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RESEARCH ARTICLE

GROWTH AND YIELD PERFORMANCE OF ORGANIC FERTILIZERS

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ABSTRACT

This open-field experiment utilized RCBD, four treatments, and three replications to determine the performance of vermicast obtained from various substrates on the growth and yield of pechay. Growth was measured at 10, 20, and 30 days from transplanting while yield was measured at harvest. T1 or control utilized chicken manure while T2, T3 and T4 utilized various *Eudrilus eugeniae* worm castings which were applied per spot or per hill. It was disclosed that plants fertilized with vermicast obtained from 100% carabao grass (*Paspalum conjugatum*) consistently produced high measurements on plant height, width of leaves, and number of leaves from transplanting to harvesting compared with other vermicast treatments. When compared with plants fertilized with chicken manure, it was during the 30th day after transplanting that chicken manure fertilized plants registered wider leaves and heavier weight measurements. All vermicast treatments registered abrupt growth responses at 10 and 20 days growth periods, but mean values on growth indices of vermicast and chicken manure treatments taken during the 30th day were not significantly different. However, plant weight measurements between vermicast and chicken manure fertilized plants were significantly different at 5% LSD. For the production of organic pechay, utilization of vermicast fertilizer is recommended.

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INTRODUCTION

Production endeavor using organic fertilizers intended to complement with instruction and extension functions must showcase a technology that would highlight on environmentally sustainable and non-hazardous production management methodologies resulting from actual field trial. Organic fertilizers according to Lalitha *et al*. (2000) as cited by Rekha, *et al*. (2013) have an emphatic effect on plant growth and yield. Subler and Edwards (n.d.) reported that the best plant growth responses are when vermicast and traditional fertilizers are used together. Necessarily, there is a need to determine the performance of organic fertilizers on growth and yield of specific vegetable/crop commodity before presenting information for academic and developmental objectives. Production endeavor usingvermicast as a novel exploration in the universityhas to be pursued to provide learners with the opportunity to observe, assimilate, and possibly replicate. The data and information that will be generated from the study would be useful for similar organic farming pursuits. The study would further enable the university to comply with its core value of accountability particularly on environment preservation and food safety, and likewise comply with Section 22 of the Organic Agriculture Act of 2010, calling up for the development and promotion of organic agriculture (R.A.10068). The result of the study may compare or contrast with an existing body of knowledge on performance of organic fertilizers which may be beneficial foracademic and developmental priorities of government and non-government institutions.

Statement of objectives/problems: The study determined the growth and yield performance of organic fertilizers.Specifically, the study answered the following:

1. What is the growth of pechayfertilized with vermicast in terms of the following indices: a. plant height, b. width of leaves, and c.number of leaves?
2. Is there a significant difference on the growth of pechayfertilized with vermicast?
3. What is the yield of pechayfertilized with vermicast in terms of: a. plant weight?
4. Is there a significant difference in the yield of pechayfertilized with vermicast?

MATERIALS, METHODS AND PROCEDURE

Materials

Planting Material: "Pechaypavo" variety was utilized as the test plant. Each pre-germinated pechay seed was pricked into

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the growing medium contained in individual disposable plastic cups and allowed to grow for 10 days before transplanting.

Fertilizers: Air dried vermicasts or excreta of African Night Crawler (*Eudriluseugeniae)* worms resulting from specific farm waste feed substrates were utilized as fertilizers in T2, T3, and T4. These vermicasts were produced at the Bio-Organic Fertilizer Production Facility of the University. Air-dried chicken manure purchased from a commercial poultry farm in Western Samar was utilized as the foliar fertilizer material for T1 (Control).

Measuring Devices: Foot rule, flatform type weighing scale of 2,000 grams capacity, and a calculator were utilized as measuring devices. Ballpen and tally sheet were used to recordthe data obtained from the study.

Methods

Experimental Design: The study utilized the Randomized Complete Block Design adopting four treatments and three replications.

