BIBLIOGRAPHY

ALFONSO, HENRILYN P. APRIL. 2013. Growth and Yield of Chinese cabbageCv. Green Cool as affected by different organic fertilizer. Benguet State University, La Trinidad Benguet.

Adviser: Franklin G.Bawang, MsC

ABSTRACT

The study was conducted at Balili Organic Farm, Benguet State University, La Trinidad Benguet from October 2012 to January 2013 to evaluate the growth and yield of Chinese cabbage applied with different organic fertilizers, determine the best organic fertilizer suitable for Chinese cabbage and determine the economics of chinese cabbage production as affected by different organic fertilizer.

Result revealed that there were no significant differences among treatments on the days from transplanting to harvesting, However, the application of Yama BYM or Bioganic significantly increased head length, head equatorial circumference, percentage of heading, marketable and total yield per plot and computed yield per hectare from which higher return of investments at 381.53 % and 354.64 %, respectively were derived.

RESULTS AND DISCUSSION

Number of Days from Transplanting to Harvesting

Table 1 shows the number of days from transplanting to harvesting. There were no significant differences in the number of days from transplanting to harvesting as affected by the different organic fertilizer applied. However, numerical data shows that plants with no fertilizer applied had the longest number of days from transplanting to harvesting with a mean of 66.75 followed by the plants applied with PCM, cattle manure, cocodust compost, and vermicompost with a of 66 of days, while Yama BYM and mushroom compost having a mean of 65.25 of days followed by bioganic had the least number of days of 64.50 to reach the harvesting stage from transplanting.

Table 1. Number of days from transplanting to harvesting of Chinese cabbage

TREATMENT	MEAN (Days)
Control (No fertilizer application)	66.75[a]
Bioganic	64.50[a]
PCM	66.00[a]
Yama BYM	65.25[a]
Cattle manure	66.00[a]
Cocodust compost	66.00[a]
Mushroom compost	65.25[a]

Means with the same letter are not significantly different at 5% level using DMRT

Head Length

The result in Table 2 shows significant statistical difference of the head length as influenced by the various organic fertilizers. Plants applied with Yama BYM significantly had the longest head length of 27.90 cm followed by the plants applied with bioganic and PCM with mean of 26.83 and 25.80 cm, respectively. It was followed further by plants applied with cattle manure with a mean of 23.75cm and cocodust compost (23.30cm).The plants applied with mushroom compost with a mean of 21.50cm, had the shortest length but statistically comparable to the plants applied with vermicompost as well as the plants without fertilizer applied.

Table 2. Head length (cm) of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	20.73[d]
Bioganic	26.63[b]
PCM	25.80[b]
Yama BYM	27.90[a]
Cattle manure	23.75[c]
Cocodust compost	23.30[c]
Mushroom compost	21.50[d]
Vermicompost	21.00[d]

Means with the same letter are not significantly different at 5% level using DMRT

Head Equatorial Circumference

There were significant differences observed on the head equatorial circumference as shown in Table 3. The application of Yama BYM induced the production of wider head circumference with a mean of 33.90cm followed by the application of bioganic (33.10 cm), PCM (31.15 cm), cattle manure (23.00 cm), vermicompost (22.73 cm), cocodust compost (22.50 cm), mushroom compost (21.80 cm). The plants in the control treatment or with no fertilizers applied were observed as having the least equatorial circumference with a mean of 21.10 cm.

Table 3. Head equatorial circumference (cm) of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	21.10[f]
Bioganic	33.10[b]
PCM	31.15[c]
Yama BYM	33.90[a]
Cattle manure	23.00[d]
Cocodust compost	22.50[d]
Mushroom compost	21.80[e]
Vermicompost	22.73[d]

Means with the same letter are not significantly different at 5% level using DMRT

Head Compactness

Table 4 shows the compactness of heads as affected by different organic fertilizers used in the study. Plants applied with Yama BYM and bioganic was observed to have significantly the most compact heads of 2.45 and 2.40 cm respectively, followed by the plants applied with PCM having the mean of 1.70cm, but are statistically comparable to the plants applied with vermicompost (1.65 cm), cattle manure (1.50 cm), cocodust compost (1.45 cm) and mushroom compost (1.45 cm). The control or plants with no fertilizer applied had the least compact heading with a mean of 1.40 cm.

