BIBLIOGRAPHY

OCBUS, JUDELYN T. APRIL 2012. Performance of Lettuce (*Lactuca sativa* L) Cv. Great Lakes XL as Affected by Different Concentrations of Vermitea. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

Growth and yield response to varying vermitea concentrations and farmer's practice (application of chicken dung and complete fertilizer) on 'Great Lakes XL' lettuce were evaluated in December 2011 to February 2012 at the Horticulture Experimental area, Benguet State University, La Trinidad, Benguet. Economic Analysis of growing the crop as affected by the treatments was also done.

Results of the study showed that lettuce crops applied with 100% vermitea were significantly heavier (0.276 kg/head) and bigger in size (49.60cm in diameter) and with more marketable yield of 7.43 kg per $5m^2$ plot. In terms of profitability, the highest return on cash expenses of P1.21 was obtained from plants produced through the farmers practice of applying 100-100-100 kg/ha N-P-K. However, for organic production of lettuce, 100% vermitea is recommended.

RESULTS AND DISCUSSION

Marketable, Non-marketable, Total and Computed Yield

Table 1 shows that plants applied with 100% vermitea significantly effected the highest marketable, non-marketable, total and computed yield per hectare at 7.43 kg/5m^2 and 9.39 kg/5m^2 or 14.86 t/ha, respectively. The results, however, are comparable to the plants applied with the farmer's practice of applying 100-100-100 kg/ha N-P-K.

Non-marketable yield was not significantly affected by the different fertilizer treatments. These findings imply that vermitea has a contributory effect on the yield of lettuce.

This result is attributed to the high nutrient content of vermicompost. It was cited by Jensen (2001) that the castings contain five times the available nitrogen and seven times the available potash of the top soil. Therefore, castings are supplied with available nutrients. Likewise, it was stated by De La Cruz (2009) that slow release of nutrients from organic fertilizers minimize nutrient losses resulting to efficient uptake by the crops that leads to higher yield. Aside from its nutrient supplying capacity, vermicompost has excellent structure, aeration and high water holding capacity. These conditions of the soil are favorable for crop growth and development.

Table 1. Marketable, non-marketable, total and computed yield of lettuce as affected by different concentrations of vermitea

CONCENTRATION OF VERMITEA (%)	YIELD (kg.) MARKETABLE	NON-MARKETABLE	TOTAL	COMPUTED (t/ha)
100	7.43[a]	1.96[a]	9.39[a]	14.86[a]
75	5.60[bc]	2.00[a]	7.60[bc]	11.21[bc]
50	6.60[abc]	2.00[a]	8.60[ab]	13.20[abc]
25	5.24[c]	2.12[a]	7.35[bc]	10.47[c]
tap water only	3.74[d]	2.25[a]	5.99[c]	7.47[d]
Farmer's Paractice (100-100-100 kg/ha N-P-K)	7.07[ab]	2.25[a]	8.85[ab]	14.13[ab]

Means with common letters are not significant at 5% level by DMRT

Average Head Weight and Size

The application of 100% vermitea significantly produced heavier weight of individual heads of lettuce (0.276 kg/head) and bigger heads (49.60 cm in diameter) as presented in Table 2. It was consistently observed that there was a corresponding decrease in the weight and size of individual plants as the concentration of vermitea was decreased. This could be due to the decreased amount of nitrogen as the concentration of vermitea was decreased.

Nitrogen is critical to the growth and health of a plant. It is part of the chlorophyll, the green pigment of the plant that is responsible for photosynthesis. Nitrogen helps plant with rapid growth, increasing seed and fruit production and improving the quality of leafy crops. Without it, plants are weaker and smaller than they should be (Cavender et.al,

Table 2. Average head weight and size of lettuce as affected by different concentrations of vermitea at harvest

CONCENTRATION OF VERMITEA (%)	HEAD WEIGHT (kg)	HEAD SIZE (cm)
100	0.276[a]	49.60[a]
75	0.224[bc]	42.23[c]
50	0.253[abc]	48.30[ab]
25	0. 216[cd]	43.57[bc]
tap water only	0. 176[d]	41.00[c]
Farmer's Parctice (100-100-100 kg/ha N-P-K)	0. 264[ab]	45.83[abc]

Means with common letters are not significant at 5% level by DMRT

2001). Lagman (2003) found that organic matter of vermicompost supplies the Nitrogen required for plant growth. It serves as an energy source for micro floral and micro faunal organisms. The worm produces pounds of nitrogen during the decomposition process. This nitrogen was utilized by the crop during the growing period.

