BIBLIOGRAPHY

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ABSTRACT

The study was conducted at Atok, Benguet from September 2012 to January 2013 to determine the growth and yield of sugar beet applied with different organic fertilizers grown under greenhouse condition; identify the best organic fertilizers for sugar beet production; determine the best interaction effect of the different sugar beet varieties and organic fertilizers for sugar beet production; and determine the profitability of sugar beet production applied with different organic fertilizers.

Based from the results of the study, variety Green Top Bunching had higher root diameter and higher yield. All of the organic fertilizers applied are best for sugar beet production.

There were no significant interaction effects of sugar beet varieties and the organic fertilizers for sugar beets production. Application of the different organic fertilizers for sugar beet production was profitable.

Application of any of the organic fertilizer is therefore recommended for sugar beet production. Although, for higher profit, application of mushroom compost in Green Top Bunching variety is recommended.

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is the major sugar crop grown in temperate regions of the world. Along with sugarcane, it produces 70 tons of sugar consumed annually in the world (Johnson *et al*., 1971).

Today, sugar beet is grown in 48 countries throughout the five continents of the world. It is used as a crop to extract sugar, a carbohydrate source that contributes significantly to the flavour, aroma, texture, color and body of a variety of foods. In addition, sugar factories produce dry sugar beet pulp to feed cattle and sheep, and molasses for production of yeast, chemicals, pharmaceuticals, as well as mixed cattle feed. The major producers of sugar from sugar beet are Europe and USA, with Europe responsible for the 45-50% of the world production of sugar from sugar beet. Concerning the world sucrose production, sugar beet has a share of 30% whereas the other 70% are produced from sugar cane (Von *et al*., 2005).

Sugar beet is one of the crops being grown in high elevations. In Cattubo, Atok, Benguet the production of such crops provide better income to farmers. It requires low production cost and commands good price in the market since farmers are growing it organically. Farmers are using garden compost (weeds) as organic fertilizer to improve the physical, biological and chemical properties of the soil. In addition, application of organic fertilizer helps conserve the soil, maintain and sustain crop quality and productivity, and protect the environment. Organic fertilizers maintain if not increase the organic matter level in the soil (PCARRD, 2006).

However, inspite of using the garden compost, yield is not enough (Sacley, 2012). Thus this study will be conducted to evaluate other organic fertilizers for organic sugar beet production and the results will guide the organic vegetable growers including those who want to venture in organic farming. The study will be conducted inside the greenhouse to protect the crop from pesticides and foliar spray in the nearby farms. At the same time it will protect the crop from environment factors that will cause stress and prevent loss of nutrients from heavy rains.

The objectives of the study were to:

1. determine the growth and yield of sugar beets applied with different organic fertilizers grown under greenhouse condition ;

2. identify the best organic fertilizers for sugar beet production;

3. determine the best interaction effect of the different sugar beet varieties and organic fertilizers for sugar beet production; and

4. determine the profitability of sugar beet production applied with different organic fertilizers.

The study was conducted at Cattubo, Atok, Benguet from September 2012 to January 2013.

REVIEW OF RELATED LITERATURE

The Plant

Sugar beet (*Beta vulgaris* L.) a biennial plant that belongs to the family of Chenopodiaceae. It is a highly variable species containing four main groups of agricultural significance: leaf beets (such as Swiss chard), garden beets (such as beetroot), fodder beets and sugar beets. (Von *et al*., 2005).

Sugar beet is a conical, white, fleshy root with a flat crown. Sugar is formed through a process of photosynthesis in the sugar beet's rosette of leaves, the size of which differs according to the sugar beet variety. Sugar beet foliage has a rich, brilliant green color and grows to a height of about 14 inches. The leaves are numerous and broad and grow in a tuft from the crown. Beneath the crown is the cone shape root. The elongated upper part or the root is called the beet. The root tapers down to form a thin taproot, which extend to 0.6 to 12.5 cm into the soil. The long taproot can obtain water that lies far below the ground.

The root weighs for 0.7 to 1.4 kg about 12 - 20% of the weigh is a sugar called sucrose. The root of the beet (taproot) contains 75 percent water and rest is dry matter. The dry matter is about 5 percent pulp and about 75 percent sugar. The by-products of the sugar beet crop such as pulp and molasses add another 10 percent to the value of the harvest (FAO, 2009).

Climatic Requirement

Sugar beet is the crop of temperate and cold climate, with a temperature range of 18 to 45 ^{o}C. It can be grown profitably in almost all parts of the country where such climate exists. Sugar beet requires good sunshine during its growth period with a well distributed rainfall of 300 – 350 mm. This condition favors vegetative growth and for tuber enlargement. Sugar beet can be grown in well drained sandy loam to clay loam soils. Optimum pH range is from 6.5 to 8.0 but it can also grow in saline and alkaline soil. The soils with good organic matter status are more favorable for sugar beet (Bazar, 2002).