Table 4. Head compactness of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	1.40^{c}
Bioganic	2.40^{a}
PCM	1.70^{b}
Yama BYM	2.45^{a}
Cattle manure	1.50^{bc}
Cocodust compost	1.45^{bc}
Mushroom compost	1.45^{bc}
Vermicompost	1.65^{bc}

Means with the same letter are not significantly different at 5% level using DMRT

Scale	Description
1	Soft, loose heads
2	Slightly compact
3	Compact

Percentage of Heading

There were significant statistical differences noted on the percentage of heading as affected by the application of fertilizers (table 5). Plants applied with Yama BYM significantly had highest percentage of heading with a mean of 90.83 followed by the plants applied with bioganic (84.17), PCM (72.50), vermicompost (46.67), cocodust compost (29.17), cattle manure (27.50). The control or plants with no fertilizer application obtained the lowest percentage of heading having a mean of 14.17.

Table 5. Percentage of heading of Chinese cabbage

TREATMENT	MEAN (%)
Control (No fertilizer application)	14.17[c]
Bioganic	84.17[a]
PCM	72.50[a]
Yama BYM	90.83[a]
Cattle manure	27.50[bc]
Cocodust compost	45.00[bc]
Mushroom compost	29.17[bc]
Vermicompost	46.67[b]

Means with the same letter are not significantly different at 5% level using DMRT

Non-Marketable Yield

The results in table 6 shows that were no significant statistical differences on the non-marketable yield as affected by different organic fertilizer applied. However, numerical figures reveals that plants applied with cattle manure had the highest non-marketable yield(1.40 kg) followed by plants applied with mushroom compost (1.28 kg), bioganic (1.24 kg), PCM (1.21 kg), Yama BYM (1.67 kg), vermicompost (0.83 kg). The control or plants not applied with fertilizers had the least weight of non-marketable yield a mean of 0.73 kg.

Table 6. Non-Marketable yield of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	0.73[a]
Bioganic	1.24[a]
PCM	1.21[a]
Yama BYM	1.16[a]
Cattle manure	1.40[a]
Cocodust compost	0.93[a]
Mushroom compost	1.28[a]
Vermicompost	0.83[a]

Means with the same letter are not significantly different at 5% level using DMRT

Marketable Yield

As shown in Table 7, the marketable yield was significantly affected by the application of organic fertilizer. Plants applied with Yama BYM significantly had obtained

the highest marketable yield of 3.94 followed by the plants applied with bioganic (3.63 kg). Plants applied with PCM were comparable with the plants applied with vermicompost having a mean of 2.06 kg followed by the plants applied with cocodust compost (1.56 kg), cattle manure and mushroom compost with a mean of 0.69 kg. Lastly, the control or plants with no fertilizer applied had the lowest marketable yield of 0.50kg.

Table 7. Marketable yield of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	0.50^{c}
Bioganic	3.63^{ab}
PCM	2.06^{bc}
Yama BYM	3.94^{a}
Cattle manure	0.69^{c}
Cocodust compost	1.56^{c}
Mushroom compost	0.69^{c}
Vermicompost	2.06^{bc}

Means with the same letter are not significantly different at 5% level using DMRT

Total Yield

The total yield per plot as affected by the application of organic fertilizers is shown in table 8. Plants applied with either Yama BYM or bioganic significantly obtained the highest total yield of 5.04 and 4.80 kg respectively followed by plants applied with PCM (3.28 kg), but statistically comparable with the plants applied with vermicompost (2.61 kg), cocodust

compost (2.49 kg), cattle manure (2.09 kg), mushroom compost (1.69 kg). The lowest total yield of 1.23 kg was noted on the control or treatment where no fertilizer was applied.