Bacterial Soft Rot and Cutworm Infestation

As shown in table 3, there were slight incidence of bacterial soft rot and cutworm infestation and there were no significant differences among the treatments.

Bacterial soft rot is a common disease caused by a soil dwelling bacteria. It does not appear to survive in the soil but can survive on plant debris. Infected plant tissues first develop a water-soaked lesion that enlarges rapidly in diameter and depth. The affected area becomes soft and mushy and generally turns a dark color in advanced stages of disease

development. Rainfall and high temperatures enhance infection in the field. Soft rot bacteria can grow over a temperature range of 5-37°C and with an optimum temperature of about 22°C. Cutworms are oil-dwelling nocturnal caterpillars of several moths, which eat plant roots. The worst damage is done to young plants with tap roots wherein lettuce suffers especially badly. The cutworms eat the stem or just below the soil surface. The plant eventually collapses, but by then the cutworm is attacking another plant. This can happen suddenly, but early warning signs are wilting and stunted growth. In fact, they often work along rows, killing one plant after another (Lettuce Pest Guide, 2011).

Vermitea helps fight plant diseases. The high concentrations of humus in vermitea help to prevent harmful plant pathogens, fungi, nematodes and bacteria. It also suppresses diseases such as club root and white rot. The beneficial microbes present in vermitea has been found to bring natural fungal disease-suppressant qualities when sprayed onto the leaves of plants (Duchock, 2011)

Economic Analysis

The different total yields and costs of farm inputs had resulted to the differences in net income and return of expenses from the different concentrations of vermitea application (Table 4). The farmers practice of applying 100-100-100 kg/ha N-P-K has significantly produced higher return on cash expenses. Comparatively lower ROCE was noted with the application of vermitea. This was mainly due to the high cost of vermicast used in the experiment.

In contrast, the costs associated with organic production are relatively stable, predictable and comparative to conventional agriculture, according to Stonehouse (2000). The main areas of cost identified were inputs and labor. Most farmers reported that the cost

of inputs (composts, feeds, soil amendments etc.) is fairly constant. Because organic farming excludes the use of chemical fertilizers, pesticides, herbicides and fungicides, the total cost of inputs used is generally lower than in conventional production.

Table 3. Incidence of bacterial soft rot and cutworm infestation rating as affected by different vermitea concentrations

CONCENTRATION OF VERMITEA (%)	BACTERIAL SOFT ROT	CUTWORM
100	2.00	2.33
75	2.00	2.33
50	2.00	2.33
25	2.33	2.00
tap water only	2.67	2.67
Farmer's Practice (100-100-100 kg/ha N-P-K)	2.33	2.33

Means with common letters are not significant at 5% level by DMRT

Rating

a. Disease Infection

Scale	Description
1	No disease
2	(1-19%) Slight incidence
3	(20-39%) Moderate Incidence
4	(40% or more) Severe Incidence

b. Insect Infestation

Scale	Description
1	No Infestation
2	(1-19) Slight Infestation
3	(20-39%) Moderate Infestation
4	(40% or more) Severe Infestation

Table 4. Return on Cash Expenses (ROCE) from lettuce per $90m^2$ as affected by different concentrations of vermitea.

