BIBLIOGRAPHY

LUISITO A. DE GUZMAN. APRIL 2011. Abundance of Insects Associated with Chicken Manure. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study aimed to record the population of the different species of insects associated with chicken manure. It also aimed to determine the most abundant insects and growth stages that are found on the chicken manure from different sources and also to compare the arthropods inhabiting the chicken manure. Furthermore, it sought to identify the texture of the chicken manure from the different sources.

Four sources of chicken manure were considered in the study which includes the chicken manure from BSU, Batangas. Bulacan, and Tarlac. Each sample of chicken manure were opened every after 14 day's interval from storage. Chicken manure was spread on a manila paper for easier collection. Insects were picked using forceps and placed on vials. The insects were identified according to their order, family and genus. Analysis of Variance (ANOVA) and computed mean were used in the analysis of the data collected.

Results revealed that there are six orders of insects found on chicken manure from different sources which include the order Blattodea, Coleoptera, Dermaptera, Diptera, Hemiptera, Hymenoptera and Lepidoptera. Nine families were found under the order Coleoptera and one family in order Dermaptera. Order Diptera and Hemiptera have

4 identified families respectively while only two families on order Hymenoptera and order Lepidoptera respectively.

Chicken manure from Tarlac has the highest total number of insect species collected with a total mean of 11.75 (27 %) followed by chicken manure from BSU with a total mean of 11.50 (26 %). However, there is no significant difference in the total number of species found on the four sources of chicken manure. Eighteen species of insects were identified as to their adult stage, 4 families on their pupa stage while 2 families were identified on their larvae stage. Base on the computed mean of the three growth stages of insects, adult stage has the highest total mean of 82.69 followed by pupa stage and larvae stage with a total mean of 24.88 and 21.06 respectively. There are no significant differences in the abundance of the adult and pupa stage however it is highly significant on the larvae stage.

Order Coleoptera has the highest number of families identified and was considered as the highest populated order of insect found on chicken manure with a total a total mean of 64.81. Furthermore, family Erotylidae from the order Coleoptera was the most populated family of insect under adult stage found on chicken manure with a total mean of 24.25 while family Reduviidae of the order Hemiptera was the least with only 0.06 total mean. Family Muscidae under pupa stage was the most abundant with a total mean of 14.25 while family Hepalidae has the most abundant population under larvae stage with total mean of 14.31.

Furthermore, two orders of Arthropods were identified which are Arachnida and Pseudoscorpiones. Pseudoscorpiones was the most abundant arthropods with a total mean

of 28.25 however the results revealed that there is a significant difference on the abundance of arthropods found on chicken manure.

There are three textures of chicken manure identified. These are sticky, porous and rough. Population of insects may vary depending on the texture of chicken manure. Under adult stage about 993 insects were found on rough or decomposed chicken manure. A total of 555 immature insect is found on rough textured chicken manure while

Based on the findings of the study, the following conclusions were drawn:

1. Insects are present abundantly on the chicken manure from different resources though there are differences in numbers.

2. There are different orders and families of insects found on chicken manure and insects most of the insects were on their adult stages already.

3. Arthropods are also present on chicken manure however in lesser pollution only.

4. Texture of chicken manure differs from each source thus this indicates the stage of decomposition. Also, chicken manure may vary depending on the days of its storage.

Given the above findings, the researcher recommends the following:

1. The insects present on chicken manure be studied for their benefits and nuisance to crops when chicken manure is used as organic fertilizer.

2. A similar study be conducted using more other sources of chicken manure.

3. The arthropods present on chicken manure be studied and evaluated as to how they survived on chicken manure.

4. Texture of chicken manure be studied for their effectiveness on crops.

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INTRODUCTION

Insects are everywhere. They can be found in nearly all environments and live in almost every habitat on land. Insects were among the earliest terrestrial herbivores and acted as major selection agents on plants. They even consume an enormous variety of food. Insects are also often regarded as pests, however some insects are known in recycling organic matter by feeding on wastes and on dead plants and animals.

Insects are considered scavengers which are essential for maintaining balance in nature. Decaying plants and animals matter provide home and food for larvae of large assemblage of species. Such habitats also contain a variety of dipteral whose larvae are predacious on other vertebrates including human (Ferrar, 1987).

Chicken manure is considered as one of the habitat of insects. According to the Ohio Livestock Manure Management Guide, many insects can reproduce in manure. These insects may be a nuisance, or they may be of economic concern due to transmission of disease and contamination of food products. Flies, mosquitoes, and rattailed maggots are frequently of major concern. This was agreed by Williams (1997) who stated that synanthropic arthropods, particularly flies and certain beetle species readily breed in accumulated wastes of confined livestock and poultry. They often become a source of nuisance complaints and health concerns.

Manure-breeding insects include houseflies, face flies and horn flies. During the decomposition of the chicken manure, many organisms are involved in the process. These are the arthropods and microorganism. Insects belong to arthropods. These insects are able to feed on decaying matters and animal manures. At times, it also serves as their

habitation. Insect involved in the decomposition of chicken manure for the completion of there life cycle requirement.

Arroyo (1998) cited that high manure moisture favors the survival of house fly larvae in terms of their life cycle. Ohio Guide added that manure is also a favorite place of flies to lay their eggs. Fly larvae develop in manure spread on the field.

Insects are found in different places even on chicken dung thus, this study was conducted to document the different insect inhabiting chicken manure and to determine the insect that is most abundant on chicken manure. In this way, the reader will be informed whether there are pest that could cause nuisance to crops.

The study aimed to record the population of the different species of insects associated with chicken manure; determine the most abundant insects and growth stages that are found on the chicken manure from different sources; compare the arthropods inhabiting chicken manures from different sources; and identify the texture of the chicken manure from the different sources.

The study was conducted at the Benguet State University (BSU) – Balili Experimental Farm, La Trinidad, Benguet from November 2009 to October 2010.

REVIEW OF LITERATURE

Animal manure is an organic matter used as organic fertilizer in agriculture. Manures contribute to the fertility of the soil by adding organic matter and nutrients, such as nitrogen that is trapped by bacteria in the soil. Higher organisms then feed on the fungi and bacteria in a chain of life that comprises the soil food web (Elliot, 1995).

Chicken manure contains more nitrogen than almost any other type which aids in strong leaf and stem growth. However, adding fresh chicken manure to gardens can burn the leaves and the roots of plants. In this case, the chicken manure undergoes the process of decomposition (Duncan, 2005).

Organic wastes are converted into organic fertilizer by the means of the biological activity under controlled conditions. Biological activity involves the microbial decomposition of organic matter. Many organisms are involved such as bacteria, fungi, protozoa and some invertebrates such as nematodes, worm and insect. Population of these entire scavenger insect fluctuates according to weather conditions (Haga, 1990).

According to Ferrar (1987), insects are considered scavengers because they are essential for maintaining balance in nature. Decaying plants and animals matter provide home and food for larvae of large assemblage of species. Such habitats also contain a variety of dipteral whose larvae are predacious on other vertebrates including human.

Moisture content of waste material is important in maintaining suitable condition for the decomposers to live during the composting process. The proper moisture content is around 60 % as it provides good supply of water and oxygen to the scavengers (Douglas, 1998).

Arroyo (1998) then stated that high manure moistures favor the survival of house fly (*Musca domestica*) larvae in terms to their life cycle. Larvae feed on moist food rich in organic matter.

More insects were also identified like the large shiny black convex beetle, with broad digging legs belonging to a family (Geotrupidae; about 300 species) of dung feeders. Dor beetles burrow into the soil beneath dung and lay their eggs on plugs of dung hauled down for use a food source (Elliot, 1995).

In addition, Oldroyd (1964) declared that Millichidae and Carnidae breed on dung or act as scavengers in burrows and nests. These are small, often tiny, and blackish flies. Adult flies feed from flowers, but are so tiny they seldom noticed unless they are numerous.