Table 8. Total yield of Chinese cabbage

TREATMENT	MEAN
Control (No fertilizer application)	1.23[c]
Bioganic	4.80[a]
PCM	3.28[b]
Yama BYM	5.04[a]
Cattle manure	2.09[bc]
Cocodust compost	2.49[bc]
Mushroom compost	1.96[bc]
Vermicompost	2.61[bc]

Means with the same letter are not significantly different at 5% level using DMRT

Computed Yield per Hectare

As presented in Table 9, there were statistical differences noted on the computed yield per hectare as influenced by the fertilizers used. Plants applied with Yama BYM significantly obtained the highest total yield of 10.08 kg, but are comparable with plants applied with boiganic (9.60 kg). It was followed by plants applied with PCM (6.55 kg), vermicompost (5.23 kg), cocodust compost (4.98 kg), cattle manure (4.18 kg), and mushroom compost (3.93 kg) while the control or with no fertilizer applied had the lowest total yield of 2.45 kg.

Table 9. Computed yield per hectare of Chinese cabbage

TREATMENT	MEAN (t/ha)
Control (No fertilizer application)	2.45[c]
Bioganic	9.60[a]
PCM	6.55[b]
Yama BYM	10.08[a]
Cattle manure	4.18[bc]
Cocodust compost	4.98[bc]
Mushroom compost	3.93[bc]
Vermicompost	5.23[bc]

Means with the same letter are not significantly different at 5% level using DMRT

Insect Pest Occurrence

Table 10 shows the insect pest occurrence. It was observed that there were no significant differences on the flea beetle and diamond back moth infestation. However, numerical ratings shows that plants with the application of mushroom compost had the highest flea beetle occurrence of 3.5 followed by the control as well as plants applied with PCM, Yama BYM, cocodust compost, vermicompost fertilizers having ratings of 3. While bioganic and cattle manure had the least flea beetle occurrence of 2.5.In the diamond back moth infestation plants with the application of yamabym and mushroom compost had the highest occurrence of 3.75 followed by control as well as plants applied with bioganic, cattle manure, vermicompost having rating of 3.5, and the PCM had the least infested by diamond back moth of 3.25.

Table 10. Insect pest occurrence

TREATMENT	FLEA BEETLE	DIAMOND BACK MOTH
Control	3[a]	3.5[a]
Bioganic	2.5[a]	3.5[a]
PCM	3[a]	3.25[a]
Yama BYM	3[a]	3.75[a]
Cattle manure	2.5[a]	3.5[a]
Cocodust compost	3[a]	3.5[a]
Mushroom compost	3.5[a]	3.75[a]
Vermicompost	3[a]	3.5[a]

Means with the same letter are not significantly different at 5% level using DMRT

Flea Beetle and Diamond Back Moth Rating		Description Reaction
5	None of the foliage of the plant in the plants is damage	Highly resistant
4	1-25% of the foliage of the plants in the plot are eaten by the larvae	Resistant
3	6-50% of the foliage of all the plants in the plot are eaten by the larvae	Moderate resistant
2	51-75% of the foliage of all the plants in the ploy are eaten by the larvae	Susceptible
1	Only the veins of the plants in the plot are left	Very susceptible

Soil Analysis

Table 1 show that the soil in the experimental area before and preparation had a pH of 5.63 and contained 2.5% organic matter; 0.05% nitrogen; 63 ppm phosphorous; 408

potassium. After the organic fertilizers were applied, the soil had a pH of 5.85; organic matter 2.0%; 0.07% nitrogen; 88ppm phosphorous; 240 potassium.

