphorus content of poultry manure treated plots were higher than other treatments. But potassium content was higher in goat manure treated plots. The results further revealed that poultry manure has a beneficial effect on crop growth and yield compared with other treatments. The results further revealed that the poultry manure has a beneficial effect on crop growth and yield compared with other treatments. Therefore, the combined use of poultry manure with inorganic fertilizer application (DOA recommendation) has been recognized and recommended as the most suitable way of ensuring high crop yields, than other fertilizer combinations

Keywords: animal manure application, inorganic fertilizer, vegetable cowpea, yield performance

INTRODUCTION

Organic manure plays a vital role to bring stability and sustainability to agriculture and also avoid over dependence of chemical fertilizers

(Wijewardana, 1995). Nowadays, consumer preference is more for organically grown produce because they are free of toxic chemical residues and have concern for environment. Animal manure is a good source for organic fertilizer (Saleem Ahmed, 1995). Organic manure helps to improve chemical, physical and biological properties of soil and as a source of energy for the soil ecosystem (Giardini et al., 1992). Research has shown that organic manure will lose approximately one-third of inorganic fertilizer requirement and improve soil organic matter content over a longer period (Joshi et al., 2006). Most of the farmers at Kaluwanchikudy have livestock in their farms and facing disposal problem of farm yard manure. Furthermore, majority of the farmers in this area are vegetarian and cultivate vegetable cowpea as a protein source. But, they are using excess amount of inorganic fertilizer than the department recommendation. Hence there is a great potential to use these readily available animal manure to cultivate vegetable cowpea as an alternative source of inorganic fertilizer and farmers can get benefit in eco-friendly. Hence, this study was conducted with the objective of identifying the best dosage of animal manure application for vegetable cowpea (variety BS-1cultivar) at Kaluwanchikudy area.

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METHODOLOGY

The experiment was conducted at Kaluwanchikudy in Batticaloa district situated in DL2 agro-ecological zone. Soil type of this area is Ragosols and average rainfall is 1400 mm. The

experiment was carried out during the period from July 2011 to January 2012. The experiment was arranged in a Randomized Completely Block Design (RCBD) with seven treatments. The treatments were randomized in three replicates. The land was prepared and then the area was ridged and divided into 90 x 120 cm plots. Seeds of the vegetable cowpea BS-1 cultivar were placed with 30 cm spacing between plants and 60 cm between rows.

The treatments were the seven different fertilizer combinations comprised with animal manure and DOA recommended level of inorganic fertilizer as given below.

Treatments	Fertilizer type and quantities applied to 1m ²
T ₁	Cow dung (1.25kg)
T ₂	Poultry manure (1.25kg)
T ₃	Goat manure (1.25kg)
T ₄	Cow dung (1.25kg), urea (1.75gr), TSP (3.75gr), MOP (10gr)
T ₅	Poultry manure (1.25kg), urea (1.75gr), TSP (3.75gr), MOP (10gr)
T ₆	Goat manure (1.25kg), urea (1.75gr), TSP (3.75gr), MOP (10gr)
T ₇ (control)	Urea (1.75gr), TSP (3.75gr), MOP (10gr)

Animal manure was applied 3days before sowing to minimize the harmful effect of manure. Inorganic fertilizer was applied at the sowing. But MOP only was applied in 2 splits as 7gr/m² was applied at the sowing and 3gr/m² was applied after three weeks from planting.

Data were tabulated and analyzed by using Analysis of Variance (ANOVA) procedure of Statistical Analysis System (SAS). Least Significant Difference (LSD) test was used to compare differences among the treatment means at p=0.05.

Yield and yield components of vegetable cowpea

The higher number of pods per plant was obtained in treatment 4 (cattle manure with inorganic fertilizer). The lowest number of pods per plant was obtained in treatment 1 (Cattle

manure). However, there was no significant differences among treatment 5 (poultry manure with inorganic fertilizer), treatment 6 (goat manure with inorganic fertilizer) and 7, i.e.DOA recommendation of inorganic fertilizer. Plant receiving the treatment 5 (poultry manure with inorganic fertilizer) was recorded the highest fresh weight of a pod (7.48g) while the lowest fresh weight (5.18g) of a pod was noted in treatment 7 (DOA recommendation of inorganic fertilizer) (Table 1).

