EFFECT OF AROMATIC MATERIAL ON FEED STORAGE CONDITION

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DECLARATION

I hereby declare that the work embodied in this report is the result of the original research and has not been submitted for a higher degree to any universities or institutions.

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I certify that the report of this final year project entitled "Effect of Aromatic Material on Feed Storage Condition" by Nur Aqilah Binti Hapiz, matric number F18B0292 has been examined and all the correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Animal Husbandry Science) with Honours, Faculty of Agro Based Industry, University Malaysia Kelantan.

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ABSTRAK

Perlindungan makanan haiwan adalah penting untuk mengelakkan pencemaran dan penyakit makanan. Tujuan penyelidikan adalah untuk melihat kesan bahan aromatik dalam bahan makanan dalam dua keadaan penyimpanan yang berbeza. Kajian ini juga adalah untuk mencari aromatik terbaik untuk memberi kesan kepada bahan makanan. Bahan makanan yang mempunyai bahan aromatik yang ditambahkan kepadanya disimpan dalam dua keadaan selama lapan minggu. Seterusnya, Sampel plastik jenis yang digunakan ialah beg plastik steril bertali dan jenis plastik berzip, Namun menggunakan dua jenis plastik yang serupa dengan keadaan penyimpanan yang dihadapi peternak setiap hari. Sampel ditentukan untuk menentukan ketahanan sampel bahan aromatik dalam setiap makanan ikan, jagung halus, kacang soya halus, dan sisa kacang soya yang terletak di Makmal Makanan UMK Kampus Jeli. Bahan makanan terbaik yang ada pada bahan aromatik ialah kacang soya halus dan makanan ikan. Kedua-dua bahan menggunakan bawang putih dan bunga cengkih kerana kumbang merah tepung dan kutu tepung. Penundaan jangkitan semua sampel aromatik seperti bawang putih, daun pandan, cengkih, dan cili kering dalam bahan makanan bermula minggu ke-2 berada dalam keadaan yang lebih baik daripada sampel kawalan, iaitu sudah pada 30%. Untuk sesuatu seperti ulat lalat rumah, menjangkiti dalam satu sampel sahaja iaitu sisa kacang soya kerana sampel itu menjadikan minggu ke-4 pada 86 peratus diserang. Semua serangga meningkat mengikut setiap minggu, seperti yang dibuktikan di sini. Dalam kajian, nombor serangan menunjukkan keberkesanan aromatik berbanding bukan aromatik. Akhir sekali, data mempunyai beberapa aplikasi dan kegunaan kepada cadangan dengan cara baharu untuk menentukan tahap serangan menggunakan spektroskopi inframerah-dekat (NCRIS) dan kawalan perosak juga menggunakan pembangunan pertumbuhan kulat.

Kata kunci: bahan aromatik, stor penyimpanan, bahan makan, persekitaran

ABSTRACT

Protection of animals feed is critical in order to avoid pollution and feed diseases. The purpose of the research is to observe the effect of aromatic material in feedstuffs in two different storage conditions. The study is also to find the best aromatic to give effect to the feedstuff. The feedstuffs that have aromatic material added to them are stored in two conditions for eight weeks. Next, The samples used type plastic are sterile plastic bags with a rope and zipper plastic type, However, using two types of plastic that are similar to the storage conditions that farmers face on a daily basis. The samples were determined to determine the sample durability and stability of the aromatic material in each fish meal, corn meal, soybean meal, and soybean waste located at the UMK Feed Laboratory Campus Jeli. The best feedstuffs that aromatic materials have are soybean meal and fish meal. Both ingredients use garlic and cloves due to the red flour beetle and flour mite. The delayed infestion of all aromatic samples such as garlic, pandan leaves, clove, and dried chilli in the feedstuff beginning in week 2 is in better condition than the control sample, which is already at 30%. For something like the housefly maggot, infested in one sample that is soybean waste because the sample is that makes a week 4 at 86 percent infested. All of the insects increased by week, as evidenced here. In the study, the infestation number demonstrates the effectiveness of aromatics over non-aromatics. Finally, the data has some application and usefulness to recommendations in a new way to determine the level of infestation using near-infrared spectroscopy (NCRIS) and pest control also using fungal growth development.

Key words: Aromatic material, feed storage, feedstuff, environment.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The first section of this chapter contains the research background, problem statement, objective, hypothesis, and scope of study. The chapter will provide a noteworthy introduction to this project and insight into how the idea was developed. The chapter is broken down into five pieces.

1.2 Research Background

Livestock production in Malaysia was the second highest in establishments responding to the Annual Census of Agriculture Establishments 2009, with 11.3 percent, after crops (81.0 percent) in the comparison year 2008. In addition, the livestock sector contributed approximately 13.1 percent of total value gross output, while crops contributed 85.1 percent and fisheries contributed 1.8 percent, respectively.

The protection of animal feeds is critical in order to avoid pollution and food diseases. The feeding storage requires a few standards that are away from direct sunlight, rains or from the pest and insect. Significant rises in global demand for livestock goods would undoubtedly necessitate increased feed protein stocks and suppliers, and substitutes will need to be evaluated on a regular basis. In the post-harvest losses be in some of the

benefits of improved crop production and lead to higher food prices and the risk of food shortages (Hodges et al., 2014). In the growing global demand for high quality and safe foods free of insect and microbial invasion, safe and effective pest management tools need to be used to improve edible grain storage.

The aromatic plant are garlic, pandan leaves, dried chili and cloves that used to improve animal feed to storage and make the sample lifetime last a bit longer. Aromatic materials such as garlic, pandan leaves, dried chillies and cloves are used as a way to improve animal feed storage system and thus can increase the sample lifetime much longer than usual. The packaging of the material, the shielding of the feed ingredient from outside impact and harm to avoid pesticide. Lastly, feed storage is one of the top priority in livestock industry as it may be one of the factors that cause losses to the farmers.

1.3 Problem Statement

This study is about lack of storage condition requirement to discover the needs of poor storage condition that reduce the shelf time of the feed. In some way the soybean waste has compromises the storage when it wet or not properly dried has become a problem that need to be solved due to its contamination from the environment. The handling on checking of each sample can be contaminated if not properly seal or tied. After the animal feed storage is exposed, the feed becomes unsellable and cannot be used as animal feed.

1.4 Objective

To observe the effect of aromatic material of pest in feedstuff in two different storage condition. The research also to find the best aromatic that give effect to the feedstuff.