Table 11. Soil analysis

	pH	OM%	N	P	K
Before	5.63	2.5	0.05	63	408
After	5.85	2.0	0.07	88	240

Meteorological Data

The maximum temperature were 22.2, 19.9, 20.6 and 23.7 ^{o}C while in the minimum temperature were 15.1, 13.1, 13.2 and 18.8 ^{o}C; relative humidity were 83, 80, 84 and 98%;rainfall were 21, 1.33, 0.1 and 0.5 mm; sunshine duration were 348.7, 32 and 360 minutes in October, November, December and January.

Table 12. Meteorological data

MONTH	TEMPERATURE (^{o}C) Min	Max	RH (%)	RAINFALL (mm)	SUNSHINE DURATION (mins.)
OCTOBER	15.1	22.2	83	21	343.7
NOVEMBER	13.1	19.9	80	1.33	329
DECEMBER	1.2	20.6	84	0.1	377.7
JANUARY	18.8	23.7	98	0.5	360.0

Cost and Return Analysis

Table 13 shows the cost and return analysis. Plants applied with Yama BYM significantly obtained the highest return on investment of 381.53 followed by the plants applied with bioganic of 354.64, PCM of 150.70, cocodust compost of 62.16,cattle manure of 4.18, vermicompost of 54.67, control of 47.69, mushroom compost of 25.75. The plants applied with cattle manure had the lowest return on investment of 5.6.

Table 13. Cost and return analysis

TREATMENTS								
ITEMS	T1	T2	T3	T4	T5	T6	T7	T8
Yield(kg)	2	14.50	8.25	15.75	2.75	6.25	2.75	7.25
Sales(Php)	120	870	495	945	165	375	165	435
Farm Inputs (Php)								
Seeds	25	25	25	25	25	25	25	25
PCM	-	110	-	-	-	-	-	-
Bioganic	-	-	115	-	-	-	-	-
Yama BYM	-	-	-	115	-	-	-	-
Cattle manure	-	-	-	-	75	-	-	-
Cocodust compost	-	-	-	-	-	130	-	-
Mushroom compost	-	-	-	-	-	-	50	-
Vermicompost	-	-	-	-	-	-	-	200
Plastic	56.25	56.25	56.25	56.25	56.25	56.25	56.25	56.25
Total Expenses	81.25	191.25	196.25	196.25	156.25	231.25	131.25	281.25
Net Income	38.75	678.25	298.75	748.75	8.75	143.75	33.75	153.75
ROI (%)	47.69	354.64	150.70	381.53	5.6	62.16	25.71	54.67
Rank	6	2	3	1	8	4	7	5

Note: The selling per kilogram was Php.60.00

T_1- Control (No fertlizer applied)

T_2- Bioganic

T_3- PCM

T_4- Yama BYM

T_5- Cattle manure

T_6- Cocodust compost

T_7- Mushroom compost

T_8- Vermicompost

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at Balili Organic Farm Benguet State University, La Trinidad Benguet from October 2012 to January 2013 to evaluate the growth and yield of chinese cabbage applied with different organic fertilizers, determine the best organic fertilizer suitable for chinese cabbage and to determine the economics of using the different organic fertilizers in chinese cabbage production.

Based on the results, there were no significant differences on the number of days from transplanting to harvesting. However, numerical data shows that plants with no fertilizers applied had the longest number of days from transplanting to harvesting with a mean of 66.75. Plants applied with bioganic had the least number of days of 64.50 to reach the harvesting stage from transplanting. Plants applied with Yama BYM significantly had the longest head length of 27.90 cm. The plants applied with mushroom compost with a of 21.50cm had the shortest length but statistically comparable to the plants applied with vermicompost as well as the plants without fertilizer applied. The application of Yama BYM induced the production of wider head circumference with a mean of 33.90 cm. The plants in the control treatment with no fertilizer applied were observed as having the least equatorial circumference with a mean of 21.10 cm. Plants applied with Yama BYM and bioganic was observed to haves significantly the most compact heads of 2.45 and 2.40 cm, respectively. The control or plants with no fertilizer applied had the least compact heading with a mean of 1.40. Plants applied with Yama BYM significantly had highest percentage of heading with a mean of 90.83. The control or plants with no fertilizer application obtained the lowest percentage of heading having a mean of 14.17. Plants applied with