Futhermore, dung beetles provide a range of environmental and agricultural production benefits. Burial and shredding of dung: reduce pasture fouling and nutrient run of into water ways, removes fly and parasite breeding habitat, facilitate nutrient recycling by exposing dung to soil microbes, plant roots and earthworm and improves water infiltration and earation of soil by generating a network of under ground tunnels. Dung beetles feed on dung vertebrates. The adult feed on dung fluid which they extract by squeezing the dung in their mouth part. In contrast dung beetle larvae feed on whole dung (Fluid and Fibre) which they cut and chew with there mouthparts (Aisthore, 2004).

In the recent study done by Botite (2003), she found out that four orders of insect were associated with chicken manure such as Coleoptera, Dermaptera, Hemiptera and Diptera. She also found out that the most abundant chicken decomposers are Coleopterans. The population of all decomposers decreased as the chicken manure was

composed. Some arthropods were also noted in the chicken manure. These include millipedes, ticks, and pseudoscorpion.

MATERIALS AND METHODS

The materials, methods and data gathered were identified in this chapter.

Materials

The materials used in the study include the following: chicken manure, manila paper, killing jars, vials, 75 % ethyl alcohol, pointed forceps, magnifying glass and microscope.

Methods

Source of Chicken Manure

The chicken manures were bought from Shilan, La Trinidad, Benguet. The source of the chicken manure was confirmed from reliable dealers. Four sources of chicken manure were considered for the study. These include the chicken manure from BSU, Batangas, Bulacan and Tarlac. Six sacks from each source were bought. These were placed at the Balili Experimental farm for observation.

Collection of Insects

One sack from each source of chicken manure were opened every 14 days interval from storage. Table 1 shows the treatments of chicken manure. There were six evaluation storage where in the first collection is after 14 days then the next is after 28 days and the like.

The chicken manure was spread on manila paper above a table for the easier collection of insects. The insects were hand pick with the help of a forceps and were placed on killing jars. Immature insects were placed on vials with 75 % ethyl alcohol.

Table 1. Different treatments of chicken manure

SOURCE OF CHICKEN MANURE	DAYS OF EVALUATION AFTER STORAGE					
	1	2	3	4	5	6
BSU	14	28	42	56	70	84
Batangas	14	28	42	56	70	84
Bulacan	14	28	42	56	70	84
Tarlac	14	28	42	56	70	84

Counting and Identification of Insects

The collected insects were classified according to order, family and genus. Insects were also separated according to their life stages which are adult, pupa, nymph, larva, and egg stages. They were placed on different vials for easier identification. The specimens were focused under dissecting microscope for proper classification and identification. The identified insects were tabulated according to order, family, genus and growth stages. Each was analyzed and discussed base on the results drawn.

Tabulation and Analysis of Data

The collected insects tabulated by table and undergone through statistics using Analysis of Variance (ANOVA) and computed mean to come out with a better results presentation.

Characteristics of Texture

Texture of the chicken manure from each source was also identified through sense of touch. Table 1 shows the texture category. Texture will be base on the three categories which includes fresh, decomposing or on the process of decomposition and decomposed.

Table 2. Texture category of chicken manure

TEXTURE	CATEGORY
Sticky	Fresh
Rough	Decomposing
Porous	Decomposed

The texture is sticky if the chicken manure is fresh while when decomposing, it is rough. On the other hand, the manure is decomposed when the texture is porous.

Data Gathered

The data gathered includes the following:

1. The insect orders.
2. Abundance of the different growth stages of insects.
3. Other arthropods.
4. Texture evaluation of the chicken manure.

RESULTS AND DISCUSSION

The Insect Orders

Six (6) orders of insects were found on chicken manure from different sources. These include the order Coleoptera, Dermaptera, Diptera, Hemiptera, Hymenoptera and Lepidoptera. Likewise, two orders of Arthropods were identified which are Arachnida and Pseudoscorpions.

The insects were also classified according to their family and genus. Nine families of the order Coleoptera were identified and one family in order Dermaptera. Orders Diptera and Hemiptera have four (4) identified families respectively while only two (2) families on the order Hymenoptera and order Lepidoptera. Thus, order Coleoptera has the highest number of families identified.

Table 3 shows that there were 18 species of insects identified in their adult stage. On the other hand, only four (4) families were considered on their pupal stage while two (2) families were identified on their larval stage.

Based on the studies made, there are different stages of insects found on chicken manure which includes adult, pupa and larvae. Examples of such are adult flies and larvae of dung beetles similar to the findings of Oldryod (1964) and Aisthore (2004) respectively.

In the recent study of Botite (2003), only four orders of insects were collected which include Coleoptera, Dermaptera, Hemiptera and Diptera. As compared with the present study, two orders of insect were added. These are Hymenoptera and Lepidoptera. There are lots of insects' species that can be found on chicken manure.

Table 3. Identified families of insects associated with chicken manure

ORDER	FAMILY	GENUS	GROWTH STAGES		
			LARVA	PUPA	ADULT
Coleoptera	Bostrichidae	Lyctus			/
	Curculionidae	Sitophilus sp.			/
	Dermestidae	Dermestes sp.			/
	Elmidae	Notriolus sp.	/		
	Erotylidae	Thallis sp.			/
	Hydrophilidae	Spercheus sp.			/
	Scarabaeidae	Sericesthis sp.			/
	Staphylinidae	Creophilus sp.			/
	Tenebrionidae	Gonocephalum sp.		/	/
Dermaptera	Carcinophoridae	Euborellia sp.			/
Diptera	Asilidae	Chrysopogon			/
	Muscidae	Musca sp.		/	/
	Perissommatidae	Perissomma sp.		/	
	Tanypezidae	Strongylophthalmyi			/
Hemiptera	Anthocoridae	Plochiocorella sp.			/
	Lygaeidae	Dilompus sp.			/
	Miridae	Felisacus sp.			/
	Reduviidae	Not identified			/
Hymenoptera	Formicidae	Pheldole sp.			/
	Not identified	-		/	
Lepidoptera	Gelechiidae	Phthorimea sp.			/
	Hepalidae	Aenetus sp.	/		
	TOTAL		2	4	18

Abundance of the Different Growth Stages of Insects

Figure 1 shows the number of insect species associated with chicken manure. Chicken manure from Tarlac has the highest total number of insect species collected with a total mean of 11.75 (27 %). This is followed by chicken manure from BSU with a total mean of 11.50 (26 %). Batangas chicken manure has a total mean of 10.25 (24 %) followed by chicken manure from Bulacan which is 10.00 (23 %). However, based on the

results, there is no significant difference in the total number of species found on the four sources of chicken manure.

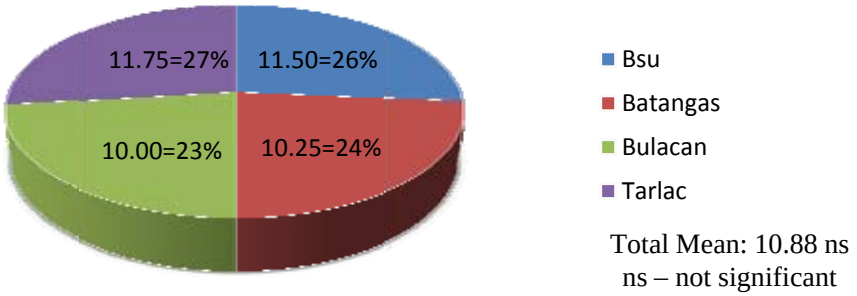


Figure 1. Number of insect species associated with chicken manure

Based on the computed mean of the three growth stages of insects as shown on Figure 2, adult stage has the highest total mean of 82.69 followed by pupal stage and larval stage with a total mean of 24.88 and 21.06 respectively. BSU has the highest total mean of 104.50 as shown on the graph. Based on the results, there are no significant differences in the abundance of the adult and pupal stage in accordance to the 4 sources of chicken manure. However, it is highly significant on the larval stage with Tarlac as having the highest mean of 52.50.