Organic Farming

Organic farming is a system devoid of the used of any chemical or genetically modified inputs in which the biological potential of the soil. Organic sources and underground water resource are conserved and protected by adapting suitable cropping pattern including agro forestry and of organic replenishment (Deshmukh, 2010).

A significant amount of research has been undertaken in regard to organic farming and organic practices and their positive impacts. First and foremost, organic agricultural practices result in the lessening and synthetic fertilizers in soil and water. These chemicals remain fixed in soil for years and leach into water system causing further short and long term damage. Additionally, it has been demonstrated twice and again that organic agricultural practices work to lessen soil erosion to a very significant degree (Deshmukh, 2010).

Increasing population levels on a near stabilized agricultural land places a heavy burden on the soil source-particularly its nutrient supplying power. Chemical fertilizers have come to increase the output of an agricultural product and to meet ever increasing demand of human population. The problem is further compounded in several areas due to the excessive use of chemical fertilizers which resulted into considerable deterioration in the quality of indigenous soil. Intensive agriculture with the use of chemical fertilizers in large amount has, no doubt, resulted in manifold increase in the productivity of farm commodities but the adverse effect of these chemicals are clearly visible on soil structure, microflora, quality of water, food, and fodder. Organic farming has emerged as the only answer to bring sustainability to agriculture and environment. Organic farming is a farming integration of biological, cultural and natural inputs including integrated diseases and pest management practices (Panda and Hota, 2007).

Organic Fertilizer

Organic fertilizer are fertilizers made of animal or plant products that have completely decomposed until the original material has become soil-like in texture, and should be free from plant and animal pathogens. Either natural or fortified, organic fertilizer contains at least 20% organic matter (OM) in an oven-dried basis and must be capable of supplying nutrients to plants. All other materials that fall short of these requirements are classified as soil conditioners or amendments (Phil Rice, 2009)

In terms of the end product, such as the quality of plant produced by a commercial greenhouse, organic fertilizers can be quite competitive with traditional synthetic sources.

Compost is an alternative fertilizer offered by organic farming, it is a mixture of decomposed organic materials containing nutrients such as nitrogen, phosphorus and potassium and lots of other minerals (copper, molybdenum, boron, iron, manganese, etc.) released into readily available forms for plant use (La Top MPC, undated).

Effect of Organic Fertilizers on the Soil

Organic fertilizers granulated the soil and improve the structure. With improved structure, the soil became loose better aerated and easier to cultivate (ARF, 2010). Organic fertilizers also improve biological activities on the soil as it increases rapid multiplication of fungi, bacteria, actinomycetes and other soil organisms (PCARRD, 2006).

Experiment has shown that organic fertilizers increase soil aggregation, lower bulk density (compaction) and increase porosity, pH and cation exchange capacity. Organic fertilizers have very important effect in neutralizing aluminum which is the predominant toxic metal in acids soils. They are known to stimulate activities of soil organisms since organic matter is their primary source of carbon and energy (ARF, 2010).

Organic materials are often promoted for improving the physical biological and chemical properties of soils. The claimed improvements in soil physical properties include better soil structure and aggregation improved water holding capacity and better drainage. Such changes in physical properties of well drained aerobic soil can improve the medium for plant growth. Purported benefits of organic materials on soil chemical properties include higher nutrient holding-capacity, and increased ability to resist changes in soil ph (ARF, 2010).

Organic materials effects on the soil are strongly influenced by the nature, their nutrient content, and the process of their decomposition in the soil. They increase soil fertility, balanced supply of nutrient and build up of organic matter. There is a diverse array of organic materials, which can be processed and composted for application in the farm. Most of these are known wastes but some are by-products that can be put to good use by simple processes or treatment such as composting (PCARRD, 2006).

Compost is decomposed organic matter, such as crop residues and/or animal manure. The presence of organic matter in the soil is fundamental in maintaining the soil fertility and decreasing nutrient losses. Increasing soil organic matter improves soil structure, water infiltration, soil aeration, combats compaction and increases the soil's water-holding capacity. In sandy soils, organic matter increases nutrient-holding capacity and is associated with increased organic nitrogen levels that can be mineralized to provide crop nitrogen. Adequate soil organic matter also counters acidification caused by most fertilizers. The associated increases in biological activity and diversity can reduce diseases and pests (Paulin and O'Malley, 2008).