1.5 Hypothesis

The study is comprised of two hypothesis:

H_0: The aromatic material not have effect on feed stuff and storage condition

$H_{1:}$ The aromatic material have effect on feed stuff and storage condition

1.6 Scope of Study

The study focuses on two different purposes to prove the validity of the hypothesis. The study focuses on the impact of the use of aromatic materials on the feedstuffs with the two feed storage conditions. The important of aromatic material for ability to improve and reduce the presence of infestation. The sample are placed in open and closed area in UMK Animal Laboratory also tested the durability the aromatic material to feedstuff after 8 weeks.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter includes a description of similar and prior work done by other researchers. There are five sections in this chapter

2.2 Problem in Feed Storage

Feed storage is a livestock feed is a perishable item. It will spoil, much like the bread we buy from the grocery or the cheese we keep in our refrigerator, if left for an extended period of time. Humans can go to the store every week to get new groceries, but that was neither practical nor economical when purchasing large quantities of animal feed. The question then becomes, how can we extend the shelf life of animal feed over a period of several months? When discussing shelf life, it is critical to comprehend what tends to happen to feed during long-term storage.

In the study from Howe, et al..(1965), the losses resulting from insects, micro-organisms and livestock forage and insufficient treatment are often associated with physical and chemical changes. Loss of storage is largely due to infestation and livestock pests and fungi eating or destruction of material in the feed mill. If the pest are seriously infesting

the feedstuffs, there will be extensive loss of weight and quality damage. Intensive insect behaviour leads also leads to mould formation, which not only supplements the feed degradation, but also presents significant health risks on rations containing degraded feed products, either for livestock or fish feeding.

According to Food and Agriculture Organization, the compound manufacturer's main concern is with the first three types of storage failure. In developing countries where handling and processing are often poorly done post-harvest, weight loss due to loss of moisture or the presence of a large insect population in the stored feed is a concern. Ineffective quality enforcement (if, in particular, such requirements exists) results in inadequately treated feed materials that are much more vulnerable to deteriorating processes being produced and supplied.

The lack of quality requirements represents the relatively low aesthetic value of feed commodity transactions in those countries. The cost of inspection, prevention, and monitoring to preserve quality levels (while considered over-arching in most developed countries) is thus superseded by the other three major storage loss categories in developing countries, which we will here describe as cost. (Howe et al.., 1965).

2.3 Factors That Affecting Infestation of Feedstuff

There are several factor that have shown in factors infestation within the feedstuff storage. Temperature, humidity, and the moisture levels of the feed ingredient are key factors influencing the population growth of most insect species in the feedstuff.

2.3.1 Temperature

The temperature in the feed storage are optimal in the temperature zone in which targeting zone for the feedstuff. The tropical insects can live with a maximum temperature of around 28°C. In research from Hossen et al. (2013) stated that the fish feed store then using two temperature which are room temperature was varied from 25 to 30°C and low temperature (cool condition) was ranged from 5 to 8° C and were sampled for analysis at 15 days interval.

2.3.2 Humidity

Insect replication gradually increases to 70% relative humidity. When the condition exceeds 70%, mould formation begins, complicating the situation. The humidity quality of the feed is closely related to relative humidity. Low humidity and medium humidity protect against insect infestation. According to the same study by Hossen et al. (2013), because of humidity below 70%, controlled temperature below 35-40°C, and good feed packaging.This characteristic was discovered for softening of the texture, which could be due to increased moisture content of feeds stored at room temperature and auto degradation in both case scenarios.

2.3.3 Moisture

The moisture condensation is the process of converting water from a gas or vapour to a liquid or solid. At a given temperature, air can only hold a certain amount of moisture. When the maximum moisture-holding capacity of air is exceeded, the excess water moisture condenses and appears as fog or rain in the air, or as a liquid or solid on a surface.

When the temperature of a surface is at or below the dew point temperature, water vapour condenses on it. The temperature at which moisture begins to form is defined as the dew point temperature. Even with all the moisture in the atmosphere after all of the rains, it is crucial to keep a sight on your feedstuffs. In research from Steckler (2016) that increases moisture content by 4 to 8 percent, storage times must be less than 1 or 2 days to avoid heating and damaged products.

2.4 Aromatic Material

In research from Libretexts (2020), because of their distinct aromas, benzene-like substances were previously referred to as aromatic hydrocarbons. An aromatic compound is now defined as any compound that contains a benzene ring or has benzene-like properties (but not necessarily a strong aroma). Aromatic compounds in this text can be identified by the presence of one or more benzene rings in their structure.

According to research from M., & C. (2014), many items we take for granted in our daily lives rely on aromatics industry products, which provide benefits such as durability, safety, comfort, and lightweight design. Aromatics are used in a wide range of products, including medicine, hygiene, transportation, telecommunications, fashion, and sports.

2.4.1 Pandan Leaves

Pandan leaves are often used when making rice as a means of enhancing the flavour and aroma. The Pandanus leaves also have contain are alkaloids, flavonoids, polyphenols, terpenoids, steroids, hydrocarbons, and aldehydes known as to keep out and as a repellent, and on the other hand, are also commonly used in insect repellents, such as cockroach prevention. In addition, pandan leaves are also used in the production of other foods such as desserts, sweets, coconut jam and ice cream. Due to its high chlorophyll content,

Pandan leaves are also a popular green colorant for food. In Malaysia, especially in the Malay community have become more interested in organically grown foods as people believe they are healthy with few pesticide residues. The compound which gave a good aroma in pandanic blades was 2-Acetile-1-pyrroline (2-AP) (Laksanalamai and Ilangantilek, 2006). Slamet Fauzi and Sigit Prastowo (2021) stated in the their study done as a new way of applying insecticides by utilizing volatile compounds from the materials used or using the concept of inhalation poisons system. The study using powder pandan leave on rice as repellent. Based on the results, the combination treatment of 2 g of pandanus and 8 g of neem (P2) also had a fairly good mortality percentage of 62.5% up to 18 days after application.

2.4.2 Garlic

In research from Wescott (2002) Garlic (Allium sativum L.) is an antitumor, cardio protective, antibacterial and antidiabetic effect, high antioxidant activity (vitamins, polyphenols, flavonoids) and a significant amount of sulphur-containing derivatives. It is known to have growth-stimulating properties and the ability to protect plants from pathogens. In practice, garlic harvesting, storage and processing usually involves the formation of waste containing partially damaged cloves and is of great value for agricultural use as a protective tool against biological stress. The demonstrated insecticidal activity of garlic is determined by *allicin. Allicin is* formed as a result of alienate activity and other interesting sulphur derivatives during clove grinding, and attacks by herbivorous pests, pathogens and animals cause biological stress and promote *allicin* biosynthesis. In a previous study, garlic was found to be very effective in the protection against herbivores like caryopsis, scoop, whitefly, and weevils. Furthermore,

the investigations of Hardianciah et al. Researchers found that garlic extract can help prevent grain loss in rice plants by making them less attractive to scaly finches.