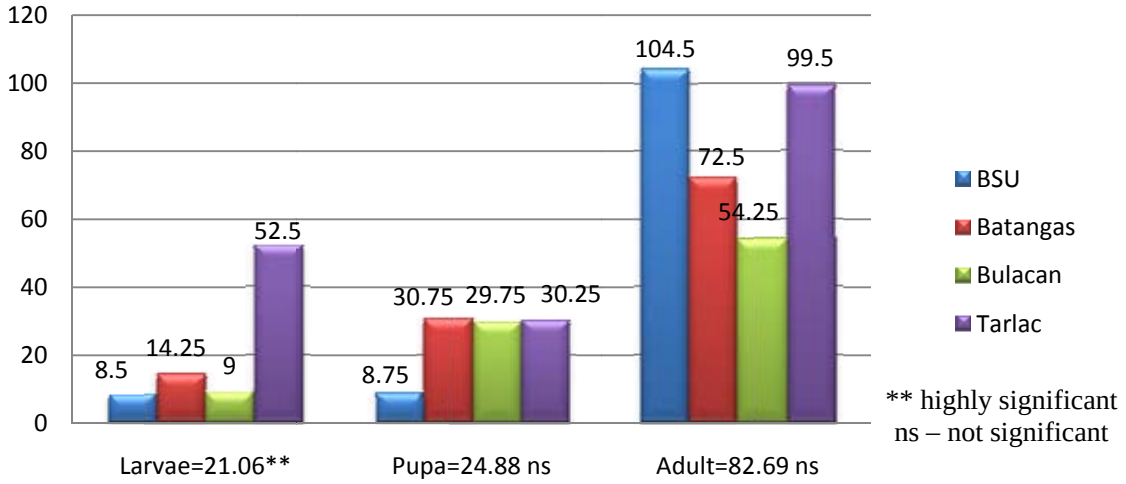
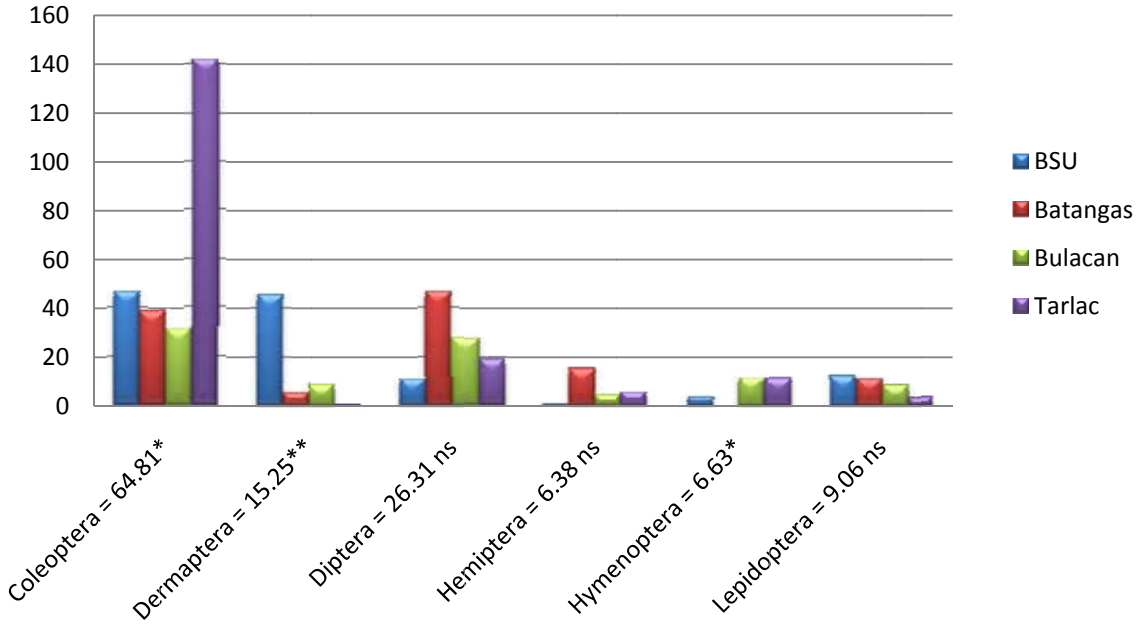


Figure 2. Abundance of insects as to their growth stages

Order Coleoptera has the highest mean of 142.25 on the chicken manure from Tarlac. Order Dermaptera was mostly found on the chicken manure from BSU with a mean of 46.00. On the other hand, Order Diptera and Hemiptera have the highest population found on the chicken manure from Batangas with a total mean of 47.00 and 15.00 respectively. In addition, Order Hymenoptera was not found on the chicken manure from Batangas and Order Lepidoptera has the same population on the four sources of manure as shown on their computed mean. The results also revealed that the abundance of Order Dermaptera on chicken manure is highly significant while Order Coleoptera and Order Hymenoptera were significant. The abundance of other orders of insect was not significant.

Studies done by Botite (2003) revealed that Coleopterans has the highest population. The same result was noted in this study.



** highly significant * significant ns – not significant

Figure 3. Abundance of insect according to their order

Adult Stage

The abundance of adult insects based on their growth stages and different families were also collected. Under adult stage, a total of 18 families of insect were collected.

I. Order Coleoptera

There were nine (9) families collected under the Order Coleoptera. Table 4 shows the eight (8) families from the Order Coleoptera as to their adult stage. It is shown that Family Erotylidae has the highest population collected on chicken manure from different sources with a total mean of 24.25. Family Erotylidae is most abundant on chicken manure from Tarlac followed by BSU, Batangas and Bulacan respectively. On the other hand, Family Scarabaeidae has the lowest population with a total mean of 0.13. Family Scarabaeidae is only present on chicken manure from Batangas. Moreover, there is a high

significant on the mean of Family Ciidae with the highest mean of 12.75 under the BSU chicken manure. There were significant difference also under the Family Staphylinidae and Tenebrionidae. Family Staphylinidae is more abundant on the chicken manure from Batangas with a total mean of 14.75 while Family Tenebrionidae was only found on chicken manure from Tarlac. In addition, there were no significant difference on the

Table 4. Abundance of adults – Order Coleoptera

SOURCE	FAMILIES OF INSECTS UNDER ORDER COLEOPTERA							
	CIIDAE	CURCU-LIONIDAE	DERMES-TIDAE	EROTYLIDAE	HYDRO-PHILIDAE	SCARA-BAEIDAE	STAPHY-LINIDAE	TENE-BRIONIDAE
BSU	12.75^{a}	0.25^{a}	0^{a}	18.50^{b}	14.75^{a}	0^{a}	0.25^{b}	0^{b}
Batangas	0.50^{b}	0.25^{a}	0.25^{a}	17.75^{b}	1.00^{a}	0.50^{a}	14.75^{a}	0^{b}
Bulacan	0 ^{b}	0^{a}	1.50^{a}	16.75^{b}	9.25^{a}	0^{a}	1.00^{b}	0^{b}
Tarlac	0.50^{b}	5.50^{a}	1.75^{a}	44.00^{a}	34.25^{a}	0^{a}	0.50^{b}	2.75^{a}
TOTAL MEAN	3.44**	1.50 ^{ns}	0.88 ^{ns}	24.25 ^{ns}	14.81 ^{ns}	0.13 ^{ns}	4.13*	0.69*

** highly significant * significant ns – not significant

abundance of Family Curculionidae, Dermestidae, Hydrophilidae and Scarabaeidae. Figure 4 shows pictures of insects under adult order Coleoptera.