Randomization: Randomization was undertaken by dividing the experimental area into three blocks corresponding to the number of replications. Each block was further subdivided into four plots to correspond to the number of treatments. The *fish bowl* technique was adopted. The numbers that were drawn represented the treatment numbers each for Replications 1, 2, and 3, respectively.

Experimental Area and Field Layout: The experimental area was an open field exposed to sunlight and rainfall.It measured 4 meters x 9.5 meters or 38 square meters. It was divided into three blocks of 1 meter each in width, separated by 0.5 meter passage. Each block was divided into four plots, also separated by 0.5 meter passage. Each plot measured 1 meter x 2 meters. There were 12 plots representing 12 treatments in the experimental area. Each plot had four rows. Each row had 10 pechay plants. The plant spacing was 25cm x 20cm. There were 40 pechay plants in each plot but only the 10 innermost plants constituted as test plants, or a total of 120 test plants for the study.

Produture

Treatments: There were four treatments of the study:

T1– Pechay fertilized with chicken manure (0 vermicast, Control).
T2– Pechay fertilized with vermicast obtained from feed substrate comprising 100% cow manure.
T3– Pechay fertilized with vermicast obtained from feed substrate comprising 50% cow manure and 50% carabao grass (*Paspalumconjugatum*).
T4– Pechay fertilized with vermicast obtained from feed substrate comprising 100% carabao grass (*Paspalumconjugatum*).

Land Preparation: The experimental area was plowed once using a four-wheel Kubota tractor. The layout of the plots using string and sticks was done after plowing. The plots were made using spade, rake and bolo. The soil in the plots was pulverized, and the weeds that were turned into the soil during plowing were removed using rake and bolo.

Fertilizer Application: Vermicast/chicken manure was applied at the rate of one (1) big salmon can (approximately 250 grams) per hill or spot to which pechay was transplanted. Vermicast/chicken manure was left unmixed with soil in the hole.

Planting: Ten-day old vigorous pechay seedling was planted per hill spaced at 25cm x 20cm. This planting spacing was adopted in all the treatments. Such spacing allowed enough space for the conduct of the cultural practices required by the plant.

Replanting: Missing hills were replaced immediately upon notice.

Weeding: Weeds growing between pechay plants were removed manually using a wooden dibble. It was done as often as needed to disallow the weeds to interfere the study results.

Watering: Wateringwas done when there was no rainfall in the evening.

Cultivating: Hilling-up using a wooden dibble was done per hill during the two-week period after transplanting, to enhance soil aeration and to restore the fertilizer and soil that covers the roots when washed away during watering.

Controlling of Insect Pests: Any worm or insect attacking the plant was handpicked and thrown in a covered compost bin. Grasses growing within the surrounding areas serving as harbor of insect pests were uprooted.

Harvesting: Pechay was harvested after 30 days from transplanting. It was done after measuringthe leaves indices.

Weighing: Each harvested pechaytest plant including its soil-empty roots was weighed and data duly recorded.

Postharvest: The roots and the undesirable leaves of pechay were removed using a sharp knife. Harvested plants were washed with clean water and were bundled using old banana fibers at desired number of pieces, ready for sale.

Data Collection: The growth and yield parameters were taken from the pechay test plants comprising the 10 innermost plants in the plot, or a total of 120 test plants. The other pechay plants were not included to avoid border effects. Growth parameters taken at 10, 20 & 30 days growth periods were plant height, width of leaves, and number of leaves per plant. Yield parameter was limited to the weight of plant in grams measured 30 days after transplanting.

Data Analysis: Mean was computed to determine the growth and yield parameters. ANOVA (5%) level was computed to determine the significant differences among treatment means. LSD (5%) was computed when treatment means were significant.