ITEMS	CONCENTRATIONS OF VERMITEA					
	T_1	T_2	T_3	T_4	T_5	T_6
Sales						
@ P20/kg. small size	-	-	-	-	11.21	21.20
@P45/kg. Big sized	22.29	-	-	-	-	-
@P 30/kg medium sized	-	16.81	19.80	15.71	-	-
TOTAL SALES (P)	1,003.05	504.3	594	471.3	224.2	636
Farm Inputs						
Seeds	50	50	50	50	50	50
Bio-organic Fertilizer	3.33	3.33	3.33	3.33	3.33	3.33
Vermicast	450	337.50	225	112.50	-	-
Urea	-	-	-	-	-	9.07
Triple-14	-	-	-	-	-	32.13
Labor						
Land Preparation	66.67	66.67	66.67	66.67	66.67	66.67
Planting	16.67	16.67	16.67	16.67	6.67	16.67
Irrigation	14.5	14.5	14.5	14.5	14.5	14.5
Weeding	8.33	8.33	8.33	8.33	8.33	8.33
Treatment Application	6.33	6.33	6.33	6.33	6.33	6.33
Harvesting	50	50	50	50	50	50
Expenses (P)	695.83	583.33	470.83	358.33	239.50	287.03
Net Income(P)	307.22	-79.33	123.17	112.97	-15.3	348.97
ROCE (%)	44.15^b	-13.60^c	26.16^b	31.52^b	-6.39^c	121.58^a
Rank	2	6	4	3	5	1

Area: $90m^2$ = 600 plants

Legend:
T_1 - 100 % vermitea
T_2 - 50% vermitea
T_3 - 50% vermitea
T_4 - 25% vermitea
T_5 - Water Only
T_6 - 100-100-100 kg/ha N-P-K (Farmers Practice)

Table 5. Meteorological Data from December 26, 2011 to February 17, 2012

MONTH	RAINFALL (mm)	RELATIVE HUMIDITY (%)	TEMPERATURE (^oC) MINIMUM	MAXIMUM	SUNSHINE DURATION (hrs.)
December	0.72	86.90	25.7	16.1	3.79
January	1.4	83.63	24.15	13.1	4.95
February	3.4	86.6	23.9	10.7	4.77
MEAN	1.84	85.71	24.58	13.3	4.50

Meteorological Data

Table 5 shows the meteorological data from December 26, 2011 to February 17, 2012 which was taken at the BSU-PAG-ASA station. During the conduct of the experiment, Rainfall has a mean of 1.84mm; Relative Humidity at 85.71%, sunshine duration at 4.50 hours and minimum and maximum temperature at 13.3^0C and 24.58^0C, respectively.

Lettuce grows well in an environment with a relative humidity of 65-85% with an optimum temperature of 15-18^oC. Hot conditions of greater than 27^oC causes the plants to produce flower shoot, commonly known as bolting and also causes the accumulation of the bitter latex in the veins which may cause the plants to turn bitter in taste and the leaves to became tough. Meanwhile, cool temperature causes lettuce to have compact and large heads. Direct sunshine with duration of 2-4 hours a day is perfect for growing lettuce. As the rule of the thumb, plants where the edible part is the leaf (like lettuce) will need less light than if the edible part is the flower or fruit (like broccoli). Vegetable plants also need 1-2 inches of water each week. Too little water will not let the plants grow deep and strong enough to gather nutrients for good growth while too much water will saturate the soil, not

allowing the plant and space needed for growth. Lettuce has a relatively high water requirement. Soil moisture and rainfall shortage will surely stunt growth and head quality (Sanders, 2001).

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Horticultural Experimental Area, Benguet State University, La Trinidad, Benguet from December 2011 to February 2012 to evaluate the performance of lettuce as affected by vermitea application, determine the best concentration of vermitea that will promote or enhance the growth and yield of lettuce and to determine the cost and return analysis of using vermitea in lettuce production.

Results of the study showed that the lettuce plants applied with 100% vermitea significantly produced heavier (0.276 kg./head) and bigger heads (49.60 cm in diameter) which was followed by those produced through farmers practice of applying 100-100-100 kg/ha N-P-K. Decreased measurements in terms of marketable and total yield per $5m^2$, computed yield per hectare and in net income was observed with decreasing concentrations of vermitea.

In terms of profitability, the highest ROCE of 121.58% was obtained from plants applied with farmers practice at a rate of 100-100-100 kg/ha N-P-K followed by 100% vermitea application at 44.15 %.

Conclusion

Based from the results presented and discussed, it is inferred that the application of 100% vermitea to lettuce significantly increased the head weight and size of individual plants but the farmers practice of applying 100-100-100 kg/ha N-P-K still yielded the highest ROCE at 121.58 %.

Recommendation

In terms of conventional farming, it is recommended to follow the farmer's practice of applying 100-100-100 kg/ha N-P-K for lettuce production. However, for organic production of lettuce, 100% vermitea is recommended.

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