a. Family Ciidae

b. Family Curculionidae

c. Family Dermestidae

d. Family Erotylidae

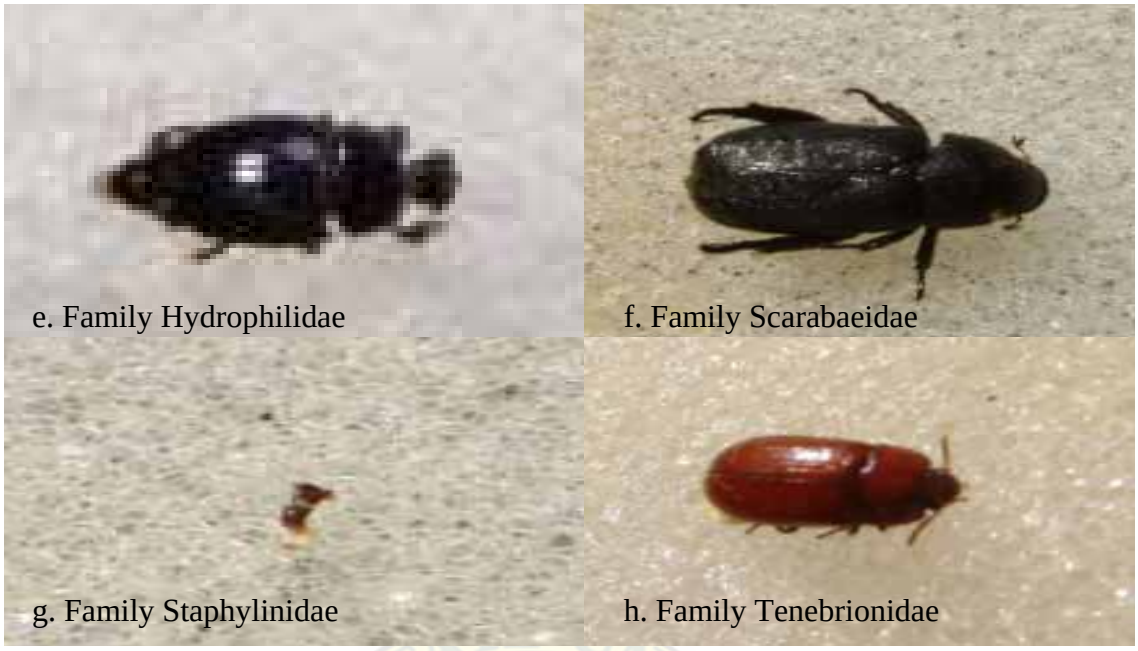


Figure 4. Insects under adult order coleoptera; a) family Ciidae; b) family Curculionidae; c) family Dermestidae; d) family Erotylidae; e) family Hydrophilidae; f) family Scarabaeidae; g) family Staphylinidae; h) family Tenebrionidae.

Table 5. Abundance of adults – Order Dermaptera

SOURCE	FAMILY OF INSECT UNDER ORDER DERMAPTERA
	CARCINOPHORIDAE
BSU	46.00[a]
Batangas	5.25[b]
Bulacan	9.00[b]
Tarlac	0.75[b]
TOTAL MEAN	15.25**

**highly significant

III. Order Dermaptera – Family Carcinophoridae

Family Carcinophoridae (Figure 5) from the Order Dermaptera are medium size insects usually with four wings. Family Carcinophoridae is the only family found on the

chicken manure under the Order Dermaptera as shown in Table 5. Family Carcinophoridae has a total mean of 15.25. There is a highly significant difference on the abundance of this insect. Carcinophoridae is most abundant on the chicken manure from BSU with a weighted mean of 46.00.

Figure 5. Order dermaptera – family carcinophoridae

III. Order Diptera

There are three (3) families identified on this order (Figure 6). Table 6 shows the comparison of the three (3) families as to their adult stage. These were Family Asilidae, Muscidae and Tanypezidae. Family Muscidae has the highest weighted mean of 6.88 followed by Family Tanypezidae and Family Asilidae with a mean of 1.50 and 0.19 respectively. Family Asilidae and Tanypezidae have no significant difference on their abundance with respect to the four sources of chicken manure. However, the abundance of Family Muscidae has significant difference with Batangas chicken manure as the source of its high abundance with a mean of 15.50.

Figure 6. Insects under adult order Diptera; a) family Asilidae; b) family Muscidae; c) family Tanypezidae.

Table 6. Abundance of adults – Order Diptera

SOURCE	FAMILY OF INSECT UNDER ORDER DIPTERA		
	ASILIDAE	MUSCIDAE	TANYPEZIDAE
BSU	0^{a}	0^{b}	5.00^{a}
Batangas	0.75^{a}	15.50^{a}	0^{a}
Bulacan	0^{a}	10.50^{ab}	0^{a}
Tarlac	0^{a}	1.50^{b}	1.00^{a}
TOTAL MEAN	0.19^{ns}	6.88*	1.50^{ns}

*significant ns – not significant

IV. Order Hemiptera

Four (4) families under the Order Hemiptera (Figure 7) were identified on their adult stage. These include Family Anthocoridae, Lygaeidae, Miridae and Reduviidae. Based on the results shown on Table 7, Family Anthocoridae was the most abundant in population under the Order Hemiptera with a total mean of 6.06. Family Anthocoridae is most abundant found on from Batangas with a mean of 15.00. On the other hand, family Lygaeidae is only found on the chicken manure from BSU with a total mean of 0.50 while Family Miridae is only found on Bulacan chicken manure and Family Reduviidae on BSU chicken manure. Base on the findings, there were no significant difference on the abundance of insects under Order Hemiptera.

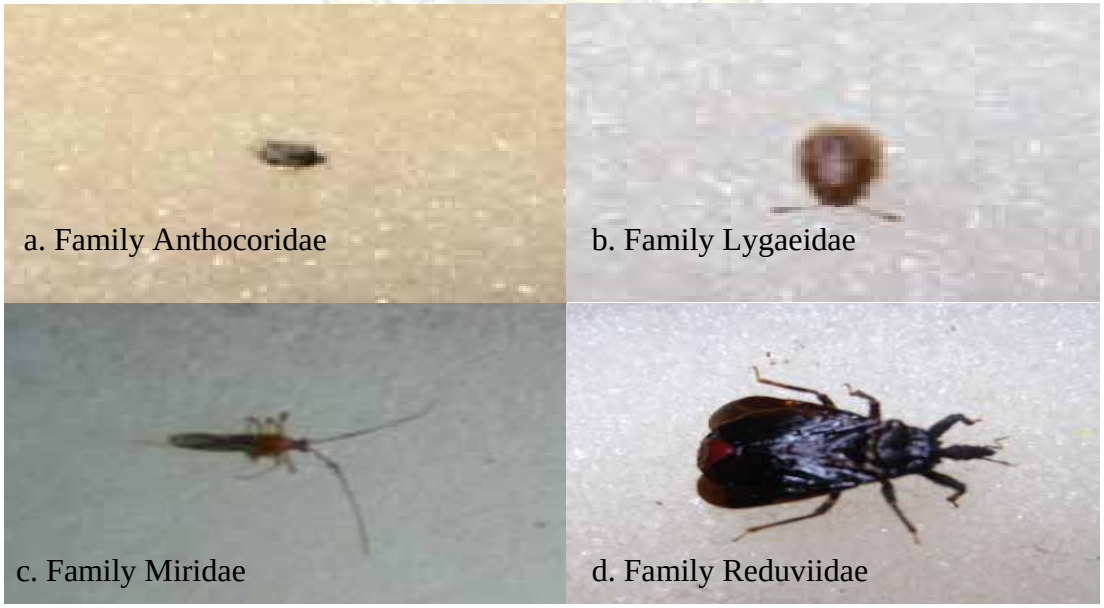


Figure 7. Insects under adult order hemiptera; a) family Anthocoridae; b) family Lygaeidae; c) family Miridae; d) family Reduviidae.

Table 7. Abundance of adults – Order Hemiptera

SOURCE	FAMILY OF INSECT UNDER ORDER HEMIPTERA			
	ANTHOCORIDAE	LYGAEIDAE	MIRIDAE	REDUVIIDAE
BSU	0^{b}	0.50^{a}	0^{a}	0.25^{a}
Batangas	15.00^{a}	0^{b}	0^{a}	0^{a}
Bulacan	3.75^{b}	0^{b}	0.50^{a}	0^{a}
Tarlac	5.50^{ab}	0^{b}	0^{a}	0^{a}
TOTAL MEAN	6.06^{ns}	0.13^{ns}	0.13^{ns}	0.06^{ns}

ns – not significant

V. Order Hymenoptera – Family Formicidae

Order Hymenoptera (Figure 8) has only one (1) identified family under the adult stage. Formicidae are eusocial with perennial colonies. Family Formicidae was only found on the chicken manure from BSU with a total mean of 1.50 as revealed on the table below. There was no significant difference on the abundance of this insect as shown on the table.

