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CALASIAO, DINA B. OCTOBER 2008. Seed Production of Garden Pea *(Pisum sativum*) as Affected by Plant Compost Application. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to determine the capability of plant compost to supply the nutrients needed to complete the life cycle of garden pea under La Trinidad conditions.

Plants applied with a handful of chicken dung per hole + 100-100-100 kg NPK/ha significantly enhanced the highest average number of seeds per pod, average number of pods per plant, average length of pod and seed yield per plot. These observations differed significantly from those taken from plants without fertilizer, but did not differ significantly from those plants applied with vermipcompost.

Results of the study revealed that an application of a handful of chicken dung per hole + 100-100-100 kg NPK/ha is needed for greater seed yield from seed production of garden pea.

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INTRODUCTION

Garden pea (*Pisum sativum*) locally known as “citzaro” is grown primarily for its edible fresh pods and matured seeds. Matured seeds contain a high percentage of digestive protein, an appreciable amount of carbohydrates and some minerals while the green pod is rich in vitamin A. Garden pea thrives best in cool places like Benguet and be grown profitably throughout the year. The crop grows fast and yields in about three months. Fresh pod production of the said crop is a good source of income of Benguet farmers because it commands a high market price.

Seed production of garden pea can be a good source of income of Benguet farmers and should be strengthened in the locality to supply the high demands of many farmers. The practice of farmers for seed production is they leave some of their crops to mature in the field especially if the prices of the pods are cheap. Seed production of vegetable crops is favorable in the said locality because of prevailing cool temperature towards the end of the year that induces a crop to produce flowers.

A campaign on organic vegetable production is spreading in the provinces of Cordillera Region. Organic production is to produce vegetables free from chemicals. This study is geared towards the production of organic seed to sustain the organic production of garden pea. The decomposed plant residues will be the source of nutrients for growth and seed development of garden pea.

This study had utilized different plant composts that are available in the locality for garden pea seed production. The objectives of the study were:

1. To determine the capability of plant compost to supply the nutrients needed to

complete the life cycle of garden pea.

2. To assess the seed yield performance of garden pea as affected by plant compost.

3. To determine the best plant compost for organic seed production of garden pea.

This study was conducted at the Organic Demo Farm Area, Benguet State University, La Trinidad, Benguet from January 2008 to March 2008.

REVIEW OF LITERATURE

Description of the Crop

Garden pea (*Pisum sativum*) belongs to the family of Leguminosae. Meril (1976) described garden pea as an annual crop standing at 3-5 m high, herbaceous in nature with pinnately compound leaves of 1-3 leaflets. Its flowers measure 1.5-2 cm and if pods are seed filled, 4-8 cm long. Further, Benton (1970) described the stem of the pea plant as hallow, and trailing or climbing. The flowers are butterfly like, purple or white, about one inch across; each has united stamens and one free stamen.

Benefits of Consuming Organically Produced Products

Organic farming is a production system that excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and others. It relies on crop rotation, crop residues, animal manures and mechanical cultivation to maintain soil productivity and tilt, to supply plant nutrients, and to control weeds, insects and other pests (Anonymous, 2005).

Thus, organic farming not only preserves the soil but also increases the chances for future generations to continue growing healthy food.

Vegetable grown organically are safe and health-promotive. Hwan (1984) stated that “You are what you eat”. Children nourished with organically-grown foods possess distinctive positive characters than those fed wit h chemical-supplemented food for instance the junk foods that make the children prone to illnesses. Such behaviors could hardly be observed in children or even adults nourished with organically-grown. For character formation, he further recommends the parents to provide their children with natural or organically grown food especially in their critical years, which is before they reach the age of twelve. And that they remain healthy. Being healthy does not only mean freedom from diseases or any symptoms of illness, but having a healthy body, mind, spirit, and manners.

Sources of Organic Matter

The most common natural organic fertilizers in the Philippines are chickens manure, hog manure, and sunflower compost, Chicken manure is extensively used in the Benguet Province than any other kind of manure (Bautista *et al*., 1983).