2.4.3 Dried Red Chili

The chilli pepper, or chilli, originated in South America and is now widespread throughout the tropics and subtropics. The insecticidal properties are highest in the ripe fruit especially in the skin and seed. Chilli's act as a stomach poison, anti-feeding and repellent to a number of pests. Chilli can be interplant with crops to act as a repellent against many insects, fungi and viruses. In the previous Fauzi, S., & Prastowo, S. (2021, July 6) the study the effect of capsaicin on whitened rice *Sitophilus o.* weevils was monitored over time based on four different factors with the presence of chilli, the initial number of weevils present or introduced into milled rice, the weight of rice processed, and the variety of rice. Their experimentation proved that these are the varieties forming a high number of weevils at the beginning with the action of chilli capsaicin was also verified as an insect repellent and unappetizing, especially at the initial time that allowed to see leaking insects. It does not prevent the hatching of larvae, even if it has the capacity to kill weevils. The observed facts show that capsaicin is reserved for the protection of samples of whitened milled rice still devoid of contamination of larvae or adult weevils.

2.4.4 Cloves

In research from Cortés-Rojas et al. (2014) the spices such as clove, oregano, mint, thyme, and cinnamon have been used as food preservatives and medicinal plants for centuries due to their antioxidant and antimicrobial properties. Many studies now confirm spice plants' antibacterial, antifungal, antiviral, and anticarcinogenic properties. Clove, in particular, has piqued the interest of researchers due to its potent antioxidant and

antimicrobial properties that distinguish it from other spices. Syzygium aromaticum (S. aromaticum) (synonym: Eugenia cariophylata), also known as clove, is a medium-sized tree (8-12 m) native to the Maluku islands in east Indonesia. For centuries, the trade of cloves and the pursuit of this valuable spice fueled the Asian region's economic development.

In research from Kang et al. (2019) cloves has been used as a topical analgesic to promote healing and prevent ageing, as well as to treat cardiovascular disease, arthritis, infections, digestive problems, skin cancer, and thyroid dysfunction; it is also used in fragrances and flavourings (Chaieb et al., 2007; Fu et al., 2007; Nassar et al., 2007). Clove extracts, both essential oil and powder, have a wide range of biological effects, including antioxidant and antibacterial properties (Menon & Garg, 2001; Sultana, Anwar, Mushtaq, Aslam, & Ijaz1, 2014). Cloves may increase the shelf life of various foods (meat, baked goods, etc.) by inhibiting the growth of foodborne pathogens while imparting a distinct flavour (Ibrahium, Abd ElGhany, & Ammar, 2013; Khaleque et al., 2016; Kumar & Tanwar, 2011; Tajik, Farhangfar, Moradi, & Rohani, 2014).

2.5 Recomendation on The Prevention of Infestation

This can be discussed by completely eliminating the emerging insects and preventing re-infestation. Under ideal conditions, these insects can multiply extremely quickly. A small population of the flour beetle, for example, can multiply to 76 million in six months at 28°C temperature and 65 to 80% relative humidity. If the infestation is severe, creeping insects can be found on the bags, between pile, on the godown's walls and floors.

2.5.1 The losses feed management

A major population of pests is the best warning of a significant weight loss. High temperatures, high humidity, softness and a high nutritional value of the feed are all conducive, but also unavoidable in small quantities to insect damage. Prolonged storage can worsen the loss. If the storage area is not maintained clean and the infested pathways are retained, there would be an increase in insect attack liability. There would be a weight loss in feed if sacked grain and oil cakes are not involved if the presence of frass on the surface of the sack points to the feeding event of a large population of insects.

Next, one of the most important factors when attacking insects on feedstuffs is consistency loss for feed manufacturers. Quality effects are different. The majority of stored foods undergo certain chemical modifications that alter their flavour and nutritional value. In addition to consuming the feed, these harmful chemicals are accelerated by insect pests. The discharge of the insect lipase enzyme itself increases chemical processes of deterioration. Few feeds are uniform and insects and mites know that they want those sections or particles of feed which they like.

Insect attacks, especially when insects break small particles, bring in micro-organisms or increase temperature or humidity levels, intensify this breakup. Insects that scavenge food, such as cockroaches, can carry pathogenic bacteria like *Salmonella*.

2.5.2 Insect Infestation

The major insect in feedstuff storage conditions are storage pests *Tribilium Castanuem* commonly known as the red flour beetle, are of great feed destroyer and affinity for stored

grains. In addition, the nature of the beetle, their small size, and their short life cycle make them ideal for laboratory studies. Since its first adoption as an experimental organism in the 1920s, beetles have been successfully used in population ecology, genetics, interspecies competition, host-parasite dynamics, chemical ecology, and sex selection studies. Recently, the red flour beetle has become an important model organism in functional genetics used in evolutionary developmental biology and general insect biology. These studies underscore the importance of this organism in contributing to an understanding of the processes of ecology, evolution, and genetic function and cycle in infestation.

According to this book J. Johnson, in Improving the Safety and Quality of Nuts, 2013 that adult red flour beetle are some survive 2.5 years, with females laying 2 to 13 eggs each day for up to 300 days. Females produce an average lifetime of 300 to 600 white spherical eggs (Good 1936, Leslie and Park 1949), with some females capable of producing more than 900 eggs by laying them directly in food material. Cream-colored larvae, about 6 mm long at maturity, with a short forked protrusion at the end of the abdomen. The pupae are also cream colored and naked inside the product. Unlike stored food moths, adult beetles, as well as larvae, live in the product and feed on it.

Therefore, any stage of life can be found in the product at any time. Development time from egg to adult depends on temperature, humidity and diet (Howe 1956), requiring more than 40 days on peanuts at 35°C and 70% relative humidity (Arbogast 1991). Mites thrive at 14% moisture content and can become a serious problem when grain moisture content is in the range of 15-18%. This can lead to insect and mould problems. Insects that feed on mould and fungus, such as mites and the fungus beetle, often live together. The grain mite can eat fungi that grow on stored grain, such as *Aspergillus flavus*. The

most common grain mite is the *Acarus Siro*. This kind of fungus feeds on the germ of damaged grains, and if the grain is mouldy, the fungus will attack the endosperm. It cannot penetrate undamaged grains. Mite management is important for grain storage. Mites feed on wheat germ, yeast, cheese, powdered milk, flour, or grain and populations can explode. In infested foods, the infestation is confined to the most superficial layer. Whole or cracked grains and nuts may be infested throughout with heavily infested grain and feed are contaminated.

2.6 Conclusion

The research demonstrates a strong function and result from each aromatic material. Thus, the research's key finding was obtained and achieved. The research objective and findings and understanding of the importance of keeping the feed free from the pest or insect that can lead to feed disease and plolution. Based on the study, it was discovered that there was need from the feed storage adding for extra protection.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter is divided into four sections. This chapter summarizes and explains the study's sample collection, experimental design, sample preparation, experimental site and evualuation of the feedstuff. Methodology encompasses the experimental design, experimental site, sample preparation, data analysis, and interpretation. The methodology thus assists the researcher and reader understand the research process, granting it scientific merit. The approach of this study is to comprehend the causes and effects of aromatic material on storage condition, specifically the improvements achieved by best of aromatic material effect.