Organic Sugar Beet

Organic sugarbeet is produced in production for organic sugar. Organic sugarbeet is relatively new development, dating back only about 10 years. According to the internationall sugar organization (ISO), organic sugarbeet farming in the world is experiencing a growth rate of 20 to 30 % annually, and it reached about 2,000,000 tons in 2005. In Europe, the british sugar corporation started in 2001 to proccess organic sugarbeet with an initial production of 10,000 t per year. Organic sugarbeet are processed at the beginning of the compaign separate from the normal beets. Organic is used in organic ice cream, jam, baked food, and confectionary (Asadi, 2007).

MATERIALS AND METHOD

An area of $90m^2$ was thoroughly prepared and divided into 24 plots measuring 0.75m x 5m under a tunnel type greenhouse (Figures 1and 2). The factors were considered as treatment and the area was used for organic production of a vegetable crops. Each treatment was laid out following factorial in Completely Randomized Design (CRD) with three replications.

The treatments are as follows:

Factor A	Variety
V_1	Detriot dark red (control)
V_2	Green Top Bunching
Factor B	Organic fertilizer
0_1	Garden compost (control) (1.00%N, 340 P ppm, 925 K ppm)
0_2	Vermicompost (1.37% N, 1.92 % $P_2 0_5$, 1.80 % K_2O)
0_3	BSU Grower compost (2.79 % N, 3.88 $P_2 0_5$, 4.11 % K_20)
04	Mushroom compost (1.00 % N, 160P ppm, 590 K ppm)

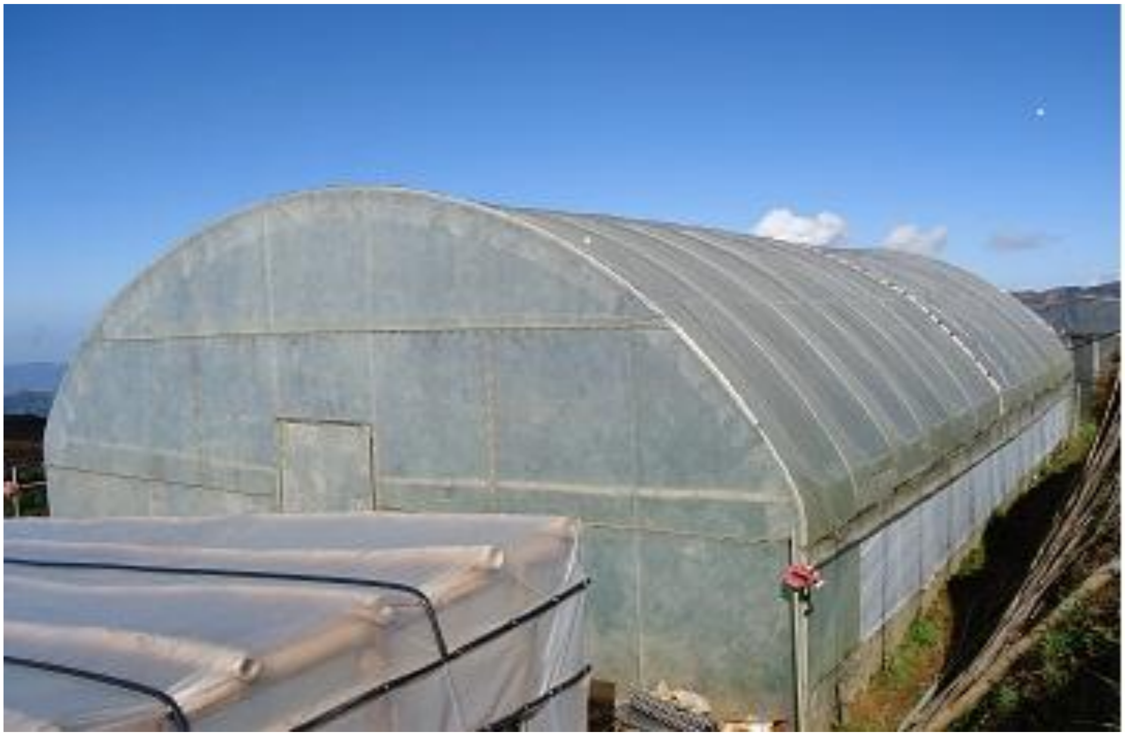

Figure 1. Overview of the tunnel type greenhouse at Atok, Benguet

Figure 2. Overview of the experimental area inside the tunnel type greenhouse at Atok, Benguet

Organic Fertilizer and Application

Garden compost was prepared by collecting weeds and other plant species in the locality. The collected weeds and other plant species were shredded and decomposed for a month applied with effective microorganisms. BSU grower compost was acquired from the farmer at CS Organic Farm. Mushroom compost and Vermicompost were acquired at Benguet State University (BSU). All of the organic fertilizers were applied with the same rate at 3.75 kg/ 3.75 m^2during land preparation (Figure 3).