Yama BYM obtained the highest marketable yield of 3.94 kg, the control or plants with no fertilizers applied had the lowest marketable yield of 0.50 kg. There were no significant statistical differences on the non-marketable yield as affected by different organic fertilizers applied. However, numerical figure reveals that plants applied with cattle manure had the highest non-marketable yield (1.40 kg). The control or plants not applied with fertilizer having a mean of 0.73 kg. Plants applied with either Yama BYM or bioganic significantly obtained the highest total yield of 5.04 and 4.80 kg respectively. The lowest total yields of 1.23 were noted on the control or treatment where no fertilizers were applied. Plants applied with Yama BYM significantly obtained the highest total yield of 10.08 kg, but are comparable with plants applied with boiganic (9.60 kg) while the control or with no fertilizer applied had the lowest total yield of 2.45 kg. Plants applied with Yama BYM significantly had obtained the highest return on investment of 381.53 %. The plants applied with cattle manure had the lowest return on investment of 5.6 %.

Conclusion

Based on the result there were no significant differences on the number of days from transplanting to harvesting. However head length, head equatorial circumference, head compactness, percentage of heading, marketable and total yield were significantly higher with the application either of Yama BYM or bioganic from which higher return of investment was obtained at 381.53 % and 354.64 %, respectively.

Recommendation

It is therefore recommended that the best organic fertilizer suitable for Chinese cabbage production was the application of Yama BYM or bioganic to have longer, wider, more compact heads, and higher return on investment.

LITERATURE CITED

BAUTISTA, O.K. 1983. Introduction to Tropical Horticulture. University of the Philippines Los Banos ,Laguna. P. 100.

DAGGON, J. D. and T. G CADIZ. 1985. Soils, Fertilizers and Plants. Rex Book Store, Manila. Pp. 1-5.

DONAHUE, R. C. 1972. Our Soils and the Management. Danville Illinois the Printer and Publishing Inc. P. 101.

EDMOND, J. B., T. L. SENN and F. S. ANDREW. 1964. Fundamentals of Agriculture. 3rd Edition. Bombay Tata McGraw-Hill Publishing Co. LTD New Delhi. P. 71.

FOLLET, R. H. 1981. Fertilizers and Soil Amendments. New Jersey: Prentice Hall Inc. Pp. 459-460.

KUDAN, J. D. 2010. Performance Evaluation of Sugar Beet Varieties as affected by Organic Fertilizers under La Trinidad condition. BS Thesis. Benguet State University, La Trinidad Benguet.Pp .6-7.

MABESA, R .C. 1977. Vegetable Production. UPLB College. Los Banos, Laguna. P. 63.

MACMILLAN, H. F. 1991. Tropical Planting and Gardening. 6th Edition. J. B. Lippincott Company, Chicago, Philadephia. Pp. 101-102.

MATSUMURA, T. 1954. The status of Chinese cabbage growing in Japan Proceeding of Chinese cabbage Symposuim. AVRDC. Publishing 8 (135). Pp. 36-40.

POINCELOT, R. P. 1980. Horticulture Principles and Practical Applications. Prentic Hall. Inc. New Jersey. Pp. 529-530.

PURSEGLOVE, J. W. 1986. Tropical Crops Dicotyledons. Longman Group Limited. United Kingdom.

PCCARD, 1982. Annual Report Philippines Council on Agriculture and Recourse Research. Los Banos, Laguna. P. 63.

SANGATAN, R. L. 2000. Practical Guide to Organic Gardening in the Philippines. Busy Book Store. Quezon City.

SAHADEVAN, H. 1987. Green Fingers Total Commitment of the Development of the Family Sahadevan Publishing Co. Malaysia. P. 73.

THOMPSON, H. C. 1954. Vegetable Crops. New York McGrassHill Books Co. Inc. P .245