Figure 8. Order hymenoptera – family formicidae

Table 8. Abundance of adults – Order Hymenoptera

SOURCE	FAMILY OF INSECT UNDER ORDER HYMENOPTERA
	FORMICIDAE
BSU	1.50^{a}
Batangas	0^{a}

Bulacan	0[a]
Tarlac	0[a]
TOTAL MEAN	0.38 [ns]

ns – not significant

VI. Order Lepidoptera – Family Gelechiidae

The Gelechiidae (Figure 9) also called twirler moths or gelechiid moths, are a family of moths. Likewise with Order Hymenoptera, only one (1) family from Order Lepidoptera is identified under adult stage. Family Gelechiidae was found on the four (4) sources of chicken manure namely BSU, Batangas, Bulacan and Tarlac. Family Gelechiidae is more abundant on BSU chicken manure while least abundant on Batangas chicken manure. However, there was no significant difference on the abundance of this insect as shown on Table 9.

Figure 9. Order lepidoptera – family gelechiidae

Table 9. Abundance of adults – Order Lepidoptera

SOURCE	FAMILY OF INSECT UNDER ORDER LEPIDOPTERA
	GELECHIIDAE
BSU	4.75 [a]
Batangas	1.00 [a]

Bulacan	2.00 [a]
Tarlac	1.50 [a]
TOTAL MEAN	2.31 [ns]

ns – not significant

Pupal Stage

The following presents the different orders and families present on the chicken manure on their pupal stage (Figure 10). Three (3) orders of insects were identified namely Order Coleoptera, Diptera and Hymenoptera. Only one family was identified on the Order Coleoptera and Hymenopetra while two families were identified under Order Diptera.

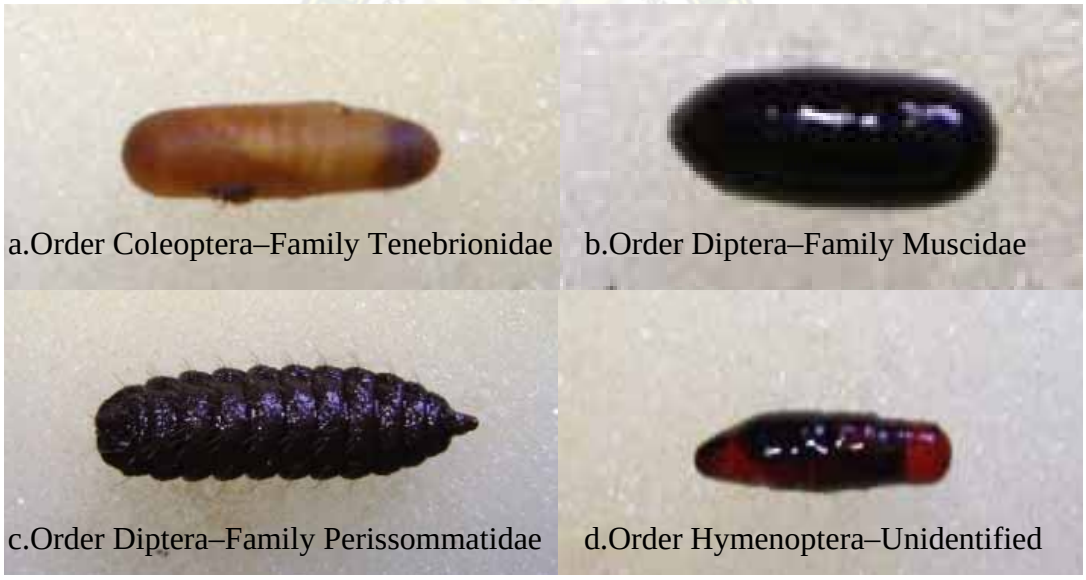
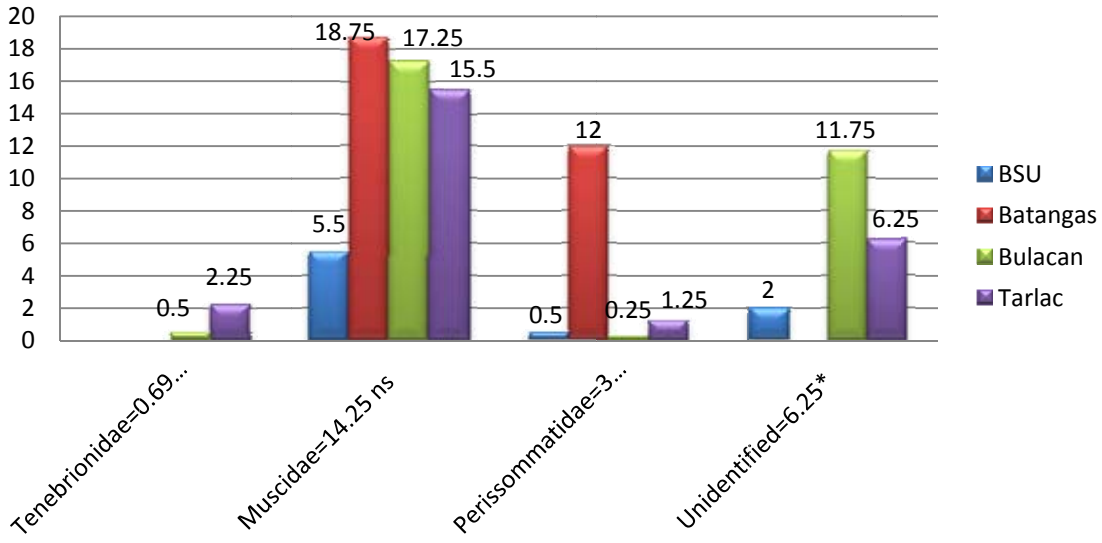


Figure 10. Insects classified on its pupa stage; a) order coleoptera-family tenebrionidae; b) order diptera-family muscidae; c) order diptera-family perissommatidae; d) order hymenoptera-unidentified.

Figure 11 shows the abundance of the four (4) families of insects found under pupal stage. Family Muscidae under pupal stage was the most abundant with a total mean of 14.25. However, based on the results shown, there were no significant difference on the abundance of insect under Family Muscidae and Tenebrionidae while there is a significant difference on the abundance of the unidentified insect under Order Hymenoptera. Moreover, there is highly significant difference of the abundance of Family Perissommatidae under Order Diptera. Family Muscidae and Perissommatidae is most abundant on chicken manure from Batangas with a mean of 18.75 and 12.00. On the other hand, Family Tenebrionidae is abundant on chicken manure from Tarlac while the unidentified insect is abundant in Bulacan with a total mean of 2.25 and 11.75 respectively.



** highly significant * significant ns – not significant

Figure 11. Abundance of insect under pupal stage in their corresponding order and family

Larval Stage

Two (2) orders and families of insect were identified on their larval stage. These include Order Coleoptera and Order Lepidoptera (Figure 12). Under the Order Coleoptera is Family Elmidae while order Lepidoptera is Family Hepalidae. Family Elmidae is found on the four (4) sources of chicken manure likewise with Family Hepalidae. Family Hepalidae has the highest abundance with a total mean of 14.31 however there were no significant difference on the abundance of this insect. Unlike with Family Elmidae which is highly significant on its abundance. Family Elmidae is mostly found on chiken manure from Batangas while Family Hepalidae is most abundant in Tarlac with a total mean of 10.50 and 50.75 respectively (Table 10).

a.Order Coleoptera–Family Elmidae b.Order Lepidoptera–Family Hepalidae

Figure 12. Insects classified on its larvae stage; a) order coleoptera-family elmidae; b) order lepidoptera-family hepalidae.

Table 10. Abundance of larval stage in their corresponding order and family

SOURCE	COLEOPTERA	LEPIDOPTERA
	ELMIDAE	HEPALIDAE
BSU	8.00 [a]	0.50 [b]
Batangas	10.50 [a]	3.75 [b]
Bulacan	6.75 [a]	2.25 [b]
Tarlac	1.75 [a]	50.75 [a]

TOTAL	6.75**	14.31 ns

** highly significant ns – not significant

Arthropods Present on Chicken Manure

Two orders of arthropods were identified during the collection time. These include Order Arachnida and Pseudoscorpions (Figure 13). Table below shows that they are both on its adult stages.

a.Order Arachnida – Family Salticidae b.Pseudoscorpions

Figure 13. Arthropods found on chicken manure; a) order arachnida-family salticidae; b) pseudoscorpions.