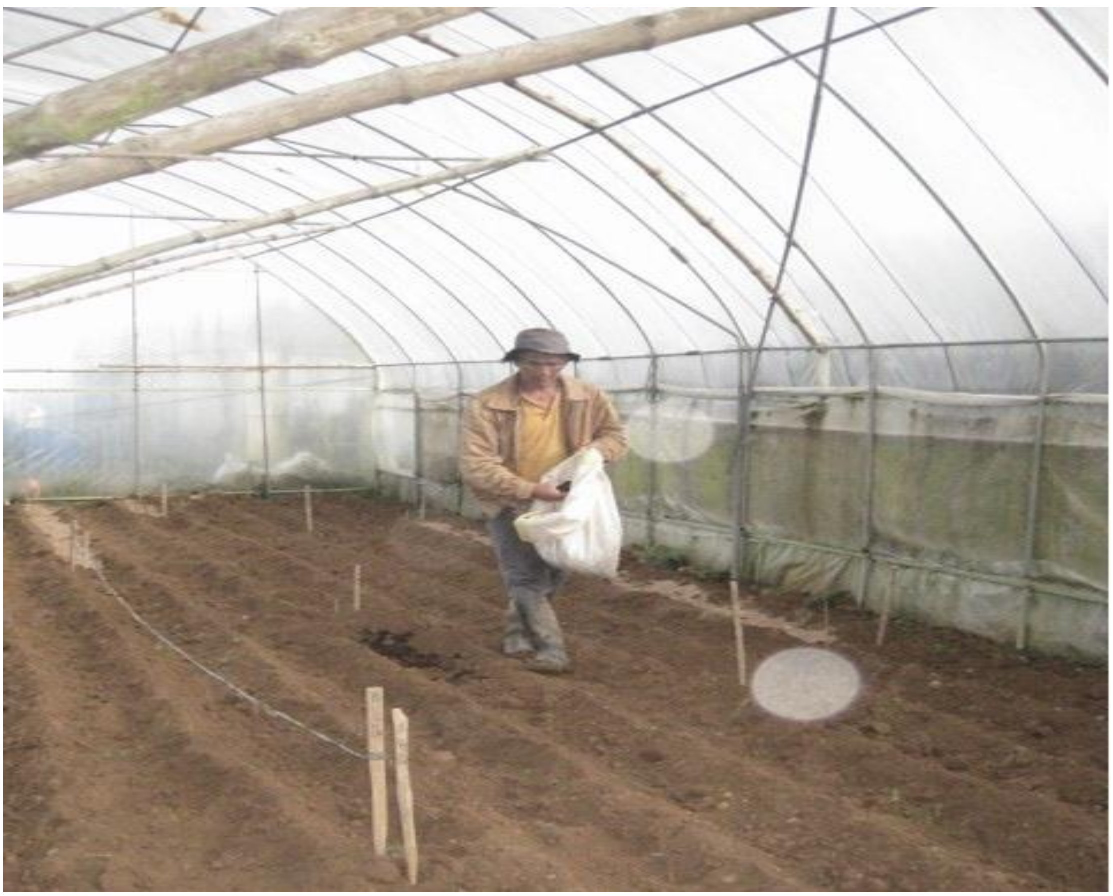

Figure 3. Application of Organic Fertilizer

Planting and Planting Distance

Seeds were sown at a distance of 20 cm between hills and 20 cm between rows at 2 seeds per hill (Figure 4).