3.2 Sample Collection

The soybean bought the nearest store in Kelantan., the sample were collected and materials that were used in this experiment are fishmeal, corn meal, soybean meal, and soybean waste whereas aromatic materials are pandan leaves, garlic, dried red chillies, with cloves for feed preparation of the experiment except commercial feedstuff. The equipment that are were used for the study are microscope also electronic scale, with sterile plate and spoon. The aromatic material and commercial feedstuff tested of the

durability for eight weeks, stability also the appearance with the effectiveness that located at Feed Lab, UMK Campus Jeli then followed by the weighed feed.

3.3 Experimental Design

The sample were weight 100 g each and placed it inside sterile plastic bag and zipper bags. Then, aromatic materials pandan, garlic, cloves with dried chili was add on along into the sample. Control and feedstuffs were in triplicates. Lastly, the sample were put under observation for 8 weeks and been observed weekly.

All the observation had been documented in picture besides samples being observed under microscope to note any changes. Four samples of feedstuffs were used in this study which are fish meal, corn meal, soybean meal and soybean waste that are used in this study. The control are the sample that are not added any aromatic materials. Aromatic materials used in the samples were pandan leaves, garlic, dried red chili, and clove. The samples were triplicated to get the average results. The sample that placed inside a sterile plastic bag with a rope and zipper plastic type were put in a closed are, which is in the animal laboratory, and in an open area, which is outside of the laboratory. The samples then were observed on the durability and stability of the aromatic material. Loose plastic bag and zipper bag used to put the samples for better observation. It is also cheap, easy to get and easy to be stored during observation. Samples were observed and record either foreign objects or pest's presence in the sample.

Table 1 : Sample prepared

Sample	Aromatic Material	Plastic Type
Control	-	Zipper Loose
Fish Meal	Cloves	
Cornmeal	Pandan Leaves	
Soybean Meal	Dried Chili	
Soybean Waste	Garlic	

3.4 Sample Preparation

The feedstuff have to process before turn into feedstuff are soybean waste and cornmeal. The 4 kg soybean had to soak overnight and grind into small particle. The sample also strained all the milk, left it just a waste and then dried in the oven for two days at 60 °C. After two days, it became dried up and ready to use. Next, the corn, grind the corn into cornmeal to turn it into powdery structure to easy use.

3.5 Experimental Site

The sample that placed that located at UMK Animal Laboratory Campus Jeli about eight weeks. The sample was placed in two storage condition near the Animal Lab that have open and close area at the lab.

3.6 Evaluation of the feedstuff

The physical method of detecting adulterants in feeds involves the senses of smell, taste, or sight. The microscope used to identify the pests in the feedstuffs, either confirms or denies their presence. A compound microscope can detect even the finest ground adulterants in a sample. This method is more accurate than the use of the senses in checking adulteration in feeds and feed ingredients. To check the foreign objects or insects in the samples, there are two types of microscopes used in feed microscopy which are compound microscopes and stereomicroscopes.

The feedstuff is having an unpleasant, stale smell or taste, like decomposing fat or oil, which can be detected by sense of smell. The presence of materials like small stones, scrap metal, dirt, pieces of wood, and seeds that are added to increase the weight of the product and the presence of insects and moulds can be detected by sight. Last but not least, the wetness, dryness or hardness of a feed or feed ingredient can be detected by the touch of your hand. The feed must be dry and not clumpy.

3.7 Data Analysis

Data analysis is commonly used to refer to gathering the data and information required for proper analysis. The purpose of data analysis and interpretation is to turn collected data into credible evidence about the effect of the aromatic towards the feed handling in bulk storage and losses that able minimize the loss for the breeders and the stockist. Three fundamental processes were used to analyse the data: organizing, describing, and interpreting.

Microsoft Excel and Microsoft word used to enter and analyzed the data, which displayed in percentages. The analysed data then tabulated in the form of tables. The findings are then discussed, and the data presented in the form of percentage tables in chapter 4.

3.8 Conclusion

This chapter defines how the researcher conducted the research using the methodology and data collection and how the variable was identified. In addition, the methodology defines how the researcher intends to use the data gathered to identify the analysis and produce a better result. As a result, in Chapter 4, the researcher used the method as a reference and data collection.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

There are four sections in this chapter. First, this chapter introduces data analysis before going into research findings related to the study's research objectives and research questions. The results and analysis of the experiment are the subjects of this discussion. Second, observation for eight weeks was used to gather the data. The primary goal of this study is to effects of aromatic material on feed storage condition. Third, the feedstuff were observed under compound miscroscope . This study, expected to give a positive result toward the feed storage for the farmer in future.

4.2 Results of Analysis

It provides a comprehensive account of the study's findings and analyses in tables, or text, with the essential information indicate the results and discussion

4.3 The Effect of Aromatic Material on Feedstuff in Zipper and Loose Bag Storage

In research from Nagamine (2019) when the presence or abundance of a pest can be predicted in advance, prevention may be an option. Continuous pests are, by definition, very predictable. Sporadic and potential pests can be predicted if you understand the circumstances or conditions that favour their presence as pests. Some plant diseases, for example, occur only under certain environmental conditions. If such conditions exist, you can take steps to prevent plant disease organisms from wreaking havoc on desirable plants.

Table 2: Observation of Feedstuff with Aromatic Material and Zipper Bag and Loose Bag Storage

WEEK	**OBSERVATION**			
	CLOSED		**OPEN**	
	ZIPPER	**LOOSE**	**ZIPPER**	**LOOSE**
WEEK 1	• No animal	• No animal	• No animal	• No animal
WEEK2	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• Dust like in SBM	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal and Cloudy
WEEK3	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal
WEEK4	• *Acarus Siro* (Flour Mite) & *Tribilium*	• *Acarus Siro* (Flour Mite) & *Tribilium*	• *Tribilium Castanuem* (Red Flour	• *Acarus Siro* (Flour Mite) & *Tribilium*

	Castanuem (Red Flour Beetle) in All Aromatic Material For Cornmeal	*Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal • Dust like in SBM	Beetle) in All Aromatic Material For Cornmeal	*Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal • Dust like in SBM
WEEK5	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal
WEEK6	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal
WEEK7	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal
WEEK8	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in All Aromatic Material For Cornmeal

Based on the result table above, both types of plastic, containing the samples have different types of insects or foreign objects which inside were fish meal, corn meal, soybean meal and soybean waste. More insects present week by week, in 8 weeks. Presence of insects causes the feedstuff change in appearance. The feedstuff that already been infested keep growing number of beetle.

