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## **Efficacy of Vermin as Decomposers of Plant Biomass and Animal Manure**

Leovegildo B. Mante, Jr.\*

*Faculty College of Agriculture, Fisheries and Natural Resources  
University of Eastern Philippines, Catarman Northern, Samar 6400, Philippines  
Email: leo\_mante@yahoo.com*

### **Abstract**

Completely Randomized Design (CRD) with nine treatment and three replications was used to determine the Efficacy of Vermin as Decomposers of Plant Biomass and Animal Manure The treatment includes; **T<sub>1</sub>**- 75 % Rice straw, 25 % Ipil-Ipil leaves, **T<sub>2</sub>**- 75 % Rice straw, 25 % kakawate Leaves, **T<sub>3</sub>**- 75 % Rice straw, 25 % mixture of weeds leaves, **T<sub>4</sub>**- 75 % Rice straw: 25 % Duck dung, **T<sub>5</sub>**- 75 % Rice Straw: 25 % Hog manure, **T<sub>6</sub>**- 75 % Rice Straw: 25 % Carabao-Cow manure, **T<sub>7</sub>**- 75 % Rice Straw: 25 % mixture of Ipil-ipil, kakawate, Weeds leaves, **T<sub>8</sub>**- 75 % Rice Straw: 25 % mixture of Duck dung, Hog manure, Carabao-Cow manure and **T<sub>9</sub>**- 75 % Rice straw, and 25 % chop banana bracts. Result revealed that mixture of (75%) rice straw and (25%) carabao – cow manure produced 90% vermicast in only 50 days, with higher and superior quality of cast harvested. Optimum vermin population count and weight increase (grams) was significantly greater in the same treatment compared to the other feedstuff evaluated. Assay of soil sample as organic fertilizer showed that mixture of 75 % Rice straw and 25 % carabao manure contains 1.23 % total nitrogen, 0.52 % total phosphorus, 1.25 % total potassium, 13.66 moisture content and 27.23 organic carbon.

**Keywords:** Vermin, Decomposer; Plant biomass; Animal manure; Feedstuff; Vermicast

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\* Corresponding author.

E-mail address: leo\_mante@yahoo.com

## **1. Introduction**

The increased use of agro-chemicals has virtually resulted into ‘biological droughts’ that lead to severe decline in beneficial soil microbes and earthworms that help to renew the natural fertility of soil [1].

The scientific communities all over the world desperately looking for an economically viable, socially safe and environmentally sustainable alternative to the destructive “chemical agriculture” which would help increase farm production per hectare aiming for high quality of food which should be “safe” chemical free and “protective” to human health [2].

One of the sustainable acts is through organic farming thru use of vermi cast as organic fertilizer for our crops. This is done through Vermiculture, “the culture of earthworms” that will continually increase the number of worms in order to obtain a sustainable, high and superior quality harvest of cast that will improve soil organic matter content and fertility [3]. Considering the economic contribution of vermin through its cast, identification and determination of vermin efficacy as decomposer of biomass and animal manure is important.

The study is only limited to the efficacy of utilizing vermin as decomposer of different mixtures of feedstuff from identified plant biomass and animal manure and the cast assay.

### **1.1. Objectives**

- Determine the efficacy of vermin as decomposer of plant biomass and animal manure.
- Ascertain the vermi worm population, weight increase and cast produce in different feedstuff.
- Evaluate vermi cast nutrient content per feedstuff mixtures.

## **2. Methodology**

### **2.1. Research Design**

The completely randomized design (CRD) with nine (9) treatments and 3 replications was use to determine the efficacy of vermin as decomposer of plant biomass and animal manure.