Table 1 Number of cowpea pods per plant and fresh weight of a pod

Treatments	Number of pods per plant	Fresh weight of a pod (g)
T ₁	20 ^d	5.29 ^e
T ₂	27 ^{bc}	6.22 ^d
T ₃	19 ^d	5.29 ^e
T ₄	34 ^a	6.57 ^c
T ₅	29 ^{ab}	7.48 ^a
T ₆	29 ^{ab}	7.13 ^b
T ₇	31 ^{ab}	5.18 ^e
LSD= 6.0423		LSD=0.1464

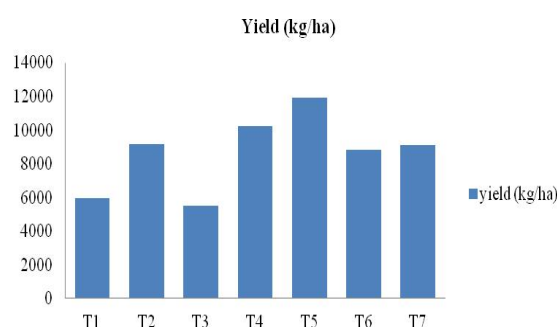
Note: Means with the same letters along the column are not significantly different at p>0.05.

Means are the average of three replicates.

Estimation of yield per hectare

The highest crop yield was obtained in treatment-5 by the application of poultry manure combined with the DOA recommended chemical fertilizer while. The lowest yield was obtained in treatment3. On the other hand, treatment-2 and treatment 6 did not show a significant yield increase over the control. Furthermore, animal manure combined with chemical fertilizer gave a higher yield than the

Figure 1 Variation of yield per hectare. Values are the means of three replicates



treatment which was applied only animal manures (Figure 1). It has been reported that the improved physical condition of soil resulting from the addition of organic matter increased the crop yield compared to use of chemical fertilizer with the same rate (Wijewardana, 1995) reported about the highest microbial activity in the soil when treated with both organic and chemical fertilizers. Therefore, the combined use of organic and chemical fertilizer providing balanced fertilization has been widely recognized as the most suitable way of maintaining soil fertility ensuring sustainable high crop yields.

When correlation analysis was performed on yield and yield components of vegetable cowpea, fresh weight of a pod showed highly significant ($P < 0.0001$) positive correlation with yield per hectare. However, number of nodules per plant did not show a significant correlation with yield components of vegetable cowpea, i.e. pods per plant, fresh weight of a pod, yield per hectare and dry weight of a plant (Table 2).

Table 2 Linear Correlation coefficients of number of pods per plant, fresh weight of a pod (g), yield per hectare (kg), dry weight of a plant and number of nodules per plant

	Number of pods	Fresh weight of a pod	Yield/ha	Dry weight	Nodule number
Number of pods	-	0.25 ^{ns}	0.69**	0.48*	-0.05 ^{ns}
Fresh weight of a pod	-	-	0.79***	0.67**	0.23 ^{ns}
Yield/ha	-	-	-	0.77***	0.17 ^{ns}
Dry weight	-	-	-	-	0.28 ^{ns}
Nodule number	-	-	-	-	-

ns, non-significant at $P = 0.05$; *significant at $P = 0.05$; **significant at $P = 0.01$; ***significant at $P = 0.001$.

CONCLUSION/RECOMMENDATION

The highest crop yield was obtained by the application of poultry manure combined with the DOA recommended level of chemical fertilizer. The lowest yield was obtained by the application of goat manure. In addition, the results revealed that the goat manure and cattle manure were inferior to poultry manure as a source of organic manure for vegetable cowpea cultivation. The animal manures combined with chemical fertilizer gave a higher yield than treatment which was applied only animal manure. Furthermore, the soil analysis showed that significantly high nitrogen and phosphorus content from poultry manure treated plots. But potassium content was higher in goat manure treated plots. The results further revealed that the poultry manure has a beneficial effect on crop growth and yield compared with other treatments. Therefore, the combined use of poultry manure with inorganic fertilizer application (DOA recommendation) has been recognized and recommended as the most suitable way of ensuring high crop yields, than other fertilizer combinations

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