For this study, the use of aromatic material whether its helps in avoiding the presence of insects and foreign objects. According to pervious study, the results of the study may be because the compounds in neem are more deadly to *S. oryzae* (alkaloids, resins) than the compounds in Pandanus leaves insecticide.

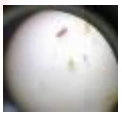
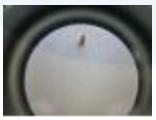
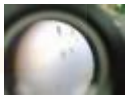
In the same research from Syamsu et al. (2015) with neem composition causes higher mortality than pandan or a combination of the both. The configuration of bulk material storage, handling, and processing systems necessitates data on bulk and handling properties such as size dimensions, bulk and particle densities, and bulk material friction coefficients on the most commonly used structural surface materials. Bulk density, angle of repose, and friction coefficients against bin wall materials are all required by theories used to predict pressures and loads on storage structures. In addition, data on bulk density and angle of repose are required for the design of hoppers for processing machinery. Finally, the bulk density is used in the design of drying and aeration systems because it affects a stored bulk's resistance to airflow.

Table 3 : Weekly Observation of Insect Type Percentage Based Feedstuff Storage Condition

Insects		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Red Flour Beetle	Aromatic	0%	19%	24%	40%	74%	89%	90%	92%
	Control	0 %	30%	46%	60%	79%	100%	100%	100%
Flour mite	Aromatic	0%	10%	17%	26%	46%	69%	77%	87%
	Control	0%	30%	49%	70%	80%	98%	100%	100%
Houseflly Maggot	Aromatic	0%	0%	0%	70%	77%	80%	86%	93%
	Control	0%	0%	0%	86%	90%	96%	100%	100%

Based on the result observation table above, the delayed infestion all aromatic samples such garlic, pandan leaves, clove and dried chili in the feedstuff starting from week 2 are more great condition that the control sample that already at 30%. For the housefly maggot, infested in one sample that are soybean waste due the sample are that make a week 4 at 86% infested. As evindenced here, all the insects increased by week for all insect. In the study, the infestation number shows the effectiveness of the aromatic than non aromatic.

Table 4 : Weekly Observation Aromatic Material of Feedstuff on Storage Condition

Week	Observation	
	INSIDE	OUTSIDE
Week 1	No Animal	No Animal
Week2	 Cornmeal (All Aromatic)	 Cornmeal (All Aromatic)
Week3	 Cornmeal (All Aromatic)	 Cornmeal (All Aromatic)
Week4	 Cornmeal (All Aromatic)	 Cornmeal (All Aromatic)
Week5	 Cornmeal (All Aromatic)	 Cornmeal (All Aromatic)
Week6	 Cornmeal (All Aromatic)	 White Mouldy In Soybean Waste

Week7	 White Mouldy In Soybean Waste	 Cornmeal (All Aromatic)
Week8	 Sample infested with maggot	 Sample infested with maggot

Based on the table, we can see that the effect of certain feedstuffs on storage conditions is a problem for the presence of infestation. The picture that was observed and discovered the animal presence problem. All the samples from week one doesn't have any animal presence in it. Week 2 up to week 5, the sample of cornmeal had flour mite, red flour beetle. Week 6 to 8, the triplicate sample of the cornmeal and soybean waste has infested and has the maggot and its physical characteristic changes into mouldy and greenish. The sample had maggot due the sample are because of the not properly dried of handling the sample.

According to new research from (Syamsu et al., 2015).The physical properties of the feed are an extremely important consideration in feed processing. The efficiency of a process of handling, processing, and storage of feed in feed mills requires not only information about the chemical nature and nutritive value of the feed, but also information about the physical properties of the feed so that loss due to feed handling can be avoided. It is critical to understand the physical properties of feed because they affect the storage, drying, and processing of feed materials.

Table 5 : Animal Presence that in the most of cornmeal and soybean waste, and soybean meal

BIL	INSECTS NAME / NAME SCIENTIFIC	PICTURE
1.	Red Flour Beetle / *Tribilium Castanuem*	
2.	Flour mite / *Acarus Siro*	
3.	Houseflly Maggot / *Musca Domestica Linnaeus , Diptera, species*	

As shown in Table 5, three types of insects are infested the sample with picture that are observed to show specific information. Picture showed are the pests found in the sample under compound microscope.

Red flour beetle or red vevil are known as *tribilium castanuem*. There two name to these beetle that is Red flour beetle and confused flour beetles. The beetle infest stored grain products such as flour, corn, grist, crackers, beans, spices, pasta, cake mixes, dried pet food, dried flowers, chocolate, nuts, seeds and even dried museum specimens (Via 1999, Weston and Rattlingourd 2000). These beetles have chewing mouthparts but do not bite or sting. The mealworm can cause an allergic reaction (Alanko et al. 2000) but is not known to spread disease and will not feed or damage the structure of a home or furniture. These beetles are two of the most popular among pesticide in storage, homes

and grocery stores. The weevil was apparently given this name out of confusion about its identity, since it is so similar to the red flour beetle at first glance (Walter).

According to Neel (1999, September 8) the article that insect keep increasing every week in the feedstuff are they are pests in mills, warehouses, and can be a pest in the home in opened flour containers or other common grain products that have been left unattended. They may live in corn meal, beans, dried fruits, flour, cake mixes, and nuts. The species commonly found is the black flour beetle called the confused flour beetle and the red flour beetle. The beetle through the process of going from egg, to larva, to pupa, and finally to an adult. Then have a complete, sequential development from egg to adult. A female will lay between 2-3 eggs a day and may live up to 2-3 years. The eggs hatch into brown-white larvae in 5 to 12 days. Depending on the temperature, they can go through a complete cycle, egg to egg, in 7 weeks.

Next, flour mite as known scientific name that is *Acarus Siro*. The grains of mites are not really insects, but they are closely related to the insects. They are microscopic, pale greyish-white, smooth, and soft bodied. The populations can increase to such large numbers that the grain appears to be covered with a moving layer of dust. Adult insects have 8 legs, while larvae have 6. Each leg has one claw on the end, plus a sucker. Grain mites are found in all regions because they prefer cool, moist climates. Females retain the sperm they were given by the males. Since each mating yields 1 spermatophore, the number of mating's can be calculated. Females can mate between 16 and 40 times. Egg-laying begins the day after the insect first encloses and continues until death. Average egg production is 230, but can reach over 600 if fed powdered milk, wheat germ, yeast, cheese, or seeds under favourable conditions (68 degrees Fahrenheit and 80% relative humidity). Egg production ranges from 1 to 24 eggs daily.