The treatment includes;

T<sub>1</sub>- 75:25 ratio, 9.137(kg) rice straw: 3.125 (kg) of Ipil-Ipil leaves,

T<sub>2</sub>- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) of kakawate leaves,

T<sub>3</sub>- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) mixture of weeds/leaves,

T<sub>4</sub>- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) duck dung,

T<sub>5</sub>- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) hog manure,

**T<sub>6</sub>**- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) carabao-cow manure,

**T<sub>7</sub>**- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) mixture of ipil-ipil, kakawate and assorted garden weeds leaves

**T<sub>8</sub>**- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) mixture of duck dung, hog manure, and carabao-cow manure,

**T<sub>9</sub>**- 75:25 ratio, 9.137 (kg) rice straw: 3.125 (kg) chopped banana bracts

## 2.2 . *Feed stuff Preparation*

Rice straw, ipil-ipil, kakawate, and assorted garden weeds leaves, duck dung, hog manure, carabao-cow manure, banana bracts, were collected and was chopped into small pieces.

Chopped rice straw was soaked in water for three days to soften its part and attain the initial decomposition. The prepared rice straw was mixed with other feed stuff/ substrate following the prescribed ratio of mixture and was placed in container ready for the vermi worm release (Figure1).



**Figure 1:** Feed stuff processing ready for vermi worm release

## 2.3. *Vermin Preparation*

One fourth ( $\frac{1}{4}$ ) kg of vermi worm was release to the respective treatment after counting the actual number of vermi worm contained in every  $\frac{1}{4}$  kilograms per treatment.

## 2.4. *Care and Maintenance*

Sixty percent (60%) moisture was maintained in every treatment using diluted water with molasses in ratio of 1:4 (1 gallon of water: four 4 table spoonful of molasses).



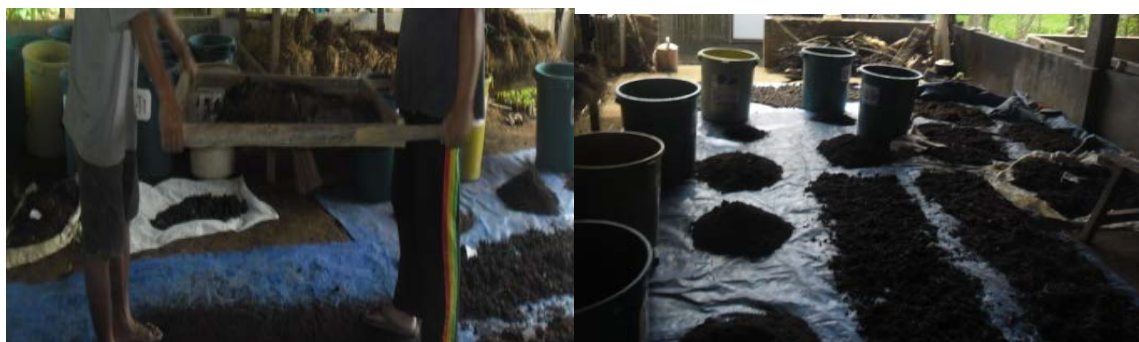
**Figure 2:** Vermi worm stocking



**Figure 3:** Different treatment in container being taken cared and monitored

## 2.5. Harvesting

The vermicast was harvested using (1/8 inch) strainer and was air dried for two (2) days before bagging.



**Figure 4:** Vermicast harvested from the different feed stuff

## 3. Results and Discussion

### 3.1. Average Number of Days from Treatment to 90% Decomposition

Result revealed that mixture of (75%) Rice straw and (25%) Carabao – Cow manure was the best mixture of feedstuff that produced 90% vermicast in only 50 days. Sixty five (65) days for (75 %) Rice straw and (25 %) of Duck dung, Hog and Carabao manure. Seventy one (71) days for those mixtures of (75 %) Rice straw (25 %) Weeds leave (75 %) Rice straw (25 %) Duck dung- and Hog manure mixture. The latest was eighty five (85) days for those mixtures of (75 %) Rice straw (25 %) Ipil-ipil leaves, (25%) Kakawate leaves, (25 %) mixtures of Ipil-ipil leaves plus Kakawate and (25 %) Chopped banana bracts.