On the research done by Botite (2003), a total of three (3) arthropods were collected which include millipeds, ticks and pseudoscorpions. On the present study, only pseudoscorpiones were present with addition Order Arachnida – Family Salticidae.

The total mean of the arthropods found on chicken manure from BSU, Batangas, Bulacan and Tarlac was presented on Table 11. Two (2) arthropods were identified which includes Arachnida-Salticidae and Pseudoscorpions. Arthropods were most abundant on the chicken manure from BSU with a total mean of 43.50 (38 %) followed by Batangas (23%), Tarlac (20%) and Bulacan (19%) respectively. Thus the results revealed that there is a significant difference on the abundance of arthropods found on chicken manure.

Table 11. Arthropods present on chicken manure with their corresponding growth stages

ORDER	FAMILY	GROWTH STAGES

		LARVAE	PUPA	ADULT
Arachnida	Salticidae	0	0	1
Pseudoscorpions	-	0	0	1
TOTAL		0	0	2

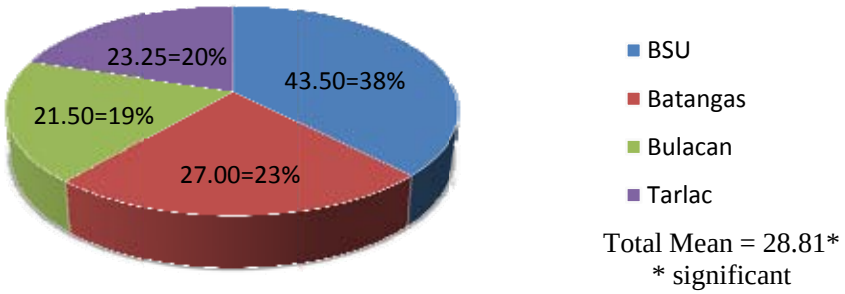


Figure 14. Abundance of arthropods associated with chicken manure

Table 12. Abundance of arthropods according to their order and family

SOURCE	ARTHROPODS	
	ARACHNIDA-SALTICIDAE	PSEUDOSCORPIONS
BSU	1.25 [a]	42.25 [a]
Batangas	0 [a]	27.00 [b]
Bulacan	0.50 [a]	21.00 [b]
Tarlac	0.50 [a]	22.75 [b]
TOTAL MEAN	0.56 [ns]	28.25*

*significant ns – not significant

Pseudoscorpions was most abundant with a total mean of 28.25 while Family Salticidae has a total mean of 0.56. However Arachnida – Salticidae has almost the same population as revealed on its computed mean from the four (4) sources of chicken manure which is then referred as not significant. On the other hand, Table 12 shows that the

abundance of Pseudoscorpions on chicken manure is significant. Pseudoscorpions is most abundant on chicken manure from BSU with mean of 42.25.

Texture Evaluation

Table 13 and Figure 15 shows the texture evaluation of the chicken manure from different sources base on the days of its storage. Chicken manure from BSU is sticky on the first 14 days of storage however it became rough after the 28-84 days of storage. Batangas' chicken manure had a porous texture from the beginning of storage until the last day (14-84 days of storage). On the other hand, chicken manure from Bulacan and Tarlac had the same texture which is rough from 14th day to 84th day of storage. Thus, chicken manure may or may not change its texture even how long it is stored.

Table 13. Texture evaluation of chicken manure

DAYS OF EVALUATION AFTER STORAGE	SOURCE OF CHICKEN MANURE			
	BSU	BATANGAS	BULACAN	TARLAC
14	Sticky	Porous	Rough	Rough
28	Rough	Porous	Rough	Rough
42	Rough	Porous	Rough	Rough
56	Rough	Porous	Rough	Rough
72	Rough	Porous	Rough	Rough
84	Rough	Porous	Rough	Rough

Figure 15. Different textures of the chicken manure; a) sticky textured chicken manure; b) porous textured chicken manure; c) rough textured chicken manure.

Population of insects may vary depending on the texture of chicken manure. Table 14 shows the population of adult insect base on the texture of chicken manure. About 993 adult insects were found on rough or decomposed chicken manure while only 290 insects were found on porous or decomposing chicken manure. In addtition, only 40 insects were found on sticky or fresh chicken manure.

In contrast with the study of Botite (2003) which states that the population of insects decreased as the chicken manure decomposed, the results of the present study shows that as the chicken manure decomposed, the more insects were present.

Immature insects were also found on the chicken manure with porous and rough texture. No immature insects are present on sticky textured chicken manure. A total of 180 immature insect is found on porous textured chicken manure while a total of 555

immature insect is found on rough textured chicken manure as shown in Table 15. Immature insects were also found on chicken manure depending on its texture.

Table 14. Abundance of adult insect according to the texture of chicken manure

TEXTURE OF CHICKEN MANURE	SOURCES OF CHICKEN MANURE				TOTAL
	BSU	Batangas	Bulacan	Tarlac	
Sticky / Fresh	40	0	0	0	40
Porous/Decomposing	0	290	0	0	290
Rough/Decomposed	378	0	217	398	993

Table 15. Abundance of immature insect according to the texture of chicken manure

TEXTURE OF CHICKEN MANURE	SOURCES OF CHICKEN MANURE				TOTAL
	BSU	Batangas	Bulacan	Tarlac	
Sticky / Fresh	0	0	0	0	0
Porous/Decomposing	0	180	0	0	180
Rough/Decomposed	69	0	155	331	555

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study aimed to determine the abundance of insect associated with chicken manure. It also aimed to record the population of the different species of insects associated with chicken manure; to determine the most abundant insects and growth stages that are found on the chicken manure from different sources; to compare the arthropods inhabiting chicken manures from different sources; and to identify the texture of the chicken manure from the different sources.

The study was conducted at Benguet State University (BSU) – Balili Experimental Farm, La Trinidad, Benguet. The study was delimited to the four sources of chicken manure were considered in the study which includes the chicken manure from BSU, Batangas. Bulacan, and Tarlac. Collected insects from the different sources were properly identified and populations of insects were properly tabulated by table and undergone through statistics using Analysis of variance (ANOVA) and computed mean to come out with a better results presentation.

From the four sources of chicken manure, six orders of insects were collected. These are order Coleoptera, Dermaptera, Diptera, Hemiptera, Hymenoptera and

Lepidoptera. Order Coleoptera has the highest number of families identified with a total of 9. Base on the studies made, chicken manure from Tarlac has the highest total number of insect species collected with a total mean of 11.75 (27 %) followed by chicken manure from BSU with a total mean of 11.50 (26 %). However, there is no significant difference in the total number of species found on the four sources of chicken manure.

Eighteen species of insects were identified as to their adult stage, 4 families on their pupa stage while 2 families were identified on their larvae stage. Base on the computed mean of the three growth stages of insects, adult stage has the highest total mean of 82.69 followed by pupa stage and larvae stage with a total mean of 24.88 and 21.06 respectively. There are no significant differences in the abundance of the adult and pupa stage however it is highly significant on the larvae stage.

Order Coleoptera has the highest total mean of 64 while order Hemiptera has the lowest mean of 6.38. The abundance of order Dermaptera on chicken manure is highly significant while order Coleoptera and order Hymenoptera is significant. The abundance of other orders of insect was not significant.

Under adult stage, family Erotylidae from the order Coleoptera has the most abundant population with a total mean of 24.25. Family Muscidae under pupa stage was the most abundant with a total mean of 14.25 while family Hepalidae has the most abundant population under larvae stage with total mean of 14.31.

Furthermore, two orders of Arthropods were identified which are Arachnida and Pseudoscorpiones. Pseudoscorpiones was the most abundant arthropods with a total mean of 28.25. Thus the results revealed that there is a significant difference on the abundance of arthropods found on chicken manure.

There are three textures of chicken manure identified. These are sticky, porous and rough. Population of insects may vary depending on the texture of chicken manure. Under adult stage about 993 insects were found on rough or decomposed chicken manure. A total of 555 immature insect is found on rough textured chicken manure while

Conclusions

Based on the findings, the following conclusions were drawn:

1. Insects are present abundantly on the chicken manure from different resources though there are differences in numbers.