The decomposition of organic materials is a digestive process of bacteria, fungi and actinomycetes in the presence of oxygen. It is a common to pile organic raw material with sufficient supply of water and that used to compost (Inoko, 1985).

The Philippines Farmers Journal as cited by Laurean (1981) reported that there are seven major sources of organic fertilizers. These include animal manure, crop products, green manures or legumes, azolla and other blue green algae, industrial waste and garbage commercial organic fertilizers, and peat soil, silt or river mud. Animal manure is the most common organic fertilizers used by vegetable farmers. Examples are guano, chicken dung, cow, hog, carabao, and horse manure, crop by-products such as rice straw, corn stubbles and sugar cane tops and leaves are can be used as materials in the production of organic fertilizers. Other adequate aquatic plants like water lily and sea weed and legumes like mongo, soybean, garden pea, and ipil-ipil can be used as green manure.

Bucu (1991) mentioned that mushroom compost is a good source of organic fertilizer. It consists of sawdust with some materials like limestone and rice barn. Mushroom compost has low in potassium, rich in nitrogen, phosphorous, calcium and other secondary nutrient elements. It is recommended however, to mix this compost with proper amount of manure like swine or poultry. It was also found out that it has carbon as main source of energy for the activities of soil microorganism like Rhizobia for nitrogen fixation and mycorrhizae for increasing the availability of soil phosphorous. Soil treatment with sawdust, tree leaves, green manure, oil cake, or rice barn promotes the multiplication of earthworm and inhibits nematodes population. The use of rice straw reduces the incidence of wilt and black leg in white potato and root in common bean, pea and cotton.

Alnus compost is abundant in the highland that can be a perfect organic nitrogen source. It is easy to compost and hastens decomposition (Pandosen, 1986 as cited by Marcelino, 1995). At present, alnus compost has been discovered as a good source of organic fertilizer; it is also friendly to the environment and also controls some plant diseases. In addition, alnus compost has been discovered as a good source of organic fertilizer; it is also friendly to the environment and also controls some plant diseases. In addition, alnus compost is more economical to the farmers than inorganic inputs because they can plant trees for the production of their own compost, thus helping in reforestation and restoration of the ozone layer. A study conducted by Dida (1998) reported that population and incidence of black scurf on potato tuber with increasing level of Alnus compost applied.

Andrew (1947) claimed that compost from plant residues are excellent source of organic matter because they have sufficient amount of nitrogen. The most important soil organic matter is from plant residues. Plant residues can provide soil organic matter ranging from 11tons/ha per year for tropical rain forests, 6 tons for temperate forests, 3 tons for temperate grasslands, and down to 0.05 tons for deserts (Bolin et al. 1979).

Allison (1973) reported that plant residues are chemically complex organic materials that enter the soil and play an important role in maintaining soil productivity by providing nutrients and inputs to organic matter. They improve the soil physical properties, availability of soil nutrients, and soil fauna populations. Decomposition signifies the mechanical disintegration of dead plant structure from the stage where it is still attached to the living plant, to the humus stage where the gross cell structure is no longer recognizable.

Different compost has varying compositions. Bureau of Soil Water Management (BSWM, 1994) has found that mushroom compost provides necessary nutrients for growing a crop. It contains 17.5% of organic matter, 5% of nitrogen, 310% ppm phosphorous and 365% ppm potassium and has pH of 7.2 (Cuyahon, 1996). Balaoing 2006 reported that the BSU compost contains 5% of nitrogen, 3% phosphorus and 2% potassium, while Mercado (1996) stated that alnus compost contains 50% organic matter, 2.5% nitrogen, 7.0% phosphorus, 3.36% potassium and pH of 4.6.

Benefits of Using Organic Fertilizer

Organic fertilizers are derived from decomposed excretes from animals and/or plant residues which can supply one or more essential nutrient elements to plants.

Capuno (1984) as cited by Villamor (2002) stated that using organic material like chicken manure alone or in concentration with inorganic fertilizer promoted a more vigorous growth and enhanced production of more leaves and taller solanaceous crop than those treated with inorganic fertilizer alone.

