

INVESTIGATIONS ON QUANTITY AND PROXIMATE QUALITY OF MAGGOTS PRODUCED FROM TWO SUBSTRATES (CATTLE BLOOD AND POULTRY DROPPINGS) CONTAINING VARYING LEVELS OF SAWDUST

*Anene A., E. O. Okorie, and G. A. Uche

Animal Nutrition Laboratory, Department of Animal Science and Fisheries,
Faculty of Agriculture, Abia State University, Umuahia Campus, Umuahia, Abia State, Nigeria.

*Corresponding Author: afamanene31@gmail.com

ABSTRACT

This study was conducted to evaluate the quantity and proximate quality of maggots produced from different livestock wastes. The livestock wastes used in this experiment were poultry droppings at 0%, 10% and 20% sawdust inclusion levels and cattle blood at 0%, 10% and 20% sawdust inclusion levels. The experiment was conducted in an open environment under the room temperature. Results from this experiment suggest that a 10% sawdust inclusion could optimize the quantity and proximate composition, especially protein, of maggots produced from cattle blood and poultry droppings.

INTRODUCTION

Literature shows that poultry droppings, paw-paw leaves, cocoyam leaves, pig dung, blood meal (cattle), rice bran, etc. have been used as substrates for the production of maggots (Aniebo *et al.*, 2008). Substrates such as poultry droppings are mixed with proteinous leaves like paw-paw leaves. The mixture of poultry droppings and leaves makes the substrate pasty and it can be put in a container and exposed in a humid environment. The proteinous leaves are used because they can easily decay to attract flies to lay eggs which will hatch into larvae that grow into pupae and finally into maggots.

Additives such as attractants and absorbents have been used to enhance the potentials of these substrates in attracting flies and the development and production of maggots (Okech and Hassanali, 1990; Madubunyi *et al.*, 1996; Hwangbo and Hong, 2008; Mihok and Lange, 2011). An absorbent is a substance, material or item that easily sucks up liquid and internally retains such liquids. Absorbents typically have a large number of pores. The makeup of the absorbent makes it very effective at sucking up and soaking up water and other liquids. A loose fibre forms chambers that can retain liquid. The holes between the fibres soak up the liquid and cause the fibrous material itself to swell, trapping the liquid inside and preventing it from sloshing right back out.

Wheat bran and sawdust have been utilized as absorbent materials for blood waste in the production of maggots. However, wheat bran is becoming costly such that sawdust and wood shavings now appear to be better alternative absorbent materials.

This study evaluates the quantity and proximate quality of maggots produced from cattle blood and poultry droppings with the inclusion of various levels of an absorbent (saw dust). The choice of cattle blood and poultry droppings was based on results of the previous work that indicated these wastes as better substrates for the production of maggots (Anene *et al.*, 2013).

MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of the Faculty of Agriculture, Abia State University, Umuahia Location. The experiment was performed in an open environment. Three substrates were prepared by mixing 50kg of undiluted poultry droppings with 0, 10, and 20% saw dust (PDS0, PDS10 and PDS20, respectively) while three other substrates were prepared by mixing 50 kg cattle blood with 0, 10 and 20% saw dust (CBS0, CBS10 and CBS20, respectively) making them a total of six substrates.

The prepared substrates were placed in an open space under a roof at ambient temperature of 30°C. Each substrate was sprinkled with about 1 litre of untreated underground water on daily basis to prevent the substrate from drying out. The drier the weather, the more water that was sprinkled. The odour of fresh blood and poultry droppings attracted flies which laid eggs on the substrates. The eggs hatched into larvae within two days and were allowed to develop further for 48 hours. Maggots attained mature size of 7-12 mm in length in 3-4 days becoming the desired maggots ready to be harvested. Harvesting of maggots was done by the use of sedimentation technique (ST). Each of the replicates was mixed with 8-10 litres of water and was allowed for about 10-15 minutes to separate the maggots from the substrates. After 10-15 minutes, the substrates sank down while the maggots floated on the surface. The matured maggots were then harvested using a 4mm-5mm sieve and taken to the laboratory for measurement of weight and proximate analysis. Maggots from each replicate were weighed to the nearest 0.1g when wet and then weighed after drying to a constant weight at 35°C in an oven using a digital weighing balance. Dried maggots from each treatment were blended into a fine smooth paste in a 3.8 L kitchen-type blender (Warning Products, New Hartford, CT) which was carefully cleaned and dried between samples.

Samples were analysed for crude protein (CP), crude fiber (CF), ash, nitrogen free extract (NFE), and moisture in triplicate groups using methods described by AOAC (1995). All data were subjected to Analysis of Variance (ANOVA) using SPSS version 17 and differences in means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Results and Discussion

Table 1 shows wet and dry weights of maggots produced from cattle blood and poultry droppings at three levels of sawdust inclusion.

