

# Full Trap Method in Handling Warehouse Pests in Ledokombo, Jember

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**Abstract.** Rice is the main source of food in Indonesia which its needs is increasing each year. The minimum availability of rice in the market is caused by the scarcity of rice stock in rice storage warehouses due to the existence of warehouse pests. Beside decreasing the quantity and quality of rice, they also affect financial losses by farmers. The declining quality of rice causes the price offered by collecting merchants to be very cheap and far below the Floor Price. The Team of Community service provides counseling and training of warehouse pest control using full trap to farmer groups in Jember. The Team of Community service also conducts counseling about warehouse sanitation in order to keeping the hygiene of warehouse properly. To increase farmers' income, the Team of Community service also conducts marketing management training. Full trap method is a method combination of physical and chemical control. The management was applied by purple lights and chemical pesticides, humidifiers with colorful lights and insect pheromones, and mouse traps from buckets. The results showed wet pests that were caught in full trap media are *Sitophilus oryzae* pests, *Rhizopertha dominica*, *Cryptolestes ferrugineus*, *Necrobia rufipes*, *Tribolium castaneum*, *Sitophilus granaries*, *Periplaneta amiricana*, *Solenopsis fugax*, *Rattus rattus diardi*, *Spodoptera litura*. As the population of warehouse pests decrease, while rice quality and packaging increase.

## 1. Introduction

Rice is one of the staple foodstuffs of the Indonesian people and almost 90% of Indonesians consume rice as their staple food [1]. The need for rice increases every year based on data from the Central Statistics Agency for the past 10 years, Indonesia's rice imports in 2015 reached 861.601 tons [2]. Constraints in national rice cultivation, not only in the aspects of production and land area, but also in the aspect of post-harvest rice. Post harvest includes harvesting and processing of grain. Storage is one of the important stages because rice experiences a process of decreasing quality and quantity. Agricultural development policies in 2015-2019 include self-sufficiency policies, competitive product development, and strengthening of systems and institution. In connection with this matter, the government has also set grain quality standards and supervised the processing, transportation, and storage suggestions so that grain quality can be maintained and the level of damage can be reduced so that the economic value remains high.

The presence of warehouse pest attacks results in a decrease in the quality and quantity of grain which is certainly detrimental to farmers financially. Several factors that influence product quality during storage include biotic and antibiotic factors. Biotic factors include the presence of insects, mites, mice, molds, and warehouse pests from the Coleoptera order, namely *Sitophilus oryzae*, *Sitophilus granarius*, *Rhizopertha dominica*, *Tribolium castaneum* and *Cryptolestes ferrugineus*. Damage due to *Sitophilus oryzae*, for example, can cause weight loss of 6.29%, water content of 15.9%, broken rice 24.40%, rice flowing 10.08%, rice being musty and cloudy white [3].



Several factors that are likely to affect the population and development of warehouse pests (insects) are hardness, humidity, density of seeds, and calcifying grains [4]. Climate of micro warehouses with an average temperature of 34 °C, 59% humidity and good warehouse aeration still allow the presence and development of warehouse pest insects. During the 1.5 month period of storage of rice in the warehouse, there were several changes in the quality and quantity of rice. Post-harvest methods carried out by farmers in several areas in Jember Regency are still relatively simple, ranging from drying of grain and grain storage in the warehouse lacks assistance [5].

Bulog is a corporation namely a food institution in Indonesia that deals with the rice trading system. Bulog carries out maintenance and control of integrated warehouse pests, including the hermetic method of CO<sub>2</sub> stack technique and the use of plastic Cocoon [6]. The growth of pest population is influenced by environmental factors including availability of oxygen, humidity and temperature, so that by manipulating the environment it is expected to be able to physically control pests. Innovations in grain drying, packaging, storage processes, and the application of full trap techniques in warehouse pest control need to be carried out by rice farmers in Jember, this is aimed to maintaining the quality and quantity of grain / rice sold. The aim of the study was to determine the diversity of species of pest insects that attacked rice grain commodities in the storage warehouse of Suren Jaya 2 farmer groups and Jaya Abadi farmer groups by using the Full Trap method.

## 2. Method

The research was carried out in the rice milling storage warehouse owned by Suren Jaya 2 farmer group in Suren Village and Tani Jaya Abadi Group in Lembangan Village, Jember Regency, East Java Province. The study used qualitative methods and counseling of two Jember district farmer groups, counseling on warehouse sanitation so that the cleanliness of rice storage warehouses was well maintained. To increase farmers' income, the implementing team also conducts marketing management training. Retrieval of observation data is done by counting the insects caught in the 'Full Trap' trap. Observation data retrieval was carried out for 4 times for 4 months with an interval of 1 month observation. Each insect caught in the 'Full Trap' trap is then taken to the laboratory to be observed. The things that were observed were: 1. Type of pests, pests were sorted / separated according to the type and location of the harvest. Pest samples were collected in 70% alcohol to be identified. Identification of insect pests was carried out at the Plant Protection Laboratory of the Department of Agriculture in the State Polytechnic of Jember. Identification of insect pests using the material library [7], [8], [9], [10], [11], [12], [13] *dalam* [14]. 2. Insect populations, Insects found to be sorted / separated then manually counted under a digital / multimedia microscope.