According the article that the cornmeal should not be stored at a temperature that is too high or too low. Ideally, they should be stored frozen. This helps prevent rancidity from developing in the oil, it precludes insect infestation, and nearly prevents the loss of vitamins. Frozen in an airtight, moisture-proof film, corn meal will keep indefinitely. The second best way to store corn meal and flour is at refrigerated temperatures at 32-40°F at a relative humidity of 55-65% for one year. Warm, damp conditions may cause mould to grow and a bad flavour and odour to develop. Warm weather also causes insects to hatch in the cornmeal. Unless the products are packaged in vapour-proof packages, there can be a serious problem of moisture absorption from condensation when they are removed from freezing to higher temperatures. Proper tempering can prevent this. A more rapid tempering can be obtained by placing large, 3 mil poly bags around each pallet of flour before it is removed from frozen storage.

In the conclusion, the animal that have inside the sample are the housefly, or *musca domestica* Linnaeus 1758, is the most common fly, or *Diptera*, species. Flies are a pest and carrier of diseases that find their food in manure and decaying organic waste. Housefly maggots' ability to grow on a wide range of materials can make them useful for turning waste into a protein and fat-rich biomass. Producing housefly maggot biomass in controlled conditions to feed farm animals has been investigated since the late 1960s. Some housefly larvae, cultured on poultry litter, have been shown to be useful as a possible protein source in poultry nutrition. The use of housefly maggots to feed fish and crustaceans in pond farming has been studied extensively since the late 2000s. Other Musca species, such as the face fly *Musca autumnalis* (De Geer) (Koo et al., 1980), have been studied to a lesser extent.

4.4 The Effect of Non-Aromatic Material on Feedstuff in Zipper and Loose Bag Storage

This should show the sample that was observed to provide no aromatic material at the most redunctant from physical characteristics and causing more problems as the week progressed.

Table 6 : Observation of Feedstuff with Non-Aromatic Material and Zipper Bag and Loose Bag Storage

WEEK	OBSERVATION			
	CLOSED		OPEN	
	ZIPPER	LOOSE	ZIPPER	LOOSE
WEEK 1	• No animal	• No animal	• No animal	• No animal
WEEK2	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• Dust like in SBM	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control
WEEK3	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control
WEEK4	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control • Dust like in SBM	• *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control • Dust like in SBM
WEEK5	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour

	Beetle) in Control		Beetle) in Control	Beetle) in Control
WEEK6	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control
WEEK7	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control
WEEK8	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control	• *Acarus Siro* (Flour Mite) & *Tribilium Castanuem* (Red Flour Beetle) in Control

Table 6 shows that both types of plastic containing the control samples have different types of insects inside the feedstuffs: fish meal, corn meal, soybean meal, and soybean waste. The infestation did not increase drastically after 2 weeks, except for cornmeal. This indicated that cornmeal is not suitable for use as a main ingredient as the sample was contaminated.

During the study, the problem occurred in the control samples of cornmeal, which indicated infestation during the second week at 19% Red Flour Beetle and 10% Flour mite. This proves infestation occurred early in the study, even though the samples controlled were in the close area.

4.5 Recommendation

According to table 3, the number of insects increased week by week for all insects. In the study, the infestation number demonstrates the effectiveness of aromatics over non-aromatics. For the housefly maggot, infested in one sample that is soybean waste because the sample is that makes a week 4 at 86 percent infested. As shown in Table 5, three types of insects are infested, which are able to get into the feedstuff and render it unfit for long-term storage. Thus, the effect of aromatic material is minor in comparison to feedstuff, but it is capable of causing changes in feed storage. Table 5 shows that the problem occurred in the control cornmeal samples, which indicated infestation during the second week at 19% Red Flour Beetle and 10% Flour mite. This demonstrates that the infestation occurred early in the study, despite the fact that the samples controlled were in close proximity.

However, to change the level of infestation without aromatic material , the researcher must also consider long-term strategies for educating people about how the aromatic material effectiveness and goodness particularly regarding preventing pestation.

This finding is comparable to that in the research Benchaar (2019) stated essential oil that are use for keeping the from in the feed which indicated that clear, transparent, and easy-to-understand effect of aromatic to feed storage condition are necessary for improved understanding. By conducting suitable test that thoroughly reveal the causes of that lead to the pest and infestion that can improve feed loss also safety while also boosting public awareness and safeguarding animal's lives.

4.6 Conclusion

The study shows how essential to keep a clean feed storage and a good aromatic material to prevent pests and infestations in each section. As a result, the research's main finding was obtained and achieved. The research objective and findings aided in analysing the efficacy of aromatic materials and understanding the importance of feed storage conditions. According to the findings of the study, there is a need for breeders and stockists to thoroughly understand the causes and effects of any feed disease that can cause trouble and losses, as well as how the insect and disease has evolved over time.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

The chapter is broken down into four sections. First, the findings are summarized, and their implications are discussed in these sections. Next, the evidence that the data analysis results support the study's conclusions is discussed here. Then, a reasonable explanations are provided, with conclusions supported by results regarding the project objectives. Finally, the research's potential limitations are also discussed here.

5.2 Significance of the Findings

First, this research's contribution to society is that the results of this study will farmer to save cost on buying more due to infestation. Furthermore, these findings from all the previous research are a good starting point for further investigating the problem in feeding storage. As a result, all of the infestation in the feedstuff could occur agreed upon by the researcher can be summarised as follows:

1. The best feedstuff that have aromatic material that show a small amount of infestation are soybean meal and fishmeal.

2. Both ingredients use garlic and cloves that reduced the risk of feedstuff weight loss due to red flour beetle and flour mite.

Finally, the results of this research answered the second objective that is to study the effect of aromatic material on feed storage condition and which were to make recommendations on how to improve the storage condition in farmers life and understanding the level on infestation.

5.3 Research Limitation

During the research period, certain limitations limit the more effective results of the results. One of the limitations is that the timing of the study limits any future research into nutrient content. After that, manpower is critical in the experiment since there is a lot of plastic to handle by one person and it is easy to make a mistake and redundant the sample. In brief, the storage for the study is limited because the area is sometimes used by another student for their final year project, so the study is causing issues for another and making the experiment impossible to create a single space to store the feedstuff.

5.4 Conclusion

This chapter brought the research and its findings to a close. The research objectives were met, and the research question was answered in this study. Concisely, the researcher also makes future suggestions for future research.

5.5 Future Research Recommendation

There are some recommendations that can be made for this research that space requirement because large amount of space are required to avoid overlapping and mixing with various types of feedstuff in the study. This is because the amount of the feedstuff that are put in same tray that make feed creating a pocket of air and wet mist.

In addition, the future that can be done for another researcher are to determine the level that had been set to identify faster the infestation using near infrared spectroscopy (NCRIS) is a potential to detected internal low level of insect infestation. The method is inherently slow and has practically ability at handling larger storage of feedstuff.

Others work that determine the level are using fungal growth, also in the pest management tools that be pest control, pest identication, pest monitoring and lastly are pest control goal. In the pest control goal that have 3 level that can be done are prevention that keep pest, suppression and eradication.