Knott (1976) mentioned that the application of organic fertilizers in the soil prior to planting or sowing results to high yield. Manure does not only provide nutrients but also humus which improves the physical condition of the soil. He further mentioned that, well decomposed manure should be applied at rate of 10 to 12 tons/hectare after the first plowing. This amount will slowly provide nutrients during vegetative growth of the crop.

Rodriquez (1981) reported that organic fertilizer such as compost and green manuring are very important needs in the vegetable production. It makes the soil fertile that also makes production continuous. Tisdale and Nelson (1975) has stated that organic fertilization releases the nutrient element slowly specially nitrogen for efficient utilization of plants. Once available nutrients are translocated to plant parts, growth and yield increases.

Abadilla (1982) reported that crops fertilized with organic matter have greater resistance to pests and diseases. Humic acids and growth substances are absorbed by plant tissues through the roots and that they favor the formation of proteins by influencing the synthesis of enzymes thereby increasing the vigor and insect resistant of the plant. Soils high in organic matter allow little or no borne diseases because of oxygen ethylene cycle in the soil. He further mentioned that the sap of plants fertilized with organic matter is more bactericide than plants not fertilized with organic matter. Humus had also improved the quality of crops.

In 1997, Cadiz and Deanon as cited by Ebbes (1998) mentioned that compost is the best organic fertilizer, since it contains nitrogen, phosphorus, potassium, silica as well as enough carbon or fibrous material to improve the physical, chemical and biological properties of soil. They also noted that composting helps control pollution. Much of the industrial and agricultural are either burned polluting the air and/or left scattered in the field clogging waterways. In addition, Tan (1975) cited that compost is used to improve the soil condition. It granulates the soil particles and makes it loose for easy tillage. It improves the soil drainage aside from being a good source of plant nutrient.

Application of compost improves the physiological, chemical and biological condition of the soil besides providing plant nutrients. The humus serves as the colloidal material with negative electric charge and coagulated with cation and form particles to form granules. Soil with more granules is less sticky, high buffering capacity, and has better permeability and greater water holding capacity. It is capable of regulating plant growth and disease occurrence (Sangatnan and Sangatnan, 2000). In addition, Pataras (1984) stated that the application of compost fertilizers is best way to prepare of soil for vegetable production. It can improve the soil structure making it deal for crop production.

In 1994, Mechalak cited that compost is a good source of organic matter and nutrients for plants. It improves soil structure and water retention. Compost contains beneficial microorganism that suppress plant pathogen in soil.

Compost application replenishes soil organic matter or humus being depleted with continuous cropping. Application of compost also activates the soil microorganisms, consequently increasing the availability of nutrients that plant feed on (Marquez, 1988).

Follet (1981) added that organic residues on the soil protect the land against raindrop, splash erosion and reduce the extreme of surface temperature. When organic residues are decomposed, they supply some essential nutrient needed by plants, and makes macronutrients ready available to plant over wide range.

MATERIALS AND METHOD

Materials

The materials used in the study were garden pea seeds, plant compost derived from spent mushroom, alnus leaves compost, vermicompost, chicken dung, 14-14-14 (Triple 14), trellis/"rono", identifying tags, garden tools and record book.

Methods

An area of 75 square meters was thoroughly prepared and divided into three blocks. Each block contained five plots with a dimension of 1 x 5 meters. Double row holes with spacing of 25 cm between rows and 25 cm between hills were made in each plot. Each plot contained 20 holes to have 40 holes per plot. The plant compost with their recommended rate were studied are as follows:

Treatment

C_1 – Control (no fertilizer application)

C_2 – Farmer's practice (a handful of chicken dung/hole) + 100-100-100 kg NPK/ha

C_3 – Spent mushroom compost = 20t/ha

C_4 – Alnus leaves compost = 10 t/ha

C_5 – Vermicompost = 20t/ha

The experimental was laid out in a Randomized Complete block Design (RCBD). All the data were subjected to Analysis of Variance (ANOVA). The recommended rates of each plant compost as described in the treatments were distributed equally to the number of holes per plot and mixed thoroughly with the soil before planting, except in the control wherein no plant compost was applied in the soil. Likewise, in farmers practice, a handful of chicken dung was applied in a hole and mixed thoroughly with the soil before planting. Three seeds of garden were sown per hill and thinned to two plants per hill after emergence.