## 3. Result and Discussion

The application of full trap technology that has been carried out on both partners includes rice warehouse sanitation counseling, training and installation of full traps in rice storage warehouses, and rice marketing counseling. Through counseling and training, it is expected that partners will be able to improve the quality and quantity of grain / rice they have. The extension of rice warehouse sanitation aims to enable partners to maintain the cleanliness of the rice warehouse. A clean rice warehouse is a good determinant of rice quality. Dirty warehouses will cause the growth of fungi, insects, rodents, and even attacks of rice lice. Therefore, one way to maintain rice in good condition before being sold is the right post-harvest treatment, including storage in a clean and representative rice warehouse.

The second activity after warehouse sanitation being carried out is the installation of a full trap or trap for various warehouse pests. Full traps installed include Light Trap for insect traps and rice lice, and

Bucked Trap for warehouse rodent pest traps. Light trap uses a purple LED light, which has been assembled with a solution (water, detergent, and sodium benzoate). The solution serves to kill insects and reduce mobility when they enter the solution. To attract insects, methyl eugenol is used which functions as pheromone sex in insects. This fluid attracts the attention of male insect pests, thus inhibiting breeding and population growth. This liquid is applied and assembled with automatic chamber sprayers. Bucked Trap application is done using a bucket that is assembled with bottles and boards which functions as a trap for warehouse rat pests.

Evaluation of full trap installation activities, it is known that some pests managed to enter the pest trap. Some pests include *Sitophilus oryzae*, *Rhyzopertha dominica*, *Cryptolestes ferrugineus*, *Necrobia rufipes*, *Tribolium castaneum*, *Sitophilus granaries*, *Periplaneta amiricana*, *Solenopsis fugax*, *Rattus rattus diardi*, *Spodoptera litura*. Installation of traps and trapped pests in a trap is expected to reduce the number of pests that damage the quality and quantity of rice stored in a warehouse.

Types of Pests found in Farmer Groups in Jember Regency, The results showed that there were 10 types of pests in grain storage warehouses in Suren Jaya Farmer Group 2 Suren Village and Tani Jaya Abadi Group Lembengan Village including *Sitophilus oryzae* pests, *Rhyzopertha dominica*, *Cryptolestes ferrugineus*, *Necrobia rufipes*, *Tribolium castaneum*, *Sitophilus granaries*, *Periplaneta amiricana*, *Solenopsis fugax*, *Rattus rattus diardi*, *Spodoptera litura* consisting of 6 types of Coleoptera order, 1 type of Blattodea order, 1 type of order of Hymenoptera, 1 type of order Rodentia, and 1 type of order Lepidoptera (Figure 1).