RESULTS AND DISCUSSION

Plant Height

During the first measurement at 10 days after transplanting (Table 1a), Treatment 4 obtained the highest mean of 79.80 cm. followed by Treatment 3 with a mean of 74.03 cm;

Treatment 2 came third with a mean of 74.00 cm. and Treatment 1 came last with a mean of 45.67 cm. During the second measurement at 20 days after transplanting, the same growth pattern with that of the first measurement was noted on vermicast fertilized plants. T4 obtained the highest mean of 139.27 cm. followed by T3 with a mean of 122.60 cm. and T2 came third with a mean of 111.37 cm. Plants fertilized with chicken manure or T1 of 122.07 cm. was higher than T2 as opposed to the first measurement. During the third measurement at 30 days after transplanting, a pattern of result which was similar to the first and second measurements was observed on vermicast fertilized plants. T4 obtained the highest mean of 245.43 cm. followed by T3 with a mean of 221.50 cm. and T2 came third with a mean of 195.80. Plants fertilized with chicken manure or T1 has now registered the highest mean of 247.90 cm. compared with any of the treatments.

Analysis of Variance of plant height at 10 days after transplanting on Table 1b showed a bigger computed F value of 5.31 compared with the tabular F value of 4.76 for treatment means at 5% level of significance. Treatment means for vermicast fertilized plants (T2, T3 and T4) were not significantly different from each other at 5% level of LSD but when compared with chicken manure fertilized plants or T1, vermicast fertilized plants were significantly different at 5% level of LSD. This result revealed that the plants fertilized with vermicast were significantly taller compared to the plants fertilized with chicken manure. At 20 days after transplanting, Analysis of Variance of plant height showed a smaller computed F value of 2.22 compared to 4.76 tabular F value for treatment means. This result revealed that the plants fertilized with vermicast were not significantly taller from each other, and likewise not significantly taller than the plants fertilized with chicken manure. Analysis of Variance of plant height at 30 days after transplanting showed a higher computed F value of 9.23 compared with 4.76 tabular F value for treatment means. LSD test at 5% level showed a significantly different treatment means except for T4 (245.43 cm) and T3 (221.50 cm) which when compared with T1 (247.90 cm), their mean differences do not exceed the LSD value. This result showed that the height of plants significantly differ among the paired treatments (T1 and T2). This result further showed that chicken manure fertilized plants (T1) were significantly taller than vermicast fertilized plants (T2) at 30 days after transplanting.

Width of Leaves

At 10 days after transplanting (Table 2a), the leaves of the plants fertilized with vermicast registered wider measurements: T4 got the widest leaf measurement with a mean 48.73 cm.; T3 came next with 44.73 cm., and T2 came third with 42.93 cm. Chicken manure fertilized plants or T1 registered the lowest measurement of 25.27 cm. At 20 days after transplanting, a measurement trend for vermicast fertilized plants similar with that of the first measurement was noted. T4 got the widest leaf measurement with a mean of 85.33 cm., T3 came next with 77.80 cm., and T2 came third with 67.97 cm. T1 or chicken manure fertilized plants measured 73.03 cm. At 30 days after transplanting, plants fertilized with vermicast showed a measurement trend similar with that of the 10^{th} and 20^{th} day growth periods wherein T4 got the widest leaf measurement with a mean of 141.57 cm., T3 came next with 125.63 cm., and T2 came third with 113.87 cm. T1 or chicken manure fertilized plants however obtained the widest leaf measurement among the treatments with a mean of 150.10 cm.

Analysis of Variance on Table 2b showed smaller computed F values of 4.55 and 2.05 for 10 and 20 days growth periods respectively, compared with the tabular F value for treatment means of 4.76. This result revealed that the leaves of the plants fertilized with vermicast (T2, T3 and T4) were not significantly wider from each other, and likewise not significantly wider with the leaves of the plants fertilized with chicken manure (T1). At 30 days from transplanting, Analysis of Variance showed that the computed F value for treatment means of 12.73 is bigger than 10.92 and 4.76 at 1% and 5% levels of significance, respectively. LSD test at 5% significance level revealed a significantly different treatment means. This result revealed that the width of leaves showed highly significant differences among the treatments. This means that T1 or chicken manure fertilized plants developed highly significant wider leaves than the plants fertilized with vermicast or T2, T3 and T4.