Hilling up was done one month after planting. No inorganic fertilizers were applied during hilling up in all the treatments, except in the Farmers practice wherein a rate of 100-100-100 kg NPK/ha was applied as side dressed. Trellising was done when plants had attained a height of 20-30 cm.

Harvesting was done when the pod color was yellow and soft. Harvested pods were sun dried until pods were fully dried and brittle in texture. Then, processing was done by separating the seeds from the pods.

Data Gathered

1. Number of days from sowing to emergence. This was noted when 50% of the sown seeds had emerged from the soil.

2. Days from emergence to flowering. This was obtained when 50% of the plant per plot had produced flowers.

3. Percentage of pod setting. Ten newly opened flowers/treatment were tagged. Three days after tagging, the remained tagged flowers were counted thus, percentage of pod set was computed by the formula:

$$\%\ \text{Pod Setting} = \frac{\text{Number of Pod Setting}}{\text{Number of Tagged Flowers}} \times 100$$

4. Days from pod set to seed maturity. This was obtained by counting the number of days from pod set to seed maturity. Seed was physiologically matured if the pod color is yellow and soft.

5. Average number of pods/plant. This was the total number of harvested pods divided total of plant per plot.

6. Average number of seeds/pod. The number of seeds per pod from the same sample harvested pod was counted.

7. Average length of pod (cm). Ten pods selected at random was measured from pedicel end to distal end. This was taken one week before harvesting.

8. Weight of 1000 seeds (g). The weight of 1000 seeds per treatment was taken when the moisture content is at 14%.

9. Seed yield per treatment (g). This was determined if the seed moisture content is at 14%. Moisture content was determined by using the formula:

$$M_2\text{-}M_3 \;\; x \;\; \frac{100}{M_2 - M_1}$$

Where:

M_1 = the weight in grams of the container and its cover.

M_2 = the weight in grams of the container, its cover and its content before drying.

M_3 = the weight in grams of the container, its cover and its content after drying.

RESULTS AND DISCUSSION

Number of Days from Sowing to Emergence

Table 1 shows the number of days from sowing to emergence as affected by the application of plant compost. The application of plant compost did not affect the number of days to emergence. All plants had emerged seven days after sowing.

Days from Emergence to Flowering

The days from emergence to flowering is shown in Table 2. Statistical analysis showed no significant differences among all the treatments.

Table 1. Number of days from sowing to emergence

TREATMENT	MEAN
Control (no fertilizer application)	7.00[a]
Farmer's practice (a handful of chicken dung/hole +100-100-100 NPK/ha	7.00[a]
Spent mushroom compost (20t/ha)	7.00[a]
Alnus leaves compost (10t/ha)	7.00[a]
Vermicompost (20t/ha)	7.00[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Table 2. Days from emergence to flowering

TREATMENT	MEAN
Control (no fertilizer application)	35.67[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	35.00[a]
Spent Mushroom compost 20t/ha	35.33[a]
Alnus leaves compost 10t/ha	35.67[a]
Vermicompost 20t/ha	35.33[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Percentage of Pod Setting

The percentage of pod setting as affected by application of plant compost is shown in Table 3. Statistical analysis showed no significant differences among the treatments. Percentage of pod set ranged from 80-90%.

Table 3. Percentage of pod setting

TREATMENT	MEAN (%)
Control (no fertilizer application)	80.00[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	90.00[a]
Spent mushroom compost 20t/ha	83.33[a]
Alnus leaves compost 10t/ha	83.33[a]
Vermicompost 20t/ha	83.33[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Days from Pod Set to Seed Maturity

Table 4 shows the number of days from pod set to seed maturity as affected by the application of plant compost. No significant difference as observed in the number of days from pod set to seed maturity.