Table 1: Wet and dry weights of maggots produced from poultry droppings and cattle blood at varying levels of saw dust inclusion¹

Treatment	Wet weight (g per kg)	Dry weight (g per kg)
PDSD0	147.63 ^a ±39.45	25.32 ^b ±2.74
PDSD10	167.91 ^a ±58.40	32.84 ^a ±16.94
PDSD20	113.30 ^{ab} ±31.74	25.09 ^b ±7.49
CBSD0	68.67 ^b ±16.62	14.37 ^c ±4.45
CBSD10	152.67 ^a ±24.29	35.47 ^a ±3.38
CBSD20	145.80 ^a ±36.13	29.06 ^{ab} ±16.59
² SEM	10.70	2.94

¹Means in the same column with different superscripts are significantly different ($P<0.05$).

²Standard error of means.

Results show that wet weight of maggots produced from cattle blood without sawdust inclusion (CBSD0) was significantly lower ($P<0.05$) than those of maggots produced from the other substrates except for those produced from

poultry droppings with 20% saw dust inclusion (PDSD20). There were no significant differences in wet weight of maggots produced from PDSD0, PDSD10, PDSD20, PDSD10 and PDSD20 or between those produced from PDSD20 and CBS0. Dry weight of maggots produced from each of the substrates with 10% saw dust inclusion were significantly higher than those produced from the other substrates except for those produced from cattle blood with 20% saw dust inclusion. This difference indicates the importance of the sawdust as an absorbent material for both cattle blood and poultry droppings at the optimum inclusion level of 10% and also as a binder for cattle blood. Results of this study suggest that sawdust enhances the quantity of maggots produced by both of the substrates under study. The weights obtained in this study are markedly higher than those recorded by Anene *et al.* (2013). Results also show that poultry droppings yielded relatively higher quantities of maggots than cattle blood. This confirms what was recorded by Anene *et al.* (2013). Insects have been shown to exhibit marked preference for particular substrates for oviposition (Zvereva and Zhemchina, 1988). Similarly, sites for oviposition can be influenced by many factors among which are moisture, nutritive value of the substrate and presence or absence of an oviposition attractant. In this study poultry droppings, characterized by high ammonium levels, produced the highest quantity of maggots. Pastor *et al.* (2011) have shown that ammonia is an effective attractant for insects.

Proximate composition of maggots produced from the different substrates is presented in Table 2

Table 2: Proximate compositions of maggots produced from cattle blood and poultry dropping at three levels of inclusion of sawdust¹

Treatment	Moisture (%)	Ash (%)	Crude Fibre (%)	Fat (%)	Protein (%)
PDSD0	41.26 ^a ±0.61	4.75 ^c ±0.06	1.62 ^c ±0.01	8.97 ^b ±0.01	43.40 ^d ±0.64
PDSD10	41.57 ^a ±0.15	4.93 ^b ±0.15	1.63 ^c ±0.01	8.67 ^c ±0.06	43.20 ^d ±0.00
PDSD20	40.74 ^b ±0.14	4.93 ^b ±0.10	1.68 ^a ±0.01	8.55 ^d ±0.02	44.10 ^c ±0.06
CBSD0	39.88 ^c ±0.11	4.56 ^d ±0.06	1.68 ^a ±0.00	8.65 ^{cd} ±0.01	45.23 ^b ±0.06
CBSD10	37.31 ^e ±0.06	5.63 ^a ±0.06	1.66 ^b ±0.01	9.17 ^a ±0.06	46.23 ^a ±0.06
CBSD20	37.76 ^d ±0.21	5.63 ^a ±0.06	1.77 ^a ±0.01	8.87 ^b ±0.06	45.83 ^{ab} ±0.15
SEM ²	0.21	0.12	0.01	0.05	0.28

¹Means in the same column with different superscripts are significantly different.

²Standard error of means

Although there were significant differences ($P<0.05$) in proximate composition of maggots produced from the different substrates, there were no clear trends except for the fact that moisture content was significantly higher while crude protein was significantly lower in maggots produced from poultry droppings than in those produced from cattle blood. Ash content increased at 10% saw dust inclusion level for each substrate but remained the same beyond this inclusion level.

Various workers have reported various levels of protein in housefly maggots. Calvert *et al.* (1971) reported protein levels of 63% while Anene *et al.* (2013) recorded values that ranged from 55.54 -57.42%. The values recorded for crude protein in this study 43.2%-46.23% are in tandem with values of 43 - 48.00% recorded by Fasakin *et al.* (2003) and Aniebo *et al.* (2008). It is possible that higher protein values in maggots may be attributed to the higher nutritional content of the substrate. Ash content

recorded in this study is lower than the 10.33% recorded in literature (Anene *et. al.*, 2013).

CONCLUSION

This study has suggested that a 10% inclusion level of sawdust will optimize the quantity of maggots produced from both poultry droppings and cattle blood although there were no clear trends in proximate composition of the maggots. Since all the substrates used in this experiment were waste materials, the research has provided another dimension to farm house waste management, environmental sanitation and control of air pollution.

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