**Table 1:** Average Number of Days from Treatment to 90% Decomposition

TREATMENT	MEAN
T <sub>1</sub> -75 % Rice straw : 25 % Ipil-ipil leaves	85 <sup>a</sup>
T <sub>2</sub> -75 %Rice straw : 25 % Kakawate leaves	85 <sup>a</sup>
T <sub>3</sub> -75 %Rice straw : 25 % Mixture of Weeds leaves	70 <sup>b</sup>
T <sub>4</sub> -75 %Rice straw : 25 % Duck dung	71 <sup>b</sup>
T <sub>5</sub> -75 %Rice straw : 25 % Hog manure	71 <sup>b</sup>
T <sub>6</sub> -75 %Rice straw : 25 % Carabao-Cow manure	50 <sup>d</sup>
T <sub>7</sub> -75 %Rice straw : 25 % Mixture of Ipil-ipil, kakawate, Weeds leaves	85 <sup>a</sup>
T <sub>8</sub> -75 %Rice straw : 25 % Mixture of Duck dung, Hog manure, Carabao-Cow manure	65 <sup>c</sup>
T <sub>9</sub> -75 %Rice straw : 25 % Chop banana bracts	85 <sup>a</sup>

### 3.2 Vermicast yield

Vermicast yield was significantly higher and with superior quality in the mixture of 75 % Rice straw 25% Carabao – Cow manure compared to other feedstuff evaluated. Other treatment with promising vermin cast produced includes; 75 % Rice straw with 25 % Duck dung; 75 % Rice straw 25 % Hog manure and 75 % Rice straw added to mixtures of 25 % Duck dung + Hog and Carabao -Cow manure with 6.57,6.27,6.22 and 6.05 kilos respectively. However, of the different feedstuff evaluated, 75 % Rice straw and 25 % Carabao – Cow mixture appeared the best in all the parameters gathered (Table 2).

## 4. Summary, Conclusion and Recommendation

### 4.1. Summary

Completely Randomized Design (CRD) with Nine Treatment and Three Replications was used to determine the Efficacy of Vermin as Decomposers of Plant Biomass and Animal Manure. The Treatment includes; T<sub>1</sub>- 75 % Rice straw, 25 % Ipil-ipil leaves, T<sub>2</sub>- 75 % Rice straw, 25 % Kakawate leaves, T<sub>3</sub>. 75 % Rice straw, 25 %

Mixture of Weeds leaves, **T<sub>4</sub>**- 75 % Rice straw: 25 % Duck dung, **T<sub>5</sub>**- 75 % Rice straw: 25 % Hog manure, **T<sub>6</sub>**- 75 % Rice straw: 25 % Carabao-Cow manure, **T<sub>7</sub>**- 75 % Rice straw: 25 % mixture of Ipil-ipil, Kakawate, Weeds leaves, **T<sub>8</sub>**- 75 % Rice straw: 25 % Mixture of Duck dung, Hog manure, Carabao-Cow manure and **T<sub>9</sub>**- 75 % Rice straw, and 25 % Chop banana bracts.

**Table 2:** Average Weight of Cast Produce per Treatment (kg.)

Average Weight			
Treatment	With Vermin	Without Vermin	
T <sub>1</sub> - 75 % Rice straw: 25 % Ipil-IPil leaves.		4.17 <sup>c</sup>	1.1
T <sub>2</sub> - 75 % Rice straw: 25 % kakawate leaves.		4.25 <sup>c</sup>	0.9
T <sub>3</sub> -75 % Rice straw: 25 % Mixture of Weeds leaves.		5.73 <sup>b</sup>	1.25
T <sub>4</sub> -75 % Rice straw: 25% Duck dung.		6.05 <sup>ab</sup>	1.15
T <sub>5</sub> - 75 % Rice straw: 25% Hog manure		6.27 <sup>ab</sup>	1.35
T <sub>6</sub> -75 % Rice straw: 25% Carabao-Cow manure.		6.57 <sup>a</sup>	2.5
T <sub>7</sub> -75 % Rice straw: 25% Mixture of Ipil-ipil, kakawate, weeds leaves		3.37 <sup>d</sup>	1.2
T <sub>8</sub> -75 % Rice straw: 25% Mixture of Duck dung, Hog manure, Carabao-Cow manure.		6.22 <sup>ab</sup>	2.4
T <sub>9</sub> -75 % Rice straw: 25% Chop banana bracts.		3.38 <sup>d</sup>	1.0