Average Number of Pods per Plant

Significant differences were observed on the average number of pods per plant as affected by the application of plant compost (Table 5). Highest average number of 9.49 pods per plant was obtained in plants applied with 100-100-100 kg NPK/ha but their number of pods did not differ significantly in the average number of 8.63 pods per plant obtained in plants applied with vermicompost. However, these average numbers of pods per plant differed significantly from the number of 5.96 pods in plants without fertilizer and plants applied with alnus leaves compost and spent mushroom compost with respective means of 7.53 and 7.19 pods per plant.

Table 4. Days from pod set to seed maturity

TREATMENT	MEAN
Control (no fertilizer application)	44.667[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	43.333[a]
Spent mushroom compost 20t/ha	43.000[a]
Alnus leaves compost 10t/ha	43.333[a]
Vermicompost 20t/ha	43.667[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Table 5. Average number of pods per plant

TREATMENT	MEAN (cm)
Control (no fertilizer application)	5.957[d]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	9.490[a]
Spent mushroom compost 20t/ha	7.190[cd]
Alnus leaves compost 10t/ha	7.533[bc]
Vermicompost 20t/ha	8.627[ab]

Means within a column with common letters do not differ significantly at 5% DMRT

Results of the study showed that the application of plant compost significantly increased the average number of pods per plant.

Average Number of Seeds per Pod

Statistical analysis show significant differences on the average number of seeds per pod as affected by the application of plant compost (Table 6). Plants applied with a handful of chicken dung + 100-100-100 kg NPK/ha obtained the highest average number of 8.53 seeds per pod but this number did not differ significantly from the number of (8.20) seeds per pod obtained by plants applied with vermicompost. However, these numbers of (8.53 and 8.20) seeds per pod obtained from the aforementioned treatments differed significantly in the average number of 6.57 seeds per pod obtained in plants without fertilizer and that of plants applied either with composted alnus leaves or spent mushroom with respective means of 7.53 and 7.27 seeds per pod. Likewise, the later

Table 6. Average number of seeds per pod

TREATMENT	MEAN (cm)
Control (no fertilizer)	6.57[c]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	8.53[a]
Spent Mushroom compost 20t/ha	7.27[b]
Alnus leaves compost 10t/ha	7.53[b]
Vermicompost 20t/ha	8.20[a]

Means within a column with common letters do not differ significantly at 5% DMRT

average numbers of seeds per pod differed significantly from the number of seeds per pod obtained in plants applied with spent mushroom compost and that of plants without fertilizer.

Average Length of Pods

Table 7 shows the effect of plant compost on the average length of pods of garden pea. Results revealed that plants applied with different plant composts showed significant differences on the pod length over the plants without fertilizer. Plants applied with a handful of vermicompost obtained the longest pod length of 6.75 cm and differed significantly from the pod length of plants applied with Alnus leaves compost and plants without fertilizer with means of 6.15 and 5.96 cm, respectively. However, the aforementioned treatment did not differ significantly from the pod length of plants applied with spent mushroom compost and plants applied with a handful of chicken dung/hole + 100-100-100 kg NPK/ha with means of 6.47 and 6.26 cm, respectively.

Table 7. Average length of pods

TREATMENT	MEAN (cm)
Control (no fertilizer application)	5.960[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	6.260[abc]
Spent mushroom compost 20t/ha	6.473[ab]
Alnus leaves compost 10t/ha	6.147[bc]
Vermicompost 20t/ha	6.747[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Results of the study revealed that before planting garden pea, a sole application of different plant compost could increase the pod length.

Weight of 1,000 Seeds

Weight of 1000 seeds was taken at the seed moisture content of 11%.

Table 8 shows the weight of 1,000 seeds as affected by the plant compost. The statistical analysis did not show significant difference among the treatments on the weight of 1,000.

