BIBLIOGRAPHY

ABAD, FILBERT L. APRIL 2009. Seed Production of Snap Bean (*Phaseolus vulgaris L.*) Cultivar Black Valentine as Affected by Plant Compost Application. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to utilize the available composts in the locality for snap bean seed production of Cv. Black Valentine. Specifically, it aimed to determine the capability of plant compost to supply the nutrients needed to complete the life cycle of snap beans; to assess the seed yield performance of snap beans as affected by plant compost and to determine the best plant compost for organic seed production of snap bean under La Trinidad, Benguet condition.

Results of the study revealed that the farmer's practice and application of 20 tons/ha spent mushroom composts significantly enhanced a higher percentage of pod setting, increase the number of pods per plot, average length of pods and seed yield per plot. However, there were significant effects observed on the number of days from sowing of seeds to seedling emergence, days from emergence to flowering, days from pod set to seed maturity, average pod weight per plant, average number of seed per pod and weight of 300 seeds.

Plants applied with a handful of chicken dung/hole + 100-100-100 kg NPK/ha (Farmer's practice), significantly produced highest percentage of pod setting of 90%,

total number of pods per plot of 225.33 pods and average length of pods of 18.77cm; resulting to higher seed yield per 1x5m plot with a mean of 303.08g.

However, the farmers practice were comparable with those applied with 20 tons/ha spent mushroom compost. Followed by those plants applied either with 10 tons/ha alnus leaves compost and plants applied with 20 tons/ha vermicompost. While the lowest means was observed on plants without fertilizer applied.

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INTRODUCTION

Black valentine locally known as “Baguio bean” or “Alno” is a vegetable crop that can be profitably grown anytime of the year in the locality. Growing this crop for fresh pod production is also feasible in the provinces with almost similar environmental conditions like in Mountain Province and Nueva Viscaya. Restaurants in Manila prefer the good quality pod of Black Valentine or Alno a variety of Snap bean produced in the locality because the pods are smooth, slender, straight and stringed.

Seed production of vegetable crops is feasible under Benguet conditions because of the cold temperature that prevails towards the end of the year. Sufficient exposure of vegetable crops to cold temperature at their juvenile stage induces a crop to produce flowers. The Benguet State University (BSU) produces seeds of snap bean for the farmers in the region. Likewise, BSU are among the agencies involved in promoting organic vegetable production in the country. It is because the organically produced vegetables are nutritious and safe for consumption. Besides, people are now aware of the good benefits of organic vegetable production to their health and in the environment. The demands of organically produced vegetables are increasing. However, the drawback of sustaining organic vegetable production is the unavailability of organic seeds for planting.

Organic fresh pod production of pole Snap bean can be done in Benguet because its seeds for planting can also be organically produced in the said locality. Besides, there are always available plant materials that can be composted for organic production. This study will help sustain the organic production of pole snap bean by producing organic seeds for planting.

Generally, this study aimed to utilize the available plant compost in the locality for Pole Snap bean seed production of the cultivar Black Valentine.

Specifically, the study aimed to:

1. determine the capability of plant compost to supply the nutrients needed to complete the life cycle of Snap beans.

2. assess the seed yield performance of Snap beans as affected by plant compost.

3. determine the best plant compost for organic seed production of Snap beans.

The study was conducted at the Organic Demo farm Area, Benguet State University, La Trinidad, Benguet from April 2008 to July 2008.

REVIEW OF LITERATURE

Description of the Crop

Snap bean Black Valentine is locally known as “Baguio bean” or “Alno” and a trailing type of Snap bean. This is the most commonly grown variety of Pole Snap bean in Benguet. The seeds are black and the average weight of 100 seeds is 17.24 grams. “Alno” is harvested 59 days after emergence in high elevated areas and 49 days in low elevated areas. Pods are smooth medium green to light green, slender, straight, and stringed. Average pod length is 14.3 cm and pod width is 0.90 cm. Shape of the cross-section of the pod is oval to flat. “Alno” is highly susceptible to bean rust and to anthracnose. The average total flesh pod yield is 20.18 tons/ha.