Number of Leaves

In the first data gathering at 10 days after transplanting (Table 3a), plants fertilized with vermicast showed higher measurements: T2=5.90; T3=5.63, and T4=5.43, compared with T1 or the plants fertilized with chicken manure with a mean of 4.93. At 20 days after transplanting, the same measurement trend was noted. Plants fertilized with vermicast showed higher measurements: T4=6.67; T3=6.43, and T2=6.30, while the plants fertilized with chicken manure or T1 got a mean of 6.00. At 30 days after transplanting, a measurement trend similar with that of the first and second growth periods wasevident. Plants fertilized with vermicast showed higher number of leaves: T4=9.97; T3=9.77, but T2 had only 8.87. Plants fertilized with chicken manure or T1 obtained a mean of 9.43.

Analysis of Variance (Table 3b) showed smaller computed F values for treatment means of 3.12, 0.70 and 3.12for 10, 20 and 30 days growth periods respectively, compared with the tabular F value of 4.76. This result revealed that the number of leaves among the treatments were not significantly different. This result further revealed that the plants fertilized with vermicast (T2, T3 and T4) had the same number of leaves with the plants fertilized with chicken manure (T1).

Plant Weight

Data in Table 4a showed that the plants fertilized with vermicast had lesser weight: T4=105.00 grams; T3=82.67 grams and T2=62.00 grams, compared with the plants fertilized with chicken manure or T1 with a mean weight of 139.30 grams.

Analysis of Variance in Table 10b showed a computed F value of 17.93 compared with 10.92 and 4.76 tabular F values at 1% and 5% levels of significance, respectively. LSD test at 5% level of significance reflected a significantly different means for vermicast and chicken manure fertilized plants. This finding revealed that vermicast fertilized plants measured a highly significant lesser weight compared with the plants fertilized with chicken manure at 30 days after transplanting.

Table 1a. Plant Height in Centimeters at 10, 20 and 30 days after transplanting in relation to performance of organic fertilizers

T	Replication									Treatment		
	1			2			3			Mean		
	10	20	30	10	20	30	10	20	30	10	20	30
1	50.10	125.10	242.60	49.30	129.10	259.00	37.60	112.00	242.10	45.67a	122.07	247.90a
2	83.40	120.40	193.70	63.70	104.20	199.00	74.90	109.50	194.70	74.00b	111.37	195.80b
3	71.80	115.30	216.20	74.30	129.40	226.60	76.00	123.10	221.70	74.03b	122.60	221.50a
4	85.40	145.70	248.40	96.20	161.00	274.60	57.80	111.10	213.30	79.80b	139.27	245.43a
Replication Total	290.70	506.50	900.90	283.50	523.70	959.20	246.30	455.70	871.80			
Replication Mean										68.38	123.83	227.66

LSD .05 = 23.11 (10 days)
= 27.74 (30 days)
Values indicated by a common letter are not significantly different at 5% level of LSD.

Table 1b. Analysis of variance of plant height at 10, 20 and 30 days after transplanting in relation to performance of organic fertilizers

Source of Variation	Degree of Freedom	Sum of Square			Mean Square			Computed F			Tabular F (5%)
		10	20	30	10	20	30	10	20	30	
Replication	2	283.92	625.04	990.37	141.96	312.52	495.19	1.06_{ns}	1.74_{ns}	2.57_{ns}	5.14
Treatment	3	2,129.50	1,194.74	5,335.66	709.86	398.25	1,778.55	5.31*	2.22_{ns}	9.23^{*}	4.76
Error	6	802.51	1,078.28	1,156.62	133.75	179.71	192.77				
Total	11	3,216.00	2,898.06	7,482.65							

