YIELD RESPONSE OF THE GROUNDNUT (*ARACHIS HYPOGAEA* L.) PROGENY FROM PLANTS TREATED WITH INORGANIC AND ORGANIC FERTILIZERS IN SANDY REGOSOL

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Introduction

The organic agriculture has the potential to contribute quite substantially to the global food supply while reducing the detrimental environmental impacts of conventional agriculture (Badgley *et al.*, 2007). Organic amendments are essential to the sustainability of soils for maintaining its physical and chemical properties. Use of organics in vegetable production appears to provide an alternative to conventional methods (Sanwal *et al.*, 2006). In some instance, use of solid organic materials and compost enhance crop yield and quality with low input cost compared to use of inorganic fertilizer. Thus locally available cattle manure is an excellent soil amendment for increasing soil fertility and also has both macro and micro nutrients for plant growth and development. The literature survey stated that applications of organic materials provide essential plant nutrients including micro nutrients which improve the quality and quantity of oil seeds. However, there is limited information on progeny performance of oil seed crop fertilized with organic manure. Therefore, this research was conducted to determine the effect of cattle manure on seed quality and the progeny yield performance of groundnut in sandy regosol.

Methodology

This experiment was carried out at the crop farm of Eastern University of Sri Lanka in 2010. Seeds were collected from the mother plant fertilized inorganically as well as organically with different levels of cattle manure (CM). Treatments were assigned according to the seed sources as follows; T1- seeds from inorganically fertilized plants, T2- seeds from unfertilized plants, T3- seeds from plants treated with 5 t/ha CM, T4- seeds from plants treated with 10 t/ha CM, T5- seeds from plants treated with 15 t/ha CM and T6- seeds from plants treated with 20 CM. Seeds were sown at the spacing of 45 cm x 15 cm. All the management practices were done uniform to all treatments according to the Department of Agriculture recommendation except seed source. Parameters such as germination %, numbers of nodules and mature pods per plant, air dried weight of seeds and pods per plant and also shelling % were recorded. Collected data were analyzed by using SAS statistical software package and treatments comparisons were performed by using Tukey's at 5% significant level.

Discussion and Conclusion

Nodulation and pod formation: There was no significant difference ($p<0.05$) among the treatments on germination % of seed source. Though, highest percentage was observed in T1 (94.4%) followed by T5 (91.7%) while minimum percentage of 87% was recorded in T2 (Table 1).Number of nodules and mature pod number per plant at harvesting stage were significantly differed ($p<0.05$) among the treatments. High number of nodules per plant (93) was recorded in T4 while high number of mature pods per plant (22) was observed in T5 and T1 (Table 1). Peanuts, cowpeas, soybeans and beans are good nitrogen fixers and

will fix all of their nitrogen needs other than that absorbed from the soil (Lindemann and Glover, 2003). At the time of pod filling stage, nodules on annual legumes generally lose their ability to fix nitrogen because the plant provides nutrients mostly for developing seeds rather than the nodule formation. Low number of nodules was recorded in plants from seed lot treated with inorganically. Seed lot treated with organic manure (15 t/ha) and inorganic fertilizer significantly ($P<0.05$) produced higher number of pods per plant than seed lot from other plants except T6.

Table 1: Effect of seed source on germination %, nodulation and pod formation of ground plant at harvest

Treatments	Germination %	Number of nodules per plant	Number of pods per plant
T1	94.4	73 b	22 a
T2	87.0	80 ab	12 d
T3	87.5	81 ab	15 c
T4	87.9	93 a	18 b
T5	91.7	86 a	22 a
T6	88.9	82 ab	20 ab
F test	ns	*	**

*Means with the same letter in each column are not significantly different using Tukey's Studentized Range (HSD) Test at 5% level.

Weights of pods and seeds: The air dried weight of mature pods per plant in T1 did not significantly vary from other treatments except T2. Higher air dried weight of pods and seeds were obtained in T5 (Table 2). Ghoshal and Singh (1995) reported that microbial biomass of C, N, P range for farmyard manure is higher than inorganic fertilizer. Thus application of cattle manure at optimum level increased the availability of plant nutrients to obtain higher pod weight per plant. Malligawad and Parameshwarappa (2006) also demonstrated that groundnut gown under organic farming produced higher dry pod weight per plant thus higher pod and kernel yield as compared to inorganic farming.

Shelling percentage: There were significant differences among the treatments in shelling percentage. According to the treatment comparisons, T1 did not significantly vary with other treatments. A highest shelling percentage of 55.6 % was observed in plant obtained in T5 (Table.2). Malligawad and Parameshwarappa (2006) also reported that groundnut gown with organic manure gave higher shelling percentage than that with inorganic fertilizer.

Table 2: The air dried weights of mature pods and seeds per plant as well as shelling % at harvest

Treatments	Pod weight (g)	Seed weight (g)	Shelling %
T1	19.67 a	10.42 ab	52.3 ab
T2	14.90 b	07.50 c	50.3 b
T3	17.49 ab	08.89 bc	50.8 b
T4	18.45 a	09.77 b	52.9 ab
T5	20.19 a	11.22 a	55.6 a
T6	19.42 a	10. 69 ab	55.0 a
F test	*	**	*

*Means with the same letter in each column are not significantly different using Tukey's Studentized Range (HSD) Test at 5% level.

Pod and seed yield: There were significant differences ($P<0.05$) on pod and seed yield among the treatments. Highest yield of mature pods (2991.1 kg/ha) and seed yield (1662.2 kg/ha) were recorded in T5 while lowest values of pods (2207.4 kg/ha) and seeds (1111.1 kg/ha) were recorded in T2 (Table 3). Application of organic manures increased soil nutrient availability and thus attributed to good quality seed production. The P level increased with increased level of cow dung applied (Akandy *et al.*, 2006).

Crop residue: Maximum crop residue of 4457.8 kg/ha was recorded in T5 while minimum crop residue of 3103.7 kg/ha was recorded in T1. Application of fertilizer had significant effect on seed performance. Hossain and Ishimine (2007) who stated that the plants with the manure remained green longer larger leaf area and greater leaf biomass which ultimately provided longer and higher photosynthesis process and resulted in a higher yield of turmeric.

Table 3: Yield response of groundnut progeny at harvest

Treatments	Crop residue (kg/ha)	Pod yield (kg/ha)	Seed yield (kg/ha)
T1	3103.7	2914.1	1543.7
T2	3240.0	2207.4	1111.1
T3	3687.4	2591.1	1317.0
T4	4170.4	2733.3	1447.4
T5	4457.8	2991.1	1662.2
T6	4240.0	2884.4	1583.7
F test	*	*	*

* Means with the same letter in each column are not significantly different using Tukey's Studentized Range (HSD) Test at 5% level.

From this experiment it could be concluded that application of cattle manures at the rate of 15t/ha is better for the production of good quality seed of groundnut in sandy regosol.

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