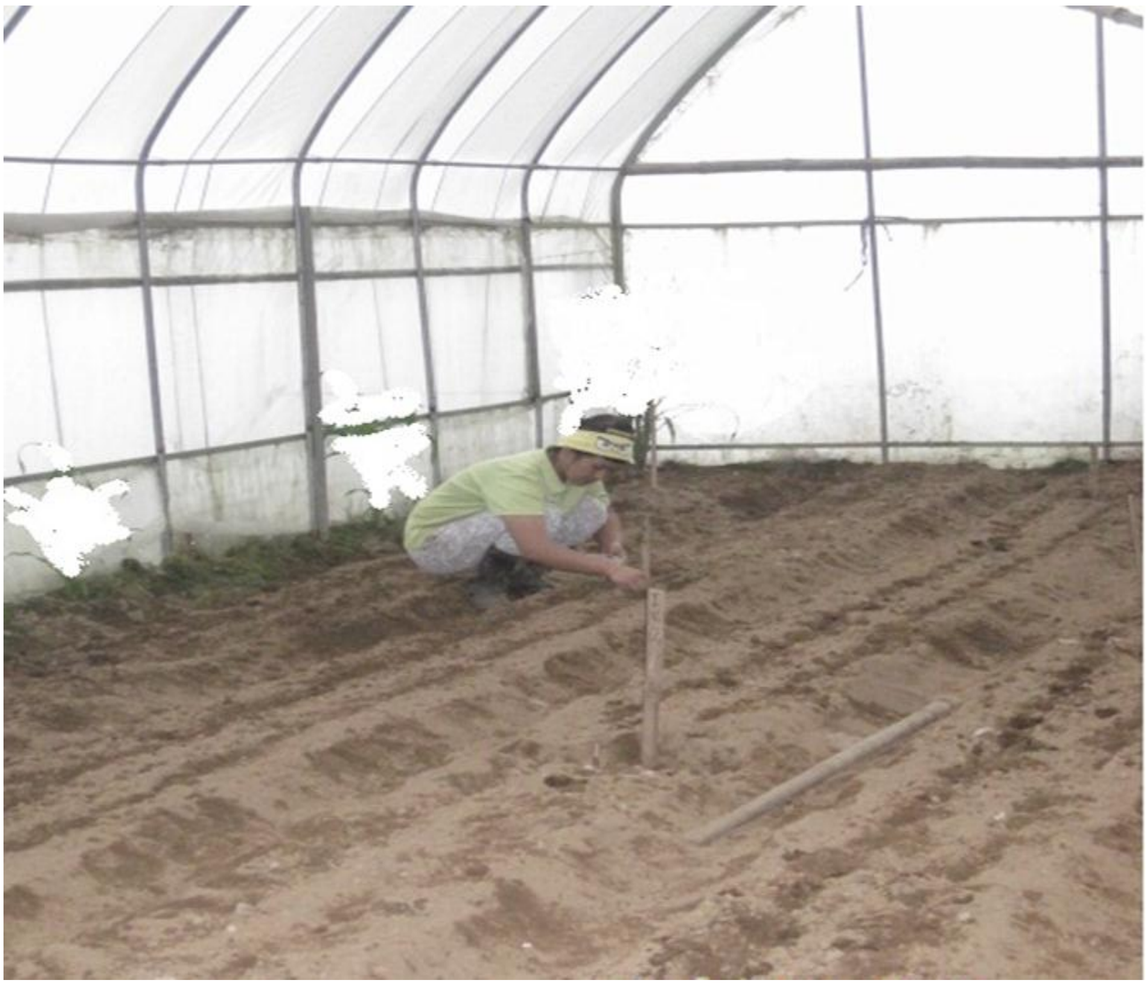

Figure 4. Planting of sugar beet seeds

Cultural Management Practices

Cultural practices such as hilling up (Figure 5), weeding, and irrigation were uniformly done. All other practices were done under organic production system.

Figure 5. Overview of sugar beet plant after hilling-up at 30 DAP

Data Gathered

1. Agro-climatic data. The average monthly temperature, relative humidity, and sunshine duration were recorded every weekend during the conduct of the experiment.

2. Soil analysis. Soil samples were taken before land preparation and after harvest to determine soil chemical properties such as pH, organic matter, nitrogen, phosphorous and potassium content. Soil samples were brought to the Bureau of Soils Pacdal, Baguio City for analysis.

3. Emergence (%). This was computed using the formula:

$$\text{Emergence (\%)} = \text{No. of seedling emerged} - \text{No. of seeds sown} \times 100$$

4. Final height of plant at 120 DAP (cm). Ten sample plants were measured from the base of the leaf petioles to the tip of the leaves at harvest.

5. Root length (cm). The length of the ten sample roots were measured using a root rule from the base to the tip of the root.

6. Root diameter (cm). The diameter of ten sample roots were measured at the mid-section with a vernier caliper.

7. Number and weight of marketable yield (kg). This was obtained by counting and weighing the saleable roots with no defects.

8. Computed yield (tons/ha). This was taken based on the total weight of the marketable roots per plot in the different treatment using the formula:

$$\text{Yield (ton/ha)} = \frac{\text{Total Weight per Plot}}{\text{Plot size (m}^2\text{)}} \times 10{,}000/1{,}000$$

9. Return on Investment (ROI). This was computed using the formula:

$$ROI = \frac{\text{Net profit}}{\text{Total cost of production}} \times 100$$

10. Sugar content (°brix). Juice was extracted from grated sugar beet roots. The sample roots was divided into three; base, middle and tip. The sugar content of each part was taken using refractrometer.