CV= 16.19% (10 days)ns= not-significant
= 10.82% (20 days)* = significant
= 6.10% (30 days)

Table 2a. Width of leaves in centimeters at 10, 20 and 30 days after transplanting in relation to performance of organic fertilizers

T	Replication									Treatment		
	1			2			3			Mean		
	10	20	30	10	20	30	10	20	30	10	20	30
1	28.20	73.70	136.10	25.60	74.90	152.40	22.00	70.50	161.80	25.27	73.03	150.10a
2	50.10	77.10	114.30	35.90	62.30	113.60	42.80	64.50	113.70	42.93	67.97	113.87b
3	41.60	73.20	122.50	43.40	84.00	133.70	49.20	76.20	120.70	44.73	77.80	125.63b
4	53.20	88.40	137.50	59.30	99.80	151.10	33.70	67.80	136.10	48.73	85.33	141.57a
Replication Total	173.10	312.40	510.40	164.20	312.00	550.80	147.70	279.00	532.30			
Replication Mean										40.42	76.03	132.79

LSD .05 = 15.70 (30 days)
Values indicated by a common letter are not significantly different at 5% level of LSD.

Table 2b. Analysis of variance of the width of leaves at 10, 20 and 30 days after transplanting in relation to performance of organic fertilizers

Source of Variation	Degree of Freedom	Sum of Square			Mean Square			Computed F			Tabular F	
		10	20	30	10	20	30	10	20	30	5%	1%
Replication	2	82.90	246.13	204.50	41.45	123.07	102.25	0.58_{ns}	1.54_{ns}	1.66_{ns}	5.14	10.92
Treatment	3	970.97	491.05	2,357.93	323.66	163.68	785.98	4.55_{ns}	2.05_{ns}	12.73**	4.76	9.78
Error	6	426.52	480.03	370.49	71.09	80.00	61.75					
Total	11	1,480.39	1,217.21	2,932.92								

CV= 20.85% (10 days)ns = not-significant
= 11.76% (20 days) ** = highly significant
= 5.92% (30 days)

Table 3a. Number of leaves per plant at 10, 20 and 30 days after transplanting in relationto performance of organic fertilizers

T	Replication									Treatment		
	1			2			3			Mean		
	10	20	30	10	20	30	10	20	30	10	20	30
1	4.50	6.30	9.30	4.90	6.10	9.20	5.40	5.60	9.80	4.93	6.00	9.43
2	6.30	6.80	9.50	5.70	6.20	7.90	5.70	5.90	9.20	5.90	6.30	8.87
3	5.70	6.50	9.60	5.50	6.30	9.80	5.70	6.50	9.90	5.63	6.43	9.77
4	5.70	7.40	10.40	5.60	7.40	10.40	5.00	5.20	9.10	5.43	6.67	9.97
Replication Total	22.20	27.00	38.50	21.70	26.00	37.30	21.80	23.20	38.00			
Replication Mean										5.47	6.35	9.51

Table 3b. Analysis of variance of the number of leaves per plant at 10, 20 and 30 days after transplanting in relation to performance of organic fertilizers

Source of Variation	Degree of Freedom	Sum of Square			Mean Square			Computed F			Tabular F
		10	20	30	10	20	30	10	20	30	5%
Replication	2	0.03	1.94	0.03	0.02	0.97	0.02	0.12 $_{ns}$	2.94 $_{ns}$	0.12 $_{ns}$	5.14
Treatment	3	1.50	0.70	1.50	0.50	0.23	0.50	3.12 $_{ns}$	0.70 $_{ns}$	3.12 $_{ns}$	4.76
Error	6	0.93	1.99	0.93	0.16	0.33	0.16				
Total	11	2.46	4.63	2.46							

CV= 7.31% (10 days)CV = 9.05% (20 days) CV= 6.81% (30 days)ns= not-significant

Table 4a. Weight per plant in grams thirty days after transplanting in relation to performance of organic fertilizers

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
1	139.60	137.40	140.90	417.90	139.30a
2	67.00	57.00	62.00	186.00	62.00b
3	69.00	99.00	80.00	248.00	82.67b
4	112.00	122.00	81.00	315.00	105.00b
Replication Total	387.60	415.40	363.90		
Grand Total				1,166.90	
Replication Mean					97.24

LSD .05=27.04

Values indicated by a common letter are not significantly different at 5% level of LSD.