The variety mentioned is commonly grown not only by the farmers in the Cordillera but also by the farmers in the lowland. The Black Valentine a popular variety and still preferred by most consumers (Kudan, 1989).

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 rotations, crop residues, animal manures and mechanical cultivation to maintain soil productivity and tilth, to supply plant nutrients, and to control weeds, insects and other pests. Thus, organic farming not only preserves and enhances the soil but also increases the chances for future generations to continue growing healthy food (Anonymous, 2005).

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 with 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, Hwan (1984) further recommended that parents should provide their children with natural or organically grown food especially in their critical years, which is before the age of twelve. And that they children 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 chicken 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 was 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 organic fertilizer. It consists of sawdust with some materials like limestone and rice bran. Mushroom compost is low in potassium but 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 mushroom compost 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 bran 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 rot 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 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 decrease 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 as Bureau of Soil Water Management (BSWM, 1994) found out 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). Moreover, 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.

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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.

Rodriguez (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. However, Tisdale and Nelson (1975) 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).

Finally, Follet (1981) stated 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 METHODS

The materials used in the study were seeds of Pole Snap bean variety Black valentine, chicken dung, triple 14, trellis/rono, ruler, plant compost derived from alnus leaves, spent mushroom, vermicompost. In addition, weighing scale, net bags and record book were also used.

An area of 75 m^2 was thoroughly prepared for the experiment 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 experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The treatments were as follows:

C_1 – Control (no fertilizer)

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

C_3- 20 t/ha spent mushroom compost

C_4- 10 t/ha alnus leaves compost

C_5- 20 t/ha Vermicompost

The recommended rate of 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 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 with the soil before planting. Three seeds of Snap bean variety Black valentine 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 fertilizer. Trellising the plant was done when 20-30 cm tall to support the plant.

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.

The following data were 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 plants per plot had produced flowers.

3. Percentage of pod setting. Ten newly opened flowers per treatment were tagged. After three days, the remained tagged flowers were counted. 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. Total number of harvested pods per plot. This was the total number of pods per plot/Number of plants per plot was counted after harvesting.

6. Average pod weight per plant (g). This was the total weight of harvested pods from the total number of plants per plot.

7. Average number of seed per pods. The number of seeds per pod from the same sample harvested pod was counted.

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

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

$$M_2 - M_3 \times \frac{100}{M_2 - M_1}$$

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.

10. Weight of 300 seeds (g). The weight of 300 seeds per treatment was taken if the moisture content is at 14%.

All the data were subjected to analysis of variance (ANOVA) for Randomized Complete Block Design (RCBD). Differences between treatment means were determined by Duncan's Multiple Range Test (DMRT).

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. Statistical analysis revealed no significant differences among treatment means. This implies that the application of plant compost did not affect the number of days to emergence.

Days from Emergence to Flowering

The days from emergence to flowering is shown in Table 2. Statistical analysis showed no significant differences among treatments. This implies that the application of plant compost did not affect the days from emergence to flowering.

Table 1. Number of days from sowing to emergence

TREATMENT	MEAN
Control (no fertilizer)	7.00[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	7.00[a]
Spent Mushroom compost, 20 t/ha	7.00[a]
Alnus leaves compost, 10 t/ha	7.00[a]
Vermicompost, 20 t/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)	39.00[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	38.33[a]
Spent Mushroom compost, 20 t/ha	38.33[a]
Alnus leaves compost, 10 t/ha	38.33[a]
Vermicompost, 20 t/ha	38.67[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 significant differences among treatments. Results revealed that plants applied with a handful of chicken dung/holes + 100-100-100 kg NPK/ha significantly had the highest percentage of 90% pod set, but did not differ significantly from the percentage of plant applied with 20 tons/ha spent mushroom compost with a mean of (89.67%). However, these aforementioned treatments differ significantly in the percentage of pod setting obtained in plants without fertilizer with a mean of (70%) and that of plants applied either with 10 t/ha alnus leaves compost or 20 t/ha vermicompost with a common means of 80%.

Days of 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 was observed in the number of days from pod set to seed maturity.