Finally, the results of this research still need to be continued by other researchers by soybean waste dried duration in the oven and using as a full feedstuff with the selected aromatic and added another aromatic material that also can be used in the market or around us. All of these efforts are expected to help reduce the risk of feedstuff damage caused by infestation and feed degration.

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APPENDIX A

Figure 1: Dried soybean waste

Figure 2: Microscope Compound Condition

Figure 3: Outside Animal Storage

Figure 4: Inside Animal Storage Condition

APPENDIX B

WEEK 1 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 1 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 1(OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 1(OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 2 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 2 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control		Cloudy	
	Pandan Leaves		Cloudy	
	Garlic		Cloudy	
	Dried Chili		Cloudy	
	Cloves		Cloudy	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 2 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 2 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like	
			Dust like	
	Pandan Leaves		Dust like	
			Dust like	
	Garlic		Dust like	
			Dust like	
	Dried Chili		Dust like	
			Dust like	
	Cloves		Dust like	
			Dust like	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 3 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 3 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Red flour beetle**	**Animal presence & Cloudy**	
	Garlic	**Red flour beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Red flour beetle**	**Animal presence & Cloudy**	
	Cloves	**Red flour beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control		Cloudy	
	Pandan Leaves		Cloudy	
	Garlic		Cloudy	
	Dried Chili		Cloudy	
	Cloves		Cloudy	
Soybean Waste	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	

WEEK 3 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 3 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like	
			Dust like	
	Pandan Leaves		Dust like	
			Dust like	
	Garlic		Dust like	
			Dust like	
	Dried Chili		Dust like	
			Dust like	
	Cloves		Dust like	
			Dust like	
Soybean Waste	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	

WEEK 4 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		No change / wet	
	Pandan Leaves		Mouldy white covers	
	Garlic		Mouldy	
	Dried Chili		Mouldy	
	Cloves		Mouldy	

WEEK 4 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Red flour beetle**	**Animal presence & Cloudy**	
	Garlic	**Red flour beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Red flour beetle**	**Animal presence & Cloudy**	
	Cloves	**Red flour beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control		Dust like	
	Pandan Leaves		Dust like	
	Garlic		Dust like	
	Dried Chili		Dust like	
	Cloves		Dust like	
Soybean Waste	Control		Has wet mist inside	
	Pandan Leaves		Has wet mist inside	
	Garlic		Has wet mist inside	
	Dried Chili		Has wet mist inside	
	Cloves		Has wet mist inside	

WEEK 4 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		Mouldy	
			Mouldy	
	Pandan Leaves		Mouldy	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		Mouldy	
			Mouldy	
	Cloves		No change /wet	
			Mouldy	

WEEK 4 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like	
			Dust like	
	Pandan Leaves		Dust like	
			Dust like	
	Garlic		Dust like	
			Dust like	
	Dried Chili		Dust like	
			Dust like	
	Cloves		Dust like	
			Dust like	
Soybean Waste	Control		Mouldy	
			Mouldy	
	Pandan Leaves		Mouldy	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		Mouldy	
			Mouldy	
	Cloves		No change /wet	
			Mouldy	

WEEK 5 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
Soybean Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Soybean Waste	Control		**Mouldy**	
	Pandan Leaves		**Mould and wet mist**	
	Garlic		**White mould**	
	Dried Chili		**White mould**	
	Cloves		**The form white mould and smell**	

WEEK 5 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence & Cloudy**	
	Garlic	**Flour mite & beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Flour mite & beetle**	**Animal presence & Cloudy**	
	Cloves	**Flour mite & beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control		Dust like	
	Pandan Leaves		Dust like	
	Garlic		Dust like	
	Dried Chili		Dust like	
	Cloves		Dust like	
Soybean Waste	Control		Mouldy	
	Pandan Leaves		Mould and wet mist	
	Garlic		White mould	
	Dried Chili		White mould	
	Cloves		The form white mould and smell	

WEEK 5 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		Has wet mist inside	
			Has wet mist inside	
	Pandan Leaves		Has wet mist inside	
			Has wet mist inside	
	Garlic		Has wet mist inside	
			Has wet mist inside	
	Dried Chili		Has wet mist inside	
			Has wet mist inside	
	Cloves		Has wet mist inside	
			Has wet mist inside	

WEEK 5 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like	
			Dust like	
	Pandan Leaves		Dust like	
			Dust like	
	Garlic		Dust like	
			Dust like	
	Dried Chili		Dust like	
			Dust like	
	Cloves		Dust like	
			Dust like	
Soybean Waste	Control		Has wet mist inside	
			Has wet mist inside	
	Pandan Leaves		Has wet mist inside	
			Has wet mist inside	
	Garlic		Has wet mist inside	
			Has wet mist inside	
	Dried Chili		Has wet mist inside	
			Has wet mist inside	
	Cloves		Has wet mist inside	
			Has wet mist inside	

WEEK 6 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence**	
	Pandan Leaves	**Red flour beetle**	**Animal presence**	
	Garlic	**Red flour beetle**	**Animal presence**	
	Dried Chili	**Red flour beetle**	**Animal presence**	
	Cloves	**Red flour beetle**	**Animal presence**	
Soybean Meal	Control		Dust like	
	Pandan Leaves		Dust like	
	Garlic		Dust like	
	Dried Chili		Dust like	
	Cloves		Dust like	
Soybean Waste	Control		The sample start to change and smell	
	Pandan Leaves		The sample start to change and smell	
	Garlic		The sample start to change and smell	
	Dried Chili		The sample start to change and smell	
	Cloves		The sample start to change and smell	

WEEK 6 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		no change	
	Pandan Leaves		no change	
	Garlic		no change	
	Dried Chili		no change	
	Cloves		no change	
Corn Meal	Control	**Red flour beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Red flour beetle**	**Animal presence & Cloudy**	
	Garlic	**Red flour beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Red flour beetle**	**Animal presence & Cloudy**	
	Cloves	**Red flour beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control		Dust like	
	Pandan Leaves		Dust like	
	Garlic		Dust like	
	Dried Chili		Dust like	
	Cloves		Dust like	
Soybean Waste	Control		The sample start to change and smell	
	Pandan Leaves		The sample start to change and smell	
	Garlic		The sample start to change and smell	
	Dried Chili		The sample start to change and smell	
	Cloves		The sample start to change and smell	

WEEK 6 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Soybean Waste	Control		The sample start to change and smell	
			The sample start to change and smell	
	Pandan Leaves		The sample start to change and smell	
			The sample start to change and smell	
	Garlic		The sample start to change and smell	
			The sample start to change and smell	
	Dried Chili		The sample start to change and smell	
			the sample start to change and smell	
	Cloves		the sample start to change and smell	
			the sample start to change and smell	