Table 4b. Analysis of variance of the weight per plant in grams thirty days after transplanting in relation to performance of organic fertilizers

Source of Variation	Degree of Freedom	Sum of Square	Mean Square	Computed F	Tabular F(5%)
Replication	2	332.23	166.11	0.91ns	5.14
Treatment	3	9,850.50	3,283.50	17.93**	4.76
Error	6	1,098.70	183.12		
Total	11	11,281.43			

CV= 9.05%ns= not significant

**= highly significant

Major findings

The study yielded the following major findings:

1. Vermicast obtained from 100% carabaograss (*Paspalumconjugatum*) feed substrate (T4) produced a consistently high measurementfor plant height from the start to the end of the experiment compared with the other vermicast fertilizers (T2 and T3). In comparison with chicken manure (T1 or control), vermicast fertilized plants (particularly T3and T4) showed a consistently high plant height measurements during the growth stages earlier than 30 days after transplanting. Chicken manure fertilized plants registered a high plant height measurement only at 30 days after transplanting. On the basis of ANOVA test at 5% level of significance, a) At 10 days growth period, vermicast fertilized plants were significantly taller than chicken manure fertilized plants; b) At 20 days growth period, vermicast fertilized plants were not significantly taller than the chicken manure fertilized plants; and, c) At 30 days growth period, chicken manure fertilized plants were significantly taller than vermicast fertilized plants.
2. Vermicast obtained from 100% carabao grass feed substrate (T4) consistently produced wider leaves measurement from the start to the end of the study compared with the other vermicast fertilizers (T2 and T3). In comparison with chicken manure (T1), vermicast fertilized plants (T2, T3, and T4) produced wider leaves from transplanting to the 20th day growth period compared with chicken manure fertilized plants (T1). However, on the 30th day after transplanting, T1 produced the widest leaf measurement, which was 8.53 centimeters wider than the leaves produced by T4, and much wider than the other vermicast fertilized plants. ANOVA test at 5% level of significance revealed that at 10 and 20 days growth periods, the width of leaves among the plants in all treatments were not significantly different from each other. But at 30 days growth period, chicken manure fertilized plants had significantly wider leaves than the vermicast fertilized plants.
3. Vermicast obtained from 100% carabao grassfeed substrate (T4) produced the highest number of leaves per plant during the 20th and 30th growth periods, followed by vermicast obtained from feed substrate comprising 50% cow manure and 50% carabao grass (T3). The vermicast produced from 100% cow manure feed substrate (T2) produced the highest number of leaves at 10th day after transplanting. In comparison with chicken manure fertilized plants (T1), all vermicast fertilized plantsproducedhigher number of leaves from the start to the end of the experiment, except T2 which registered a smaller record compared with T1 at 30 days after transplanting.ANOVA test at 5% level of significance showed that the number of leaves of vermicast fertilized plants were not significantly higher in number than the chicken manure fertilized plants.
4. Vermicast obtained from 100% carabao grass feed substrate (T4) registered heavier weight measurement compared withthe other vermicast treatments (T2&T3). Specifically on weight performance, vermicast was not comparable with chicken manure. Plant weight measurements for vermicast and chicken manure fertilized plants at 30 days after transplanting were

significantly different at 5% level of LSD. Chicken manure (T1) fertilized plants were more than 27.04 grams heavier compared to the plants fertilized with vermicast (T2, T3& T4).