Table 3. Percentage of pod setting

TREATMENT	MEAN (%)
Control (no fertilizer)	70.00[c]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	90.00[a]
Spent Mushroom compost, 20 t/ha	89.67[a]
Alnus leaves compost, 10 t/ha	80.00[b]
Vermicompost, 20 t/ha	80.00[b]

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

Table 4. Days from pod set to seed maturity

TREATMENT	MEAN
Control (no fertilizer)	36.00[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	35.00[a]
Spent Mushroom compost, 20 t/ha	35.33[a]
Alnus leaves compost, 10 t/ha	35.33[a]
Vermicompost, 20 t/ha	35.67[a]

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

Total Number of Pods per Plot

Total number of pods as affected by plant compost is shown in Table 5. Statistical analysis revealed significant differences among treatments. Plants applied with a handful of chicken dung/hole + 100-100-100 kg NPK/ha obtained the highest number of 225.33 pods per plot but did not differ significantly from the number of pods per plot obtained from plant applied with 20 tons/ha spent mushroom compost with a mean of 220.67.

Table 5. Total number of pods per plot

TREATMENT	MEAN
Control (no fertilizer)	99.00[c]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	225.33[a]
Spent Mushroom compost, 20 t/ha	220.67[a]
Alnus leaves compost, 10 t/ha	154.33[b]
Vermicompost, 20 t/ha	102.33[bc]

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

However, these numbers of pods per plot differed significantly from the total number of pods in plants applied either with 10 t/ha alnus leaves compost or 20 tons/ha vermicompost with respective means of 154.33 and 102.33 pods per plot. Plants without fertilizer had the lowest mean number of 99 pods per plot.

This confirmed that an application of different composts could increase the number of pods per plot.

Average Pod Weight per Plant

Average pod weight per plant as affected by the application of plant compost is shown in (Table 6). Statistical analysis revealed no significant difference among treatment means. This implies that the application of the different plant compost did not affect the average pod weight per plant.

Table 6. Average pod weight per plant

TREATMENT	MEAN (g)
Control (no fertilizer)	446[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	524[a]
Spent Mushroom compost, 20 t/ha	522[a]
Alnus leaves compost, 10 t/ha	520[a]
Vermicompost, 20 t/ha	489[a]

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

Average Number of Seeds per Pod

Average number of seeds per pod as affected by the application of plant compost is shown in Table 7. Statistical analysis revealed that application of the different plant compost did not significantly affect the average number of seeds per pod. All plants had almost the same average number of seeds per pod.

Table 7. Average number of seeds per pod

TREATMENT	MEAN
Control (no fertilizer)	7.80[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	7.97[a]
Spent Mushroom compost, 20 t/ha	7.93[a]
Alnus leaves compost, 10 t/ha	7.90[a]
Vermicompost, 20 t/ha	7.87[a]

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

Average Length of Pods

Table 8 shows the average length of pods as affected by the application of plant compost. Results revealed that the plants applied with different plant compost showed significant differences on the pod length over the plants without fertilizer. Plants applied with a handful of chicken dung/hole + 100-100-100 kg NPK/ha obtained the longest pod length of 18.77cm but did not differ significantly from the pod length of plants applied with 20 tons/ha spent mushroom compost with 18.49cm and plants applied with 10 tons/ha alnus leaves compost with 18.18cm. However, all the aforementioned treatments differed significantly from the pod length of plants without fertilizer with a pod length of 17.55cm.

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

Table 8. Average length of pods

TREATMENT	MEAN (cm)
Control (no fertilizer)	17.55[c]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	18.77[a]
Spent Mushroom compost, 20 t/ha	18.49[ab]
Alnus leaves compost, 10 t/ha	18.18[abc]
Vermicompost, 20 t/ha	17.98[bc]

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

Seed Yield per Plot

Table 9 shows the seed yield per plot. Results of the study revealed that fertilization of plant compost significantly increased the seed yield of snap bean variety Black valentine. Plants applied with a handful of chicken dung/hole +100-100-100 kg NPK/ha had produced the highest seed yield of 303.07 g but did not differ from the seed yield of plants applied with 20 tons/ha spent mushroom compost with 288.43 g. Likewise, seed yield of 212.67 g and 200.13 g from plants applied with 10 tons/ha alnus leaves compost and 20 tons/ha of vermicompost did not differ significantly from the seed yield of 20 t/ha spent mushroom compost. While, the seed yield per plot of and plants without fertilizer applied had the lowest mean of 118.87g, respectively.