Table 8. Weight of 1,000 seeds

TREATMENT	MEAN (g)
Control (no fertilizer application)	115.367[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	130.333[a]
Spent mushroom compost 20t/ha	124.867[a]
Alnus leaves compost 10t/ha	123.300[a]
Vermicompost 20t/ha	126.300[a]

Means within a column with common letters do not differ significantly at 5% DMRT

Seed Yield per Plot

Seed yield was obtained at the seed moisture content of 11%. Results of the study revealed that fertilization significantly increased the seed yield of garden pea (Table 9). Plants applied with vermicompost obtained a seed yield of 490.33 g but their seed yield did not differ significantly from that of plants applied with a handful of chicken dung + 100-100-100 kg NPK/ha and that of plants applied with alnus leaves compost with respective means of 509.87 and 477.93 g, respectively. All the aforementioned seed yields differed significantly from the seed yield of plants without fertilizer. Likewise, results of the study revealed that the plants applied with different plant composts showed significant difference in seed yield over the plants without fertilizer.

Table 9. Seed yield per plot

TREATMENT	MEAN (g)
Control (no fertilizer)	375.97[c]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	509.87[a]
Spent mushroom compost 20t/ha	435.60[b]
Alnus leaves compost 10t/ha	477.93[a]
Vermicompost 20t/ha	490.33[a]

Means within a column with common letters do not differ significantly at 5% DMRT

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

Seed production of Garden pea (*Pisum sativum*) as affected by plant compost application of plant composts was studied at Balili Organic Demo Farm, Benguet State University, La Trinidad, Benguet on January 2008 to April 2008. Garden pea were grown and were applied with different plant composts such as alnus leaves compost, spent Mushroom, vermicompost. A handful of chicken dung per hole + 100- 100- 100- kg NPK/ ha was included as one of the control treatments.

Results of the study revealed that the application of plant composts effected significant differences in the average number of seeds per pod, average number of pods per plant, average length of pod and seed yield per plot.

Pants applied with a handful of chicken dung per hole + 100-100-100 kg NPK/ ha significantly enhanced the highest average number of seeds per pod, average number of pods per plant, average length of pod and seed yield per plot. These observations differed significantly from those taken from plants without fertilizer, but did not differ significantly from plants applied with vermicompost.

Conclusion

Findings indicated that an application of vermicompost at 20t/ha or a handful of chicken dung per hole + 100-100-100 kg NPK/ha effected a comparable seed yield of garden pea.

Recommendation

Application of 20 tons/ha of vermicompost is recommended for organic production of garden pea.

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APPENDICES

Appendix Table 1. Number of days from sowing to emergence

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	7	7	7	21	7
Farmer's practice	7	7	7	21	7
Spent mushroom compost	7	7	7	21	7
Alnus leaves compost 10 t/ha	7	7	7	21	7
Vermicompost 20 t/ha	7	7	7	21	7

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	0	0			
Treatment	4	0	0	0	3.84	7.01
Error	8	0				
TOTAL	14	0				

Coefficient of Variation = 1.21%

Appendix Table 2. Days from emergence to flowering

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	36	35	36	107	35.67
Farmer's practice	35	35	35	105	35.00
Spent mushroom compost	35	35	36	106	35.33
Alnus leaves compost 10 t/ha	35	35	36	106	35.67
Vermicompost 20 t/ha	35	35	36	106	35.33

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	1.200	0.600			
Treatment	4	0.933	0.233	1.27^{ns}	3.84	7.01
Error	8	1.467	0.183			
TOTAL	14	3.600				

^{ns} = Not significant

Coefficient of Variation = 1.21%

Appendix Table 3. Percentage of pod setting

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	90	70	80	240	80.00
Farmer's practice	100	80	90	270	90.00
Spent mushroom compost	80	80	90	250	83.33
Alnus leaves compost 20 t/ha	90	90	70	250	83.33
Vermicompost 20 t/ha	100	80	70	250	83.33

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	480.00	240.00			
Treatment	4	160.00	40.00	0.44^{ns}	3.84	7.01
Error	8	720.00	90.00			
TOTAL	14	1,360.00				