2. There are different orders and families of insects found on chicken manure and insects most of the insects were on their adult stages already.

3. Arthropods are also present on chicken manure however in lesser pollution only.

4. Texture of chicken manure differs from each source thus this indicates the stage of decomposition. Also, chicken manure may vary depending on the days of its storage.

Recommendations

After the study has been conducted and properly interpreted, the researcher recommends the following:

1. The insects present on chicken manure be studied for their benefits and nuisance to crops when chicken manure is used as organic fertilizer.

2. A similar study be conducted using more other sources of chicken manure.

3. The arthropods present on chicken manure be studied and evaluated as to how they survived on chicken manure.

4. Texture of chicken manure be studied for their effectiveness on crops.

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APPENDICES

Appendix Table 1. Number of insect species associated with chicken manure

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	13	13	10	10	46	11.50
Batangas	10	12	9	10	41	10.25
Bulacan	11	10	9	10	40	10.00
Tarlac	13	14	11	9	47	11.75
TOTAL MEAN						10.88

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					(0.05)	F (0.01)
Treatment	3	9.250	3.083	1.21	3.49	5.95
Error	12	30.500	2.542			
Total	15	39.750				

ns – not significant CV = 14.65 %

Appendix Table 2. Larvae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	8	23	2	1	34	8.50
Batangas	5	15	11	26	57	14.25
Bulacan	13	3	5	15	36	9.00
Tarlac	56	62	32	60	210	52.50
TOTAL MEAN						21.06

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	5352.188	1784.063	17.45	3.49	5.95
Error	12	1226.750	102.229			
Total	15	6578.938				

** highly significant CV = 48.01 %

Appendix Table 3. Pupa

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	15	4	1	15	35	8.75
Batangas	64	17	19	23	123	30.75
Bulacan	48	13	32	26	119	29.75
Tarlac	58	22	25	16	121	30.25
TOTAL MEAN						24.88

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	1388.750	462.917	1.66	3.49	5.95
Error	12	3355.000	279.583			
Total	15	4743.750				

ns – not significant CV = 67.21 %

Appendix Table 4. Adult

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	113	52	143	110	418	104.50
Batangas	80	103	24	83	290	72.50
Bulacan	59	73	34	51	217	54.25
Tarlac	228	78	43	49	398	99.50
TOTAL MEAN						82.69

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	6683.688	2227.896	0.85	3.49	5.95
Error	12	31301.750	2608.479			
Total	15	37985.438				

ns – not significant CV = 61.76 %

Appendix Table 5. Order Coleoptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	35	29	84	40	188	47.00
Batangas	13	53	24	35	155	38.75
Bulacan	42	43	11	29	125	31.25
Tarlac	275	121	70	103	569	142.25
TOTAL MEAN						64.81

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F

					0.05	0.01
Treatment	3	32478.188	10826.063	4.46	3.49	5.95
Error	12	29162.250	2430.188			
Total	15	61640.438				

* significant CV = 76.06 %

Appendix Table 6. Order Dermaptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	53	20	50	61	184	46.00
Batangas	10	7	0	4	21	5.25
Bulacan	3	8	16	9	36	9.00
Tarlac	0	0	0	3	3	0.75
TOTAL MEAN						15.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	5179.500	1726.500	18.61	3.49	5.95
Error	12	1113.500	92.792			
Total	15	6293.000				

** highly significant CV = 63.17 %

Appendix Table 7. Order Diptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	32	0	0	12	44	11.00
Batangas	96	36	19	37	188	47.00
Bulacan	56	17	13	26	112	28.00
Tarlac	35	22	11	9	77	19.25
TOTAL MEAN						26.31

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	2860.688	953.563	2.02	3.49	5.95
Error	12	5652.750	471.063			
Total	15	8513.438				

ns – not significant CV = 82.49 %

Appendix Table 8. Order Hemiptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		

BSU	1	2	0	0	3	0.75
Batangas	28	20	1	11	60	15.00
Bulacan	3	12	2	0	17	4.25
Tarlac	4	12	5	1	22	5.50
TOTAL MEAN						6.38

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	445.250	148.417	3.19	3.49	5.95
Error	12	558.500	46.542			
Total	15	1003.750				

ns – not significant CV = 106.93 %

Appendix Table 9. Order Hymenoptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	3	3	6	2	14	3.50
Batangas	0	0	0	0	0	0
Bulacan	12	3	20	12	47	11.75
Tarlac	22	3	13	7	45	11.25
TOTAL MEAN						6.63

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	405.250	135.083	4.52	3.49	5.95
Error	12	358.500	29.875			
Total	15	763.750				

* significant CV = 82.44 %

Appendix Table 10. Order Lepidoptera

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	12	24	5	10	51	12.75
Batangas	2	19	10	15	46	11.50
Bulacan	4	6	9	16	35	8.75
Tarlac	6	4	1	2	13	3.25
TOTAL MEAN						9.06

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	213.688	71.229	1.89	3.49	5.95

Error	12	453.250	37.771
Total	15	666.938	

ns – not significant CV = 67.83 %

Adult

Appendix Table 11. Coleoptera – Ciidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	11	7	26	7	51	12.75
Batangas	2	0	0	0	2	0.50
Bulacan	0	0	0	0	0	0
Tarlac	0	0	2	0	2	0.50
TOTAL MEAN						3.44

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	463.188	154.396	7.39	3.49	5.95
Error	12	250.750	20.896			
Total	15	713.938				

** highly significant CV = 132.88 %

Appendix Table 12. Coleoptera – Curculionidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	1	1	0.25
Batangas	0	1	0	0	1	0.25
Bulacan	0	0	0	0	0	0
Tarlac	22	0	0	0	22	5.50
TOTAL MEAN						1.50

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	85.500	28.500	0.94	3.49	5.95
Error	12	364.500	30.375			
Total	15	450.000				

ns – not significant CV = 367.42%

Appendix Table 13. Coleoptera – Dermestidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		

BSU	0	0	0	0	0	0
Batangas	0	0	0	1	1	0.25
Bulacan	0	6	0	0	6	1.50
Tarlac	3	1	1	2	7	1.75
TOTAL MEAN						0.88

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	9.250	3.083	1.21	3.49	5.95
Error	12	30.500	2.542			
Total	15	39.750				

ns – not significant CV = 181.18 %

Appendix Table 14. Coleoptera – Erotylidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	14	14	20	26	74	18.50
Batangas	8	35	5	23	71	17.75
Bulacan	16	35	4	12	67	16.75
Tarlac	74	43	27	32	176	44.00
TOTAL MEAN						24.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	2086.500	695.500	3.29	3.49	5.95
Error	12	2534.500	211.208			
Total	15	4621.000				

ns – not significant CV = 59.93 %

Appendix Table 15. Coleoptera – Hydrophilidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	9	7	37	6	59	14.75
Batangas	0	2	2	0	4	1.00
Bulacan	17	2	5	13	37	9.25
Tarlac	108	13	5	11	137	34.25
TOTAL MEAN						14.81

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	2398.188	799.396	1.18	3.49	5.95
Error	12	8100.250	675.021			
Total	15	10498.438				

ns – not significant CV = 175.43 %

Appendix Table 16. Coleoptera – Scarabaeidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	0	0	2	0	2	0.50
Bulacan	0	0	0	0	0	0
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.13

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	0.750	0.250	1.00	3.49	5.95
Error	12	3.000	0.250			
Total	15	3.750				

ns – not significant CV = 384.62 %

Appendix Table 17. Coleoptera – Staphylinidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	1	0	0	0	1	0.25
Batangas	0	15	14	30	59	14.75
Bulacan	0	0	0	4	4	1.00
Tarlac	0	2	0	0	2	0.50
TOTAL MEAN						4.13

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	603.250	201.083	5.17	3.49	5.95
Error	12	466.500	38.875			
Total	15	1069.750				