Table 9. Seed yield per plot

TREATMENT	MEAN (g)
Control (no fertilizer)	118.87[c]
Farmer's practice(a handful of chicken dung/hole)+100-100-100 NPK/ha	303.07[a]
Spent Mushroom compost, 20 t/ha	288.43[ab]
Alnus leaves compost, 10 t/ha	212.67[b]
Vermicompost, 20 t/ha	200.13[b]

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

<u>Weight of 300 Seeds</u>

Table 10 shows the weight of 300 seeds as affected by the plant compost. Statistical analysis showed no significant difference among the treatments. All plants had almost the same on the weight of 300 seed.

Table 10. Weight of 300 seeds

TREATMENT	MEAN (g)
Control (no fertilizer)	86.77[a]
Farmer's practice (a handful of chicken dung/hole) + 100-100-100 NPK/ha	86.67[a]
Spent Mushroom compost, 20 t/ha	86.93[a]
Alnus leaves compost, 10 t/ha	86.67[a]
Vermicompost, 20 t/ha	87.10[a]

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

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

Seed production of Snap bean as affected by plant compost application was studied at Organic Demo farm, Benguet State University, Balili, La Trinidad, Benguet on April 2008 to July 2008.

Following the Randomized Complete Block Design (RCBD), the study was distributed into five treatments with three replications. The different treatments were as follows; C_1 – Control (No fertilizer), C_2 – Farmer's practice (a handful of chicken dung/hole) + 100-100-100 kg NPK/ha, C_3-20 t/ha spent mushroom compost, C_4- 10 t/ha alnus leaves compost and C_5- 20 t/ha vermicompost.

Results of the study revealed that the application of plant composts significantly affected the percentage of pod setting (%), total number of pods per plot, average length of pods (cm) and seed yield per plot. However, no significant effect was observed on the number of days from sowing to emergence, days from emergence to flowering, days from pod set to seed maturity, average pod weight per plot, average number of seed per pod and weight of 300 seeds.

Plants applied with a handful of chicken dung/hole +100-100-100 kg NPK/ha (Farmer's Practice), significantly enhanced the highest percentage of pod setting, total number of harvested pod per plot and seed yield per plots. These observations differ significantly from those taken from plants without fertilizer, but were comparable from plants applied with a 20 tons/ha spent mushroom compost.

Conclusion

Based on the results of the study, application of a handful of chicken dung/hole +100-100-100 kg NPK/ha or 20 ton/ha spent mushroom compost is needed for higher seed yield of snap beans.

Recommendation

It is recommended that the application of plant compost at the rate of 20 tons/ha spent mushroom should be introduced for the farmers to use in the organic seed production of snap bean. Moreover, further study on the different type/kind of mushroom compost for organic legume seed production is also recommended.

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APPENDICES

Appendix Table 1. Number of days from sowing to emergence

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
C1	7	7	7	21	7.00
C2	7	7	7	21	7.00
C3	7	7	7	21	7.00
C4	7	7	7	21	7.00
C5	7	7	7	21	7.00

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F 0.05	0.01
Replication	2	0	0	0	3.84	7.01
Factor A	4	0	0			
Error	8	0	0			
TOTAL	14	0				

Coefficient of variation = 0%

Appendix Table 2. Days from emergence to flowering

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	39	38	40	117	39.00
C2	38	39	38	115	38.33
C3	38	39	38	115	38.33
C4	38	38	39	115	38.33
C5	39	39	38	116	38.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	0.133	0.067	0.47^{ns}	3.84	7.01
Factor A	4	1.067	0.267			
Error	8	4.533	0.567			
TOTAL	14	5.733				

ns= Not significant

Coefficient of variation = 1.95%

Appendix Table 3. Percentage of pod setting (%)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	70	70	70	210	70.00
C2	90	90	90	270	90.00
C3	90	90	80	240	89.67
C4	80	80	80	240	80.00
C5	80	80	80	240	80.00