5. Generally, growth indices such as plant height, width of leaves and number of leaves were abruptly evident in all vermicast treatments (T2, T3, & T4) from transplanting to 20 days after transplanting. Vermicast treatments outsmarted the chicken manure treatment (T1) during the 10^{th} and 20^{th} day growth periods. The abrupt effect of chicken manure on growth indices was only evident at30 days after transplanting.

Conclusion

1. Farm wastes like cow manure and carabao grass (*Paspalumconjugatum*) can be transformed into vermicast which can be utilized as organic fertilizer for pechay production.
2. Vermicast had equalperformancewith chicken manure on number of leaves development of pechay.
3. Vermicast had lesser performance on plant height, width of leaves and weight gain on pechay compared to chicken manure.
4. In producing organic pechay, use vermicast instead of commercial poultry/chicken manure.

Recommendations

1. Conduct a similar study to validate the findings and be able to compare or contrast the initial body of knowledge on performance of organic fertilizers.
2. Undertake similar studies using freshly harvested and agedvermicasts on other vegetables and ornamentals.A cost and return analysis be made as a component of a similar study.
3. Conduct a study on residual fertilizer value of vermicast.
4. Submit fresh and aged vermicastsproduced out of the various farm wastes for laboratory analysis of nutrient components and use the same as input for similar experiments.
5. Compare effects of farm wastes transformed into compost with farm wastes transformed into vermicast in growth and yield experiments.

REFERENCES

Abbey, L., S.A. Rao, L.N. Hodgins, and F. Briet 2012. Drying and Rehydration of Vermicast Do Not Affect Nutrient Bioavailability and Seedling Growth. doi: 10.3923/ajpnft. 2012.

Cabacaba, Elpidio M. 1978. The Effect of Foliar Sprays of Urea on the Growth and Yield of Soybean (Glycine max Merrill) under Two Population Densities. Unpublished Master of Science (MS) Thesis.University of the Philippines at Los Banos.

Cabacaba, Ofelia A. 1997. Effects of Different Amounts of Dried Ipil-Ipil Leaves on the Growth and Yield of Okra.Unpublished Master of Arts in Teaching Vocational Education (MATVE) Thesis.Southern Samar Agricultural College, Salcedo, Eastern Samar.

Chaoui H. 2010. Vermicasting (or Vermicomposting): Processing Organic Wastes Through Earthworms.Retrieved fromhttp://www.omafra.gov.on.ca/english/engineer/facts/10-009.htm.

Compiled Handouts (n.d.) Foliar Fertilizer and Sprays.

Destura, Ana P. 1987. Growth Performance of Pechay Fertilized with Varying Levels of Azolla (Anabaena). Unpublished Bachelor of Science in Agriculture (BSA) Thesis.Southern Samar Agricultural College, Salcedo, Eastern Samar.

Diaz, Mark Anthony I., *et al*. 2012. Organic Fertilizer Management of Root Crop Farmers in Lawaan, Eastern Samar.Unpublished BSA Thesis.Eastern Samar State University Salcedo Campus, Salcedo, Eastern Samar.

Effects of Vermicasts on Germination and Pot Study of Black Gram (Vignamungo (L.) Hepper cv.T-9) Chapter-VI (n.d.) Retrieved from http://shodhganga.inflibnet.ac.in/bitstream/10603/1187/14chapter%206.pdf.

Elsworth, Langdon R. and Walter O. Paley, 2009. Fertilizers: Properties, Applications and Effects. Nova Science Publishers, Inc. New York.

Environmental Legal Assistance Center, Inc. 2006. (ELAC)-Eastern Visayas. Watershed Management and Development Plan, Brgy. Naparaan, Salcedo, Eastern Samar.

Gagatiga, Pamfilo M. Personal Interview. Eastern Samar State University Salcedo Campus, Salcedo, Eastern Samar. February 2014.