* significant CV = 150.97%

Appendix Table 18. Coleoptera – Tenebrionidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	0	0	0	0	0	0
Bulacan	0	0	0	0	0	0
Tarlac	6	3	2	0	11	2.75

TOTAL MEAN	0.69

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	22.688	7.563	4.84	3.49	5.95
Error	12	18.750	1.563			
Total	15	41.438				

* significant CV = 181.19 %

Appendix Table 19. Dermaptera – Carcinophoridae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	53	20	50	61	184	46.00
Batangas	10	7	0	4	21	5.25
Bulacan	3	8	16	9	36	9.00
Tarlac	0	0	0	3	3	0.75
TOTAL MEAN						15.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	5179.500	1726.500	18.61	3.49	5.95
Error	12	1113.500	92.792			
Total	15	6293.000				

** highly significant CV = 63.17 %

Appendix Table 20. Diptera – Asilidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	2	1	0	0	3	0.75
Bulacan	0	0	0	0	0	0
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.19

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	1.688	0.563	2.46	3.49	5.95
Error	12	2.750	0.229			
Total	15	4.438				

ns – not significant CV = 251.86 %

Appendix Table 21. Diptera – Muscidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	30	18	0	14	62	15.50
Bulacan	20	7	3	12	42	10.50
Tarlac	2	3	1	0	6	1.50
TOTAL MEAN						6.88

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	654.750	218.250	4.19	3.49	5.95
Error	12	625.000	52.083			
Total	15	1279.750				

* significant CV = 104.90 %

Appendix Table 22. Diptera – Tanypezidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	20	0	0	0	20	5.00
Batangas	0	0	0	0	0	0
Bulacan	0	0	0	0	0	0
Tarlac	3	1	0	0	4	1.00
TOTAL MEAN						1.50

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	68.000	22.667	0.89	3.49	5.95
Error	12	306.000	25.500			
Total	15	374.000				

ns – not significant CV = 336.65 %

Appendix Table 23. Hemiptera – Anthocoridae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	28	20	1	11	60	15.00
Bulacan	1	12	2	0	15	3.75
Tarlac	4	12	5	1	22	5.50
TOTAL MEAN						6.06

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	489.188	163.063	3.47	3.49	5.95
Error	12	563.750	46.979			
Total	15	1052.938				

ns – not significant CV = 113.10 %

Appendix Table 24. Hemiptera – Lygaeidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	1	1	0	0	2	0.50
Batangas	0	0	0	0	0	0
Bulacan	0	0	0	0	0	0
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.13

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	0.750	0.250	3.00	3.49	5.95
Error	12	1.000	0.083			
Total	15	1.750				

ns – not significant CV = 221.61 %

Appendix Table 25. Hemiptera – Miridae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	0	0	0	0	0	0
Bulacan	2	0	0	0	2	0.50
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.13

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	0.750	0.250	1.00	3.49	5.95
Error	12	3.000	0.250			
Total	15	3.750				

ns – not significant CV = 384.62 %

Appendix Table 26. Hemiptera – Reduviidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	1	0	0	1	0.25
Batangas	0	0	0	0	0	0
Bulacan	0	0	0	0	0	0
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.06

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	0.188	0.063	1.00	3.49	5.95
Error	12	0.750	0.063			
Total	115	0.938				

ns – not significant CV = 418.33 %

Appendix Table 27. Hymenoptera – Formicidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	6	0	6	1.50
Batangas	0	0	0	0	0	0
Bulacan	0	0	0	0	0	0
Tarlac	0	0	0	0	0	0
TOTAL MEAN						0.38

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	6.750	2.250	1.00	3.49	5.95
Error	12	27.000	2.250			
Total	15	33.750				

ns – not significant CV = 394.74 %

Appendix Table 28. Hemiptera – Gelechiidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	4	2	4	9	19	4.75
Batangas	0	4	0	0	4	1.00
Bulacan	0	3	4	1	8	2.00
Tarlac	6	0	0	0	6	1.50
TOTAL MEAN						2.31

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	33.688	11.229	1.78	3.49	5.95
Error	12	75.750	6.313			
Total	15	109.438				

ns – not significant CV = 108.77 %

Pupa

Appendix Table 29. Coleoptera – Tenebrionidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	0	0	0	0	0
Batangas	0	0	0	0	0	0
Bulacan	0	0	2	0	2	0.50
Tarlac	6	1	2	0	9	2.25
TOTAL MEAN						0.69

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	13.688	4.563	2.31	3.49	5.95
Error	12	23.750	1.979			
Total	15	37.438				

ns – not significant CV = 203.88 %

Appendix Table 30. Diptera – Muscidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	10	0	0	12	22	5.50
Batangas	51	4	5	15	75	18.75
Bulacan	36	10	10	13	69	17.25
Tarlac	29	16	10	7	62	15.50
TOTAL MEAN						14.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	429.500	143.167	0.73	3.49	5.95
Error	12	2343.500	195.292			
Total	15	2773.000				

ns – not significant CV = 97.31 %

Appendix Table 31. Diptera – Perissommatidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	2	0	0	0	2	0.50
Batangas	13	13	14	8	48	12.00
Bulacan	0	0	0	1	1	0.25
Tarlac	1	2	0	2	5	1.25
TOTAL MEAN						3.50

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	387.500	129.167	54.39	3.49	5.95
Error	12	28.500	2.375			
Total	15	416.000				

** highly significant CV = 44.03 %

Appendix Table 32. Hymenoptera – Not Identified

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	3	3	0	2	8	2.00
Batangas	0	0	0	0	0	0
Bulacan	12	3	20	12	47	11.75
Tarlac	22	3	13	7	45	11.25
TOTAL MEAN						6.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	449.500	149.833	5.06	3.49	5.95
Error	12	355.500	29.625			
Total	15	805.000				

* significant CV = 87.09 %

Larvae

Appenidx Table 33. Coleoptera – Elmidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	0	1	1	0	2	0.50
Batangas	3	0	1	11	15	3.75
Bulacan	9	0	0	0	9	2.25
Tarlac	56	58	31	58	203	50.75
TOTAL MEAN						14.31

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	7102.188	2367.396	43.09	3.49	5.95
Error	12	659.250	54.938			
Total	15	7761.438				

** highly significant CV = 51.80 %

Appendix Table 34. Lepidoptera – Hepalidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	8	22	1	1	32	8.00
Batangas	2	15	10	15	42	10.50
Bulacan	4	3	5	15	27	6.75
Tarlac	0	4	1	2	7	1.75
TOTAL MEAN						6.75

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	162.500	54.167	1.28	3.49	5.95
Error	12	508.500	42.375			
Total	15	671.000				

ns – not significant CV = 96.44 %

Arthropods

Appendix Table 35. Arthropods

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	50	28	39	57	174	43.50

Batangas	28	28	20	32	108	27.00
Bulacan	20	18	14	34	86	21.50
Tarlac	22	14	25	32	93	23.50
TOTAL MEAN						28.81

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	1213.688	404.563	5.09	3.49	5.95
Error	12	954.750	79.563			
Total	15	2168.438				

* significant CV = 30.96 %

Appendix Table 36. Arachnida – Salticidae

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	1	4	0	0	5	1.25
Batangas	0	0	0	0	0	0
Bulacan	2	0	0	0	2	0.50
Tarlac	0	2	0	0	2	0.50
TOTAL MEAN						0.56

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	3.188	1.063	0.76	3.49	5.95
Error	12	16.750	1.396			
Total	15	19.938				

ns – not significant CV = 210.99 %

Appendix Table 37. Pseudoscorpiones

SOURCE	REPLICATIONS OF CHICKEN MANURE				TOTAL	MEAN
	R1	R2	R3	R4		
BSU	49	24	39	57	169	42.25
Batangas	28	28	20	32	108	27.00
Bulacan	18	18	14	34	84	21.00
Tarlac	22	12	25	32	91	22.75
TOTAL MEAN						28.25

ANALYSIS OF VARIANCE

SV	DF	SS	MS	Fc	TABULAR F	
					0.05	0.01
Treatment	3	1121.500	373.833	3.99	3.49	5.95
Error	12	1125.500	93.792			
Total	15	2247.000				

* significant CV = 34.28 %