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	0.133	0.067	3091.00**	3.84	7.01
Factor A	4	824.267	206.067			
Error	8	0.533	0.067			
TOTAL	14	824.933				

**= Highly significant　　Coefficient of variation = 0.32%

Appendix Table 4. Days from pod set to seed maturity

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	36	35	37	108	36.00
C2	35	35	35	105	35.00
C3	35	36	35	106	35.33
C4	35	35	36	106	35.33
C5	35	36	36	107	35.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	0.933	0.467	1.13^{ns}	3.84	7.01
Factor A	4	1.733	0.433			
Error	8	3.067	0.383			
TOTAL	14	5.733				

ns= Not significant

Coefficient of variation = 1.75%

Appendix Table 5. Total number of pods per plot

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	96	126	75	297	99.00
C2	204	249	223	676	225.33
C3	219	225	218	662	220.67
C4	156	108	199	463	154.33
C5	98	109	100	307	102.33

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	246.933	123.467	14.24**	3.84	7.01
Factor A	4	45080.667	11270.167			
Error	8	6329.733	791.217			
TOTAL	14	51657.333				

**= Highly significant Coefficient of variation = 17.54%

Appendix Table 6. Average pod weight per plant (g)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	484	433	420	1337	446
C2	490	562	516	1568	523
C3	489	564	514	1567	522
C4	535	505	520	1560	520
C5	485	472	510	1467	489

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	2	0.040	0.020	3.11^{ns}	3.84	7.01
Factor A	4	1.346	0.336			
Error	8	0.866	0.180			
TOTAL	14	2.252				

ns= Not significant

Coefficient of variation = 6.58%

Appendix Table 7. Average number of seeds per pods

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	7.9	8.1	7.4	23.4	7.80
C2	7.8	7.7	8.4	23.9	7.97
C3	7.5	7.8	8.5	23.8	7.93
C4	8.2	7.8	7.7	23.7	7.90
C5	7.9	7.9	7.8	23.6	7.87

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Replication	2	0.033	0.017	0.08^{ns}	3.84	7.01
Factor A	4	0.049	0.012			
Error	8	1.187	0.148			
TOTAL	14	1.269				

ns= Not significant Coefficient of variation = 4.88%

Appendix Table 8. Average length of pods (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	16.95	18.05	17.65	52.65	17.55
C2	18.3	19.5	18.5	56.3	18.77
C3	18.73	18.6	18.1	55.48	18.49
C4	18.08	18.1	18.3	54.53	18.17
C5	17.75	18.05	18.15	53.95	17.98

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	0.693	0.346	4.78*	3.84	7.01
Factor A	4	2.631	0.658			
Error	8	1.101	0.138			
TOTAL	14	4.425				

*= Significant

Coefficient of variation = 2.04%

Appendix Table 9. Seed yield per plot (g)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	123.4	151.7	81.5	356.6	118.87
C2	283.4	334.00	291.8	909.2	303.07
C3	262.00	314.6	288.7	865.3	288.43
C4	212.2	149.9	275.9	638.00	212.67
C5	200.7	198.9	200.8	600.4	200.13

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	526.661	263.331	10.41**	3.84	7.01
Factor A	4	66456.799	16614.199			
Error	8	12762.872	1595.359			
TOTAL	14	79746.3333				

**= Highly significant

Coefficient of variation = 19.97%

Appendix Table 10. Weight of 300 seeds (g)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	88.8	90.00	81.5	260.3	86.77
C2	90.00	85.00	85.00	260.00	86.67
C3	85.2	85.3	90.3	260.8	86.93
C4	85.00	85.00	90.00	260.00	86.67
C5	85.00	85.00	91.3	261.3	87.10

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Replication	2	6.089	3.045	0.01^{ns}	3.84	7.01
Factor A	4	0.423	0.106			
Error	8	113.037	14.130			
Total	14	119.549				

ns= Not significant

Coefficient of variation = 4.33%