11. Dry matter content (%). Thirty grams of sample sugar beet roots were sliced into cubes, weighed, and oven dried at 70°C for 72 hours. Dry matter content was taken using the following formula:

$$\%\ \text{dry matter content} = 100\% - MC$$

$$\text{Where: } \%\ \text{moisture} = \frac{\text{Fresh weight} - \text{Oven dry weight}}{\text{Fresh weight}} \times 100$$

Data Analysis

All quantitative data were analyzed using the analysis of variance (ANOVA) for factorial in Completely Randomized Design (CRD) with three replications. The significance of difference between treatment means was analyzed using Duncan`s Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Agro-climatic Data

Monthly mean temperature, relative humidity and light intensity during the conduct of the study from September 2012 to January 2013 are shown in Table 1. Highest temperature (37.58^{o}C) was recorded during the month of October while the lowest temperature (8.3^{o}C) was recorded during the month of January. The temperature is within the range that favors the growth of sugar beet. Relative humidity was recorded in the morning and afternoon with a reading ranges from 42% to 99% and light intensity ranged from 1041.00 to 1973 Fc.

Table 1. Temperature, relative humidity, and light intensity during the conduct of the study

MONTH	TEMPERATURE (˚C)		RELATIVE HUMIDITY (%)		LIGHT INTENSITY (Fc)
	MIN	MAX	Am	Pm	
September	14.70	36.15	74.00	94.00	1474.00
October	12.12	37.58	72.00	88.00	1415.00
November	11.97	30.00	78.00	86.00	1041.00
December	10.15	28.62	69.00	99.00	1129.00
January	8.30	33.20	42.00	95.00	1973.00

Soil Chemical Properties

As shown in Table 2, there is a slight soil pH decreased after harvesting from 7.01 to 6.82. The decreased could be due to the effect of the organic fertilizer. According to Bazar (2002), the optimum pH that favors the sugar beet is from 6.8 to 8.0. The percent organic matter (OM) and nitrogen also decreased in all the soil applied with different organic fertilizers. Decreased could be due to the nutrient uptake by the plant. There was an increased on the phosphorous and potassium content of the soil applied with different organic fertilizer after harvest. Soil from plots applied with BSU grower compost was noted to have the highest increased. This could be due to the high phosphorus and potassium content of the BSU grower compost.

Table 2. Soil Chemical Properties before planting and after harvesting

	pH	ORGANIC MATTER (%)	NITROGEN (ppm)	PHOSPHORUS (ppm)	POTASSIUM (ppm)
Before planting	7.01	8.00	0.40	90.00	480.00
After planting					
Garden compost	6.88	4.00	0.20	490.00	1500.00
Vermicompost	6.83	4.00	0.20	490.00	1460.00
BSU grower compost	6.94	4.50	0.23	620.00	2060.00
Mushroom compost	6.82	4.50	0.23	490.00	1320.00

The data were analyzed at the Soils Laboratory Department of Agriculture Pacdal, Baguio City

Emergence and Final Height at 120 DAP

Effect of variety. Results showed no significant differences on the plant emergence and final height at 120 DAP of the two varieties tested. Numerically, Green Top Bunching had the highest percentage emergence of 94.17 and final height of 80.25 (Table 3 and Figure 6).

Effect of organic fertilizer. There were no significant differences observed on the percentage emergence and final height at 120 DAP of the sugar beet applied with the different organic fertilizers as shown in Table 3.

Table 3. Emergence and final height at 120 DAP of sugar beets applied with organic under greenhouse condition

TREATMENTS	EMERGENCE (%)	FINAL HEIGHT (cm) 120 DAP
Variety (V)		
Detriot Dark Red	93.75	79.52
Green Top Bunching	94.17	80.25
Organic Fertilizer (OF)		
Garden compost (control)	93.83	79.26
Vermicompost	94.83	79.94
BSU grower compost	95.00	79.88
Mushroom Compost	92.17	80.44
V x OF	ns	ns
CV%	2.41	5.22

Means with common letter are not significantly different at 5% level of significance

Figure 6. Overview of the sugar beet at maturity

Interaction effect. No significant interaction effect was noted between the sugar beet varieties and organic fertilizers on the emergence and final height at 120 DAP.

Pest and Disease Incidence.

There were no pest and diseases observed during the conduct of the study. The absence could be due to the controlled environment.

Root Length and Diameter

Effect of variety. No significant differences were noted on the root length of the two varieties evaluated. However, Green Top Bunching was significantly had the higher root diameter of 7.97cm compared to Detriot Dark Red with a diameter of 7.93cm as presented in Table 4. The significant differences on root diameter of the two varieties could be due to their genetic characteristics.