#### 4.1. Vermin Population Increased

Optimum vermin population count increase was recorded in the feedstuff mixtures of 75 % Rice straw and 25 % Carabao – Cow manure and 75 % Rice straw plus 25 % Hog manure mixture.

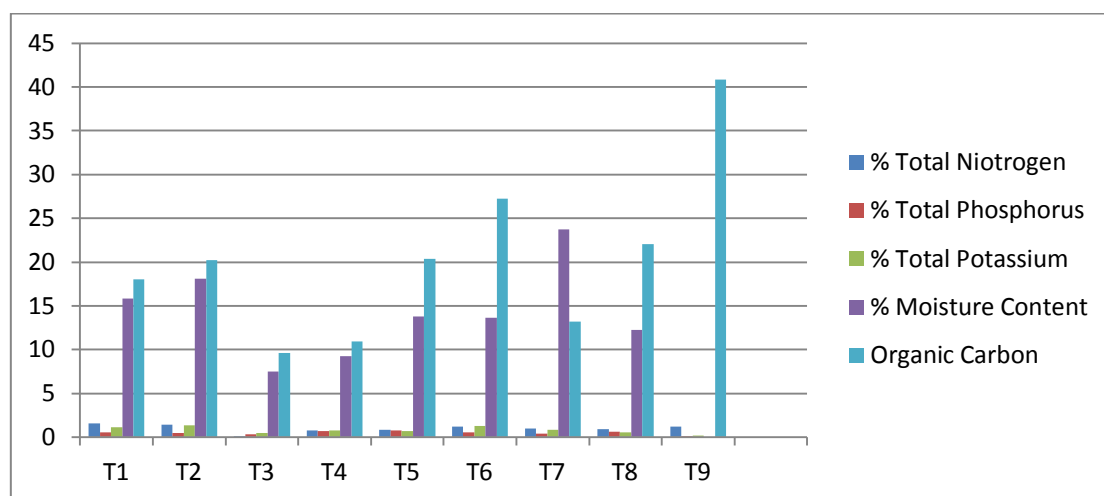
**Table 3:** Number of vermin Increase per Treatment

TREATMENT	MEAN
T <sub>1</sub> - 75 % Rice straw: 25 % Ipil-ipil leaves.	167 <sup>d</sup>
T <sub>2</sub> - 75 % Rice straw: 25 % Kakawate leaves.	171 <sup>d</sup>
T <sub>3</sub> - 75 % Rice straw: 25 % Mixture of Weeds leaves.	197 <sup>c</sup>
T <sub>4</sub> - 75 % Rice straw: 25 % Duck dung.	149 <sup>e</sup>
T <sub>5</sub> - 75 % Rice straw: 25 % Hog manure	212 <sup>b</sup>
T <sub>6</sub> -75 % Rice straw: 25 % Carabao-Cow manure.	229 <sup>a</sup>
T <sub>7</sub> -75 % Rice straw: 25 % Mixture of Ipil-ipil, Kakawate, Weeds leaves.	148 <sup>e</sup>
T <sub>8</sub> -75 % Rice straw: 25 % Mixture of Duck dung, Hog manure, Carabao-Cow manure.	166 <sup>d</sup>
T <sub>9</sub> -75 % Rice straw: 25 % Chop banana bracts.	161 <sup>de</sup>