^{ns} = Not significant   Coefficient of Variation = 11.29%

Appendix Table 4. Days from pod set to seed maturity

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Control (no fertilizer)	45	45	44	134	44.67
Farmer's practice	43	44	43	130	43.33
Spent mushroom compost	42	43	44	129	43.00
Alnus leaves compost 10 t/ha	43	43	44	130	43.33
Vermicompost 20 t/ha	42	44	45	131	43.67
TOTAL	219	219	220	654	218

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	2.800	1.400			
Treatment	4	4.933	1.233	1.68^{ns}	3.84	7.01
Error	8	5.867	0.733			
TOTAL	14	13.600				

^{ns} = Not significant

Coefficient of Variation = 1.96%

Appendix Table 5. Average number of pods per plant

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	5.38	6.41	6.08	17.87	5.96
Farmer's practice	9.07	9.82	9.58	28.47	9.49
Spent mushroom compost	7.29	7.33	6.95	21.57	7.190
Alnus leaves compost 10 t/ha	7.76	7.62	7.22	22.60	7.53
Vermicompost 20 t/ha	6.94	9.43	9.21	25.88	8.627
TOTAL	36.44	40.61	39.04	116.09	38.75

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	2.016	1.008			
Treatment	4	22.117	5.529	12.72**	3.84	7.01
Error	8	3.478	0.435			
TOTAL	14	27.611				

** = Very significant Coefficient of Variation = 8.28%

Appendix Table 6. Average number of seeds per pod

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	6.02	6.09	6.06	19.70	5.67
Farmer's practice	8.01	9.00	8.05	12.60	8.53
Spent mushroom compost	6.06	7.03	7.09	21.80	7.27
Alnus leaves compost 10 t/ha	7.01	7.05	8.00	22.60	7.53
Vermicompost 20 t/ha	7.09	9.01	8.06	24.60	8.20

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	1.516	0.758			
Treatment	4	7.237	1.809	22.25**	3.84	7.01
Error	8	0.651	0.081			
TOTAL	14	9.404				

** = Very significant

Coefficient of Variation = 3.74%

Table 7. Average length of pods (cm)

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
Control (no fertilizer)	5.80	6.07	6.01	17.88	5.960
Farmer's practice	6.23	6.00	6.55	18.78	6.260
Spent mushroom compost	6.15	6.41	5.86	19.42	6.473
Alnus leaves compost 10 t/ha	6.14	6.12	6.13	18.44	6.147
Vermicompost 20 t/ha	6.30	6.58	7.36	20.24	6.747

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F 0.05	0.01
Replication	2	0.551	0.276			
Treatment	4	1.106	0.277	4.37*	3.84	7.01
Error	8	0.506	0.063			
TOTAL	14	2.163				

* = Significant   Coefficient of Variation = 3.98%

Appendix Table 8. Weight of 1000 seeds (g)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Control (no fertilizer)	114.8	115.9	115.4	346.10	115.367
Farmer's practice	140.6	121.8	128.6	391.00	130.333
Spent mushroom compost	119.1	127.2	128.3	369.90	124.867
Alnus leaves compost 10 t/ha	123.4	121.7	124.8	369.90	123.300
Vermicompost 20 t/ha	135.1	118.6	125.2	378.90	126.300

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	78.649	39.325			
Treatment	4	363.513	90.878	2.45^{ns}	3.84	7.01
Error	8	296.431	37.054			
TOTAL	14	78.594				

^{ns} = Not significant

Coefficient of Variation = 4.91%

Appendix Table 9. Seed Yield per plot

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Control (no fertilizer)	372.9	329.9	425.1	1127.00	375.967
Farmer's practice	535.1	478.8	515.7	1529.16	509.867
Spent mushroom compost	409.5	420.9	476.4	1306.80	435.600
Alnus leaves compost 10 t/ha	468.8	466.7	498.8	1433.80	477.933
Vermicompost 20 t/ha	494.7	471.2	505.1	1471.00	490.33

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULATED F	
					0.05	0.01
Replication	2	6428.668	3214.334			
Treatment	4	34092.430	8523.107	19.25**	3.84	7.01
Error	8	3542.398	442.800			
TOTAL	14	4463.496				

** = Very significant

Coefficient of Variation = 4.60%