Gajalakshmi S. and S.A. Abbasi, 2003. Earthworms and Vermicomposting. *Indian Journal of Biotechnology*, Vol. 3, October 2004. Retrieved from website.

Gomez, Arturo A. and Kwanchai A. Gomez, 1984. Statistical Procedures for Agricultural Research. Los Banos, Laguna, Phil.: UPCA-IRRI.

History of Organic Farming 2011. Retrieved from http:// www.organicfarming.com.

Joubert W. and R. Fair, 2008. Why Vermicast Above All Others?Retrieved from http://www.capevermicast.com/vermicast.php.

KarmegamNatchimuthu and Thilagavathy Daniel, 2009. Effect of Application of Vermicasts as Layering Media for an Ornamental Plant, *Cadiaeumvariegatum* (L.) Bl. Dynamic Soil, Dynamic Plant, Global Science Books. Retrieved fromhttp://www.google.com.ph.

Lumagbas, Eduardo A. 2003. The Growth and Yield of Garlic as Affected by Different Levels of Organic and Inorganic Fertilizers.Unpublished MATVE Thesis.Eastern Samar State College–Salcedo, Salcedo, Eastern Samar.

Memorandum of Agreement on Bio-organic Fertilizer Production and Demontration Farm, DA-BAR and ESSU-Salcedo, 2011.

Munsayac, Eduardo 2011. Congressional Oversight Committee on Agriculture and Fisheries Modernization (COCAFM) Pushes Agriculture and Fisheries 2025 Vision Program. Marid Agribusiness Digest, ISSN-0117-3897, Vol. 22, No. 4, August 2011.

Panhwar M.H. and F. Panhwar (n.d.) Earthworms, Vermicasts and Vermiculture Experience in Sindh.Retrieved fromhttp://panhwar.com/Article157.htm.

PCARRD-DOST 2006. The Philippine Recommends for Organic Fertilizer Production and Utilization. Los Banos, Laguna.

Pelobello, Judith T. 2000. Growth and Yield of Tomato as Influenced by the Different Tillage Practices.Unpublished MATVE Thesis.Southern Samar College of Agriculture, Science and Technology, Salcedo, Eastern Samar.

Pitao, Dina G. (n.d.). Vermi Composting.Compiled Xerox Power Point Slides.Office of the Provincial Agriculturist, Leyte.

Rekha, G., S. Nalivitan and P. K. Kaleena 2013. Studies on the Influence of VermicompostandVermiwash on the Growth and Productivity of Black Gram (Vignamungo). doi: 10.5829/idosi.abr.2013.7.4.73217

Republic Act 10068 or Organic Agriculture Act of 2010 and its Implementing Rules and Regulations. An Act Providing for the Development and Promotion of Organic Agriculture in the Philippines and for other purposes. Layout and printed by DA Agriculture and Fisheries Information Service (AFIS) May 2011.

Samonte, Pete 2013. Organic Farming Develops Roots in Pampanga. *Agriculture Magazine*, Vol. 17, March 2013.

Serian, Zac B. 2010. Compost Tea Brewer Shines in Taiwan. *Monthly Agriculture Journal*, Vol. 14, No. 11, Nov. 2010.

Subler S. and C. Edwards 1998. What is Vermicast? Retrieved fromhttp://www.revitalfert.co.nz/revital.products/revital-vermiculture/whatisvermicast.

Subler S. and C. Edwards 1998. What is vermicast? Retrieved fromhttp://www.revitalfert.co.mz/revital-products.

Villalon, Emerita C. 1980. Comparative Study of Various Farm Manures on the Growth of Pechay.Unpublished MATEA Thesis.Southern Samar Agricultural College, Salcedo, Eastern Samar.

Webster's Ninth New Collegiate Dictionary (n.d.). ISBN 971-08-1133-9.

What is Vermicast (n.d.). Retrieved from http://kahariamfarms.com/vermiculture.php.

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