Effect of organic fertilizer. There were no significant differences observed on the root length and diameter of sugar beets applied with different organic fertilizers (Table 4). The root length ranged from 15.33cm to 15.87cm and root width ranged from 7.28 cm to 7.85cm. According to Bennett *et al* (1983), root of sugar beet crop grows at a height of more than 61 to 122cm.

Table 4. Root length and diameter of sugar beets applied with organic fertilizers under greenhouse condition

TREATMENTS	ROOT	
	LENGTH (cm)	DIAMETER (cm)
Variety (V)		
DetriotDark Red	15.61	7.23[b]
Green Top Bunching	15.71	7.97[a]
Organic Fertilizer (OF)		
Garden compost (control)	15.63	7.58
Vermicompost	15.87	7.85
BSU grower compost	15.80	7.28
Mushroom Compost	15.33	7.69
V x OF	ns	ns
CV%	9.44	8.02

Means with the same letter are not significantly different at 5% level of significance

Interaction effect. No significant interaction effect between the sugar beet varieties and the different organic fertilizers on the root length and diameter of sugar beets.

Number of Marketable Yield

Effect of variety. Results showed that there were no significant differences on the number of marketable yield of the two varieties evaluated. Green Top Bunching was noted to produced the greater number of marketable yield (Table 5).

Effect on organic fertilizer. There were no significant differences on the number of marketable yield of sugar beet applied with different organic fertilizers (Table 5). The most number of roots harvested were obtained from sugar beets applied with Garden compost.

Interaction effect. No significant interaction effect noted between the sugar beet varieties and organic fertilizers on the number of marketable yield.

Weight of Marketable and Computed Yield

Effect of variety. As shown in Table 5 and Figure 7, there were no significant differences observed on the weight of marketable and computed yield of the two sugar beet varieties. Numerically, Green Top Bunching had the higher marketable yield of 10.91 kg / 3.75 m^2 and computed yield of 31.10 t/ha.

Effect of organic fertilizer. No significant differences were noted on the weight of marketable yield and computed yield of sugar beet applied with different organic fertilizers. Sugar beet applied with BSU grower compost was noted to produced the heaviest yield (12.02 kg/3.75m^2) and computed yield (32.05 t/ha).

Interaction effect. No significant interaction effect was noted between the varieties and organic fertilizers on the weight of marketable yield and computed yield of sugar beet (Table 5).

Table 5. Number and weight of marketable yield and computed yield sugar beets applied with organic fertilizers under greenhouse condition

TREATMENTS	MARKETABLE YIELD		COMPUTED YIELD (t/ha)
	NUMBER	WEIGHT (kg / 3.75 m^2)	
Variety (V)			
Detriot Dark Red	48	10.86	28.97
Green Top Bunching	50	10.91	31.10
Organic Fertilizer (OF)			
Garden compost (control)	50	9.40	29.08
Vermicompost	49 49	10.63	28.35
BSU grower compost	49	12.02	32.05
Mushroom Compost	49	11.49	30.65
V x OF	ns	ns	ns
CV%	3.08	23.62	15.78

Means with the same letter are not significantly different at 5% level of significance

Garden Compost

Vermicompost

BSU grower compost

Mushroom compost

Roots harvested from Detriot Dark Red applied with different fertilizers

Garden Compost

Vermicompost

BSU grower compost

Mushroom Compost

Roots harvested from Green Top Bunching applied with different fertilizers

Figure 7. Sample roots harvested from sugar beet varieties applied with different organic fertilizer

Dry Matter Content (%)

Effect of variety. No significant differences were noted on the dry matter content of the two sugar beet varieties. Green Top Bunching had the higher dry matter content with a mean of 8.06 % as shown in Table 6.

Effect of organic fertilizer. There were no significant differences observed on the dry matter content of sugar beet varieties applied with different organic fertilizers. Numerically, sugar beet applied with Mushroom compost had the highest dry matter content of 8.90 % followed by 7.78% sugar beets applied with BSU growers compost (7.78%).

Interaction effect. No significant interaction between the sugar beet varieties and organic fertilizers on the dry matter content of sugar beet roots.

Sugar Content (^{o}brix)

Effect of variety. Results showed that there were no significant differences on the sugar content of the two varieties. Green Top Bunching had the higher sugar content on the base (9.88^{o}brix) and middle portion (7.63^{o}brix) of the sugar beet root while Detriot Dark Red had the higher sugar content at the tip portion of sugar beet root (7.50^{o}brix).