WEEK 6 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like	
			Dust like	
	Pandan Leaves		Dust like	
			Dust like	
	Garlic		Dust like	
			Dust like	
	Dried Chili		Dust like	
			Dust like	
	Cloves		Dust like	
			Dust like	
Soybean Waste	Control		The sample start to change and smell	
			The sample start to change and smell	
	Pandan Leaves		The sample start to change and smell	
			The sample start to change and smell	
	Garlic		The sample start to change and smell	
			The sample start to change and smell	
	Dried Chili		The sample start to change and smell	
			The sample start to change and smell	
	Cloves		The sample start to change and smell	
			The sample start to change and smell	

WEEK 7 (INSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
Soybean Meal	Control		Dust like & don't have animal	
	Pandan Leaves		Dust like & don't have animal	
	Garlic		Dust like & don't have animal	
	Dried Chili		Dust like & don't have animal	
	Cloves		Dust like & don't have animal	
Soybean Waste	Control		**The maggot have infested the sample**	
	Pandan Leaves		**The maggot have infested the sample**	
	Garlic		**The maggot have infested the sample**	
	Dried Chili		**The maggot have infested the sample**	
	Cloves		**The maggot have infested the sample**	

WEEK 7 (INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Red flour beetle**	**Animal presence & Cloudy**	
	Garlic	**Red flour beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Red flour beetle**	**Animal presence & Cloudy**	
	Cloves	**Red flour beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control	**Red flour beetle**	**Powder & animal presence**	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		Cloudy & no change	
	Cloves	**Red flour beetle**	**Animal presence**	
Soybean Waste	Control		**The maggot have infested the sample**	
	Pandan Leaves		**The maggot have infested the sample**	
	Garlic		**The maggot have infested the sample**	
	Dried Chili		**The maggot have infested the sample**	
	Cloves		**The maggot have infested the sample**	

WEEK 7 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves	**Mite**	**Animal presence**	
			No change	
Soybean Waste	Control		**The sample start to change and smell**	
			The sample start to change and smell	
	Pandan Leaves		**The sample start to change and smell**	
			The sample start to change and smell	
	Garlic		**The sample start to change and smell**	
			The sample start to change and smell	
	Dried Chili		**The sample start to change and smell**	
			The sample start to change and smell	
	Cloves		**The sample start to change and smell**	
			The sample start to change and smell	

WEEK 7 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like & don't have animal	
			Dust like & don't have animal	
	Pandan Leaves		Dust like & don't have animal	
			Dust like & don't have animal	
	Garlic		Dust like & don't have animal	
			Dust like & don't have animal	
	Dried Chili		Dust like & don't have animal	
			Dust like & don't have animal	
	Cloves		Dust like & don't have animal	
			Dust like & don't have animal	
Soybean Waste	Control		**The maggot have infested the sample**	
			The sample are badly smell and change colour and maggot	
	Pandan Leaves		**The maggot have infested the sample**	
			The sample start to change and smell	
	Garlic		**The sample start to change and smell**	
			The maggot have infested the sample	

	Dried Chili		**The sample are badly smell and change colour and maggot**	
			The maggot have infested the sample	
	Cloves		**The sample start to change and smell**	
			The sample start to change and smell	

WEEK 8 INSIDE) ZIP

SAMPLE		**TYPE OF INSECTS**	**PHYSICAL CHARACTERISTIC**	**PICTURES**
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence**	
	Pandan Leaves	**Red flour beetle**	**Animal presence**	
	Garlic	**Red flour beetle**	**Animal presence**	
	Dried Chili	**Red flour beetle**	**Animal presence**	
	Cloves	**Red flour beetle**	**Animal presence**	
Soybean Meal	Control		Dust like & don't have animal	
	Pandan Leaves		Dust like & don't have animal	
	Garlic		Dust like & don't have animal	
	Dried Chili		Dust like & don't have animal	
	Cloves		Dust like & don't have animal	
Soybean Waste	Control		**The maggot have infested the sample**	
	Pandan Leaves		**The sample are badly smell and change colour and maggot**	
	Garlic		**The maggot have infested the sample**	
	Dried Chili		**The sample start to change and smell**	
	Cloves		**The sample start to change and smell**	

WEEK 8 INSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		No change	
	Cloves		No change	
Corn Meal	Control	**Red flour beetle**	**Animal presence & Cloudy**	
	Pandan Leaves	**Red flour beetle**	**Animal presence & Cloudy**	
	Garlic	**Red flour beetle**	**Animal presence & Cloudy**	
	Dried Chili	**Red flour beetle**	**Animal presence & Cloudy**	
	Cloves	**Red flour beetle**	**Animal presence & Cloudy**	
Soybean Meal	Control	**Red flour beetle**	**Powder & animal presence**	
	Pandan Leaves		No change	
	Garlic		No change	
	Dried Chili		Cloudy & no change	
	Cloves	**Red flour beetle**	**Animal presence**	
Soybean Waste	Control		**The maggot have infested the sample**	
	Pandan Leaves		**The sample are badly smell and change colour and maggot**	
	Garlic		**The maggot have infested the sample**	
	Dried Chili		**The sample start to change and smell**	
	Cloves		**The sample start to change and smell**	

WEEK 8 (OUTSIDE) ZIP

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves	**Mite**	**Animal presence**	
			No change	
Soybean Waste	Control		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Pandan Leaves		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Garlic		**The maggot have infested the sample**	
			The maggot have infested the sample	

	Dried Chili		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Cloves		**The maggot have infested the sample**	
			The maggot have infested the sample	

WEEK 8 (OUTSIDE) PLASTIC

SAMPLE		TYPE OF INSECTS	PHYSICAL CHARACTERISTIC	PICTURES
Fish Meal	Control		No change	
			No change	
	Pandan Leaves		No change	
			No change	
	Garlic		No change	
			No change	
	Dried Chili		No change	
			No change	
	Cloves		No change	
			No change	
Corn Meal	Control	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Pandan Leaves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Garlic	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Dried Chili	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
	Cloves	**Flour mite & beetle**	**Animal presence**	
		Flour mite & beetle	**Animal presence**	
Soybean Meal	Control		Dust like & don't have animal	
			Dust like & don't have animal	
	Pandan Leaves		Dust like & don't have animal	
			Dust like & don't have animal	
	Garlic		Dust like & don't have animal	
			Dust like & don't have animal	
	Dried Chili		Dust like & don't have animal	
			Dust like & don't have animal	
	Cloves		Dust like & don't have animal	
			Dust like & don't have animal	
Soybean Waste	Control		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Pandan Leaves		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Garlic		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Dried Chili		**The maggot have infested the sample**	
			The maggot have infested the sample	
	Cloves		**The maggot have infested the sample**	
			The maggot have infested the sample	