**Table 4:** Average vermin weight increase (grams) per treatment

TREATMENT	MEAN
T <sub>1</sub> - 75 % Rice straw: 25 % Ipil-ipil leaves.	33.33 <sup>b</sup>
T <sub>2</sub> - 75 %Rice straw: 25 % Kakawate leaves.	16.66 <sup>c</sup>
T <sub>3</sub> - 75 %Rice straw: 25 % Mixture of Weeds leaves.	25.00 <sup>c</sup>
T <sub>4</sub> - 75 %Rice straw: 25 % Duck dung.	33.33 <sup>b</sup>
T <sub>5</sub> - 75 %Rice straw: 25 % Hog manure	33.33 <sup>b</sup>
T <sub>6</sub> -75 %Rice straw: 25 % Carabao-Cow manure.	41.66 <sup>a</sup>
T <sub>7</sub> -75 %Rice straw: 25 % Mixture of Ipil-ipil, Kakawate, Weeds leaves.	33.33 <sup>b</sup>
T <sub>8</sub> -75 %Rice straw: 25 % Mixture of Duck dung, Hog manure, Carabao-Cow manure.	41.66 <sup>a</sup>
T <sub>9</sub> -75 %Rice straw: 25 % Chop banana bracts.	41.66 <sup>a</sup>



**Figure 5:** Assay of sample submitted as: organic fertilizer (Bureau of Soils and Water Management)  
Department of Agriculture, Diliman, Quezon City

Average Number of Days from Treatment to 90% Decomposition. Result revealed that mixture of (75%) Rice straw and (25%) Carabao – Cow manure was the best mixture of feedstuff that produced 90% vermicast in only 50 days. Sixty five (65) days for (75 %) Rice straw and (25 %) of Duck dung, Hog and Carabao manure. Seventy one (71) days for those mixtures of (75 %) Rice straw (25 %) Weeds leaves ; (75 %) Rice straw (25 %) Duck dung- and Hog manure mixture. The latest was eighty five (85) days for those mixtures containing (75 %) Rice straw (25 %) Ipil-ipil leaves, (25 %) Kakawate leaves, (25 %) mixtures of Ipil-ipil leaves plus Kakawate and (25 %) Chop banana bracts.

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Optimum vermin population count and weight (grams) increase was recorded in the feedstuff mixtures of 75 % Rice straw and 25 % Carabao – Cow manure and 75 % Rice straw plus 25 % Hog manure mixture, figure 7 and 8.

Soil chemical analysis showed that mixture of 75 % Rice straw + 25 % Ipil-ipil leaves; 75 % Rice straw + 25 % Kakawate and 75 % Rice straw + 25 % Carabao-Cow manure yielded the highest percentage of total nitrogen ( 1.59, 1.41 and 1.23 ) respectively. Seventy five (75 %) Rice straw + 25 % Carabao-Cow manure considerably contains high percentages of total phosphorus, potassium and organic carbon.

#### **4.2. Conclusion**

Vermin (African nightcrawlers) are considered effective decomposer of plant biomass and animal manure, like Rice straw and Carabao – Cow manure mixture yielding ninety percent (90 %) cast produced in only 50 days. Optimum vermin population count and weight increase (grams) was obtained in 75 % Rice straw + 25 % Carabao – Cow manure and 75 % Rice straw + 25 % Hog manure mixture. Soil chemical analysis showed that mixture of 75 % Rice straw + 25 % Ipil-ipil leaves; 75 % Rice straw + 25 % Kakawate and 75 % Rice straw + 25 % Carabao-Cow manure obtained the highest percentage of total nitrogen ( 1.59,1.41 and 1.23 ) respectively. Seventy five (75%) Rice straw + 25 % Carabao-Cow manure considerably contains high percentages of total phosphorus, potassium and organic carbon

#### **4.3. Recommendation**

For rapid and efficient vermi composting, the use of 75 % Rice straw + 25 % Carabao – Cow manure is highly recommended.

Vermicast produced from the three different mixture of feedstuff namely; 75% Rice straw +25 % Ipil-ipil leaves; 75 % Rice straw + 25 % Kakawate and 75 % Rice straw + 25 % Carabao-Cow manure can be used as source organic fertilizer considering its nutrient content as per cast assay.

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