Effect of organic fertilizer. There were no significant differences on the sugar content of sugar beets applied with different organic fertilizers. The sugar content of the base portion ranged from 6.77 to 10.00 ^{o}brix, while the middle portion ranged from 5.83 to 7.95 ^{o}brix, and tip portion ranged from 6.00 to 10.18^{o}brix.

Table 6. Dry matter content of sugar beets applied with organic fertilizers under greenhouse condition

TREATMENTS	DRY MATTER CONTENT (%)
Variety (V)	
Detriot Dark Red	7.50
Green Top Bunching	8.06
Organic Fertilizer (OF)	
Garden compost (control)	7.22
Vermicompost	7.22
BSU grower compost	7.78
Mushroom Compost	8.90
V x OF	ns
CV%	14.77

Means with the same letter are not significantly different at 5% level of significance

Sugar content of sugar beet ranged from 12 to 20 % (FAO, 2009), reduction of sugar on sugar beet could be due to high availability of nutrient during the growing period. According to Blumenthal (2002), abundant nitrogen favored root growth but results to less sugar stored in the roots of sugar beets.

Interaction effect. No significant interaction effect between the sugar beet varieties and organic fertilizers on the sugar content of sugar beet root.

Table 7. Sugar content of sugar beet root from the base, middle, and tip portion of sugar beets applied with organic fertilizers under greenhouse condition

TREATMENTS	SUGAR CONTENT (ºbrix)		
	BASE	MIDDLE	TIP
<u>Variety (V)</u>			
Detriot Dark Red	9.88	7.62	7.18
Green Top Bunching	7.06	6.41	7.50
<u>Organic Fertilizer (OF)</u>			
Garden compost (control)	9.65	6.42	6.68
Vermicompost	10.00	7.85	10.18
BSU grower compost	6.77	5.83	6.50
Mushroom Compost	7.45	7.95	6.00
V x OF	ns	ns	ns
CV%	26.58	26.96	27.43

Means with the same letter are not significantly different at 5% level of significance

<u>Cost and Return Analysis</u>

The return on investment of sugar beet applied with different organic fertilizers as shown in Table 8. Green top bunching variety applied with mushroom compost was noted to have the highest return on investment (ROI). High ROI could be attributed to high marketable yield produced. All treatments appeared to have high return on investment.

Table 8. Return on Investment of sugar beets applied with organic fertilizer under greenhouse condition

TREATMENT	YIELD (kg /11.25 m^2)	GROSS SALE (PhP)	TOTAL COST OF PRODUCTION (PhP)	NET PROFIT	ROI (%)
Detrior Dark Red					
Garden compost(control)	32.93	2305.10	1700.00	605.10	35.59
Vermicompost	31.76	2223.20	1812.50	410.70	22.66
BSU grower Compost	35.03	2452.10	1700.00	752.10	44.24
Mushroom Compost	30.60	2142.00	1677.80	464.20	27.68
Green Top Bunching					
Garden compost (control)	32.49	2274.30	1700.00	574.30	33.78
Vermicompost	32.04	2242.80	1812.50	430.30	23.74
BSU grower Compost	37.09	2596.30	1700.00	896.30	52.72
Mushroom Compost	38.33	2683.10	1677.80	2255.30	59.92

*total expenses include seeds, fertilizers, labor and depreciation cost of the greenhouse
*sugar beet roots were sold at PhP 70/kg

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study was conducted at Atok, Benguet from September 2012 to January 2013 to determine the growth and yield of sugar beet applied with different organic fertilizers grown under greenhouse condition; identify the best organic fertilizers for sugar beet production; determine the best interaction effect of the different sugar beet varieties and organic fertilizers for sugar beet production; and determine the profitability of sugar beet production applied with different organic fertilizers.

Significant differences were observed on root diameter of the two varieties. Green Top Bunching had higher root diameter compared to Detriot Dark Red.

No significant differences observed on the effect of organic fertilizers on the growth and yield of sugar beet.

There were no significant interaction effect observed on sugar beet varieties and organic fertilizers in all the parameters gathered.

All the plants applied with organic fertilizers have positive ROI. The highest ROI was obtained from Green Top Bunching applied with mushroom compost.

Conclusions

Based from the results of the study, Green Top Bunching variety had the higher root diameter and higher yield. All the organic fertilizers were best for sugar beet production.

There were no significant interaction effects of sugar beet varieties and the organic fertilizers. However, higher profit was obtained on Green Top Bunching applied with mushroom compost.

Application of any of the organic fertilizers on sugar beet is profitable.

Recommendations

Green Top Bunching variety is recommended for sugar beet production and organic production system in Cattubo, Atok, Benguet. Applications of any of the organic fertilizers are recommended for sugar beet production. For higher profit, application of Mushroom compost on Green top bunching is recommended.

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