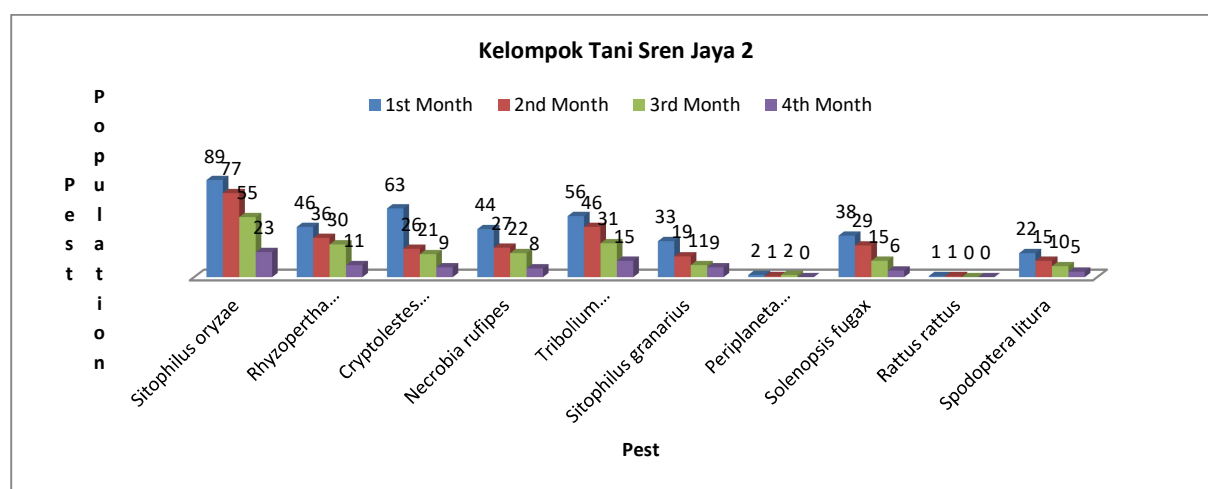


Figure 1. Warehouse pest population in the Suren Jaya Farmer Group 2

The results of identification based on features seen from both body size, color, compound eyes, limbs, wings and antennae indicate that these insects are *Sitophilus oryzae* includes reddish brown Imago and has reddish brown spots. On the front wing, there are four reddish yellow spots that form a distinctive pattern. Imago's body is oval and has a length ranging from 2 - 3.5 mm and a width of 1.1 - 1.3 mm. Having a snout and antenna shaped in the form of Lamellate (Figure 2). This pest is classified into Phylum Arthropods, Subfilum Mandibulata, Klas Insecta. Pterygota class, Order Coleoptera, Family Curculionidae, genus *Sitophilus* and species of *S. oryzae* [14].

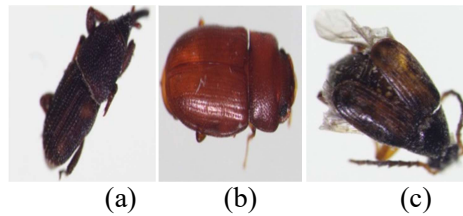


Figure 2: (a) *S. oryzae*, (b) *T. castaneum*, (c) *C. cephalonica* Imago

*Tribolium castaneum* has the characteristics of Imago's reddish brownish red color, which is about 5-6.5 mm long and 2 mm wide. The clavate-shaped antenna resembles mace, the segments enlarge regularly from the base to the tip. Imago has a mace-shaped antenna extending towards the tip regularly. These pests are found in each sample location. These insects are classified into phylum Arthropoda, Sub-phylum Mandibulata, Class Insecta, Pterygota sub-class, Coleoptera Order, Tenebrionidae Family, Genus *Tribolium* and *T. castaneum* species [14].

*Rhyzopertha dominica* has a characteristic appearance: Adult beetles are 2-3mm long. Red-brown or brown-black. Life cycle: Females produce 200-500 eggs. At an ideal temperature of 34 ° C and 70% relative humidity (RH), cocoon formation takes 3 days. At an ideal temperature of 34 ° C and Relative Humidity (RH), the life cycle lasts 3-4 weeks. Habit: Eggs are placed in cracks. Larvae will be in grain to continue growing. Larvae develop faster in grain than in flour. Grow up after they appear. Commonly found in grain storage warehouses [14].

*Ferrugineus cryptolestes* has the following characteristics: Very flat, light brown, hair-like antenna, sometimes very long. A very common species in Australia is *C. ferrugineus*. Important pests in grains and their processed products. Life cycle. Optimum: 23 days at 33 °C, 70% RH. Range: 18-42.5 °C, 40-90% RH, resistant to cold conditions. The maximum population growth rate per month: 55 times. Biology. Eggs: placed randomly. Larva: move freely, not confined. Adults: long-lived, active eating, able to fly, walking fast, able to enter food packed through small gaps [15].

*Necrobia rufipes* has a morphological characteristic consisting of an antenna, caput, compound eyes, abdomen, thorax, front legs, legs and a pair of wings. Adult body size is about 4-5 mm. The upper surface of the body is metallic bluish and shiny green. The lower surface of the abdomen is dark blue. Their feet are light reddish or orange. A reddish-brown antenna with a dark brown or black tip. In the female beetle, it has an ovipositor patch, has a pair of ovaries, 8 or 9 abdominal segments, a system of oviducts that are channeled out where to lay eggs. Whereas the male beetle, on the 10th abdominal segment has a genitals in the form of a penis, has an outer clamping organ and a median part of the piercing organ [15].

*Sitophilus granaries* have traits. In the front head there is a snout, *S. Zeamay* / *S. oryzae* has two orange spots on the front wing, the rear wing appears below elitra, *S. granarius* does not have the wing characteristics. Is a major pest in cereals and hard cereal products such as pasta. Life cycle. Optimum: 25 days at 30 °C, 80% RH. Range: 14-35 °C, minimum 40% RH. Maximum population growth rate per month: 25 times. Biology. Eggs: Put on a hole that is prepared in advance on the seeds and covered with a waxy plug. Larvae: Does not move, and develops entirely in grain. Adults: long life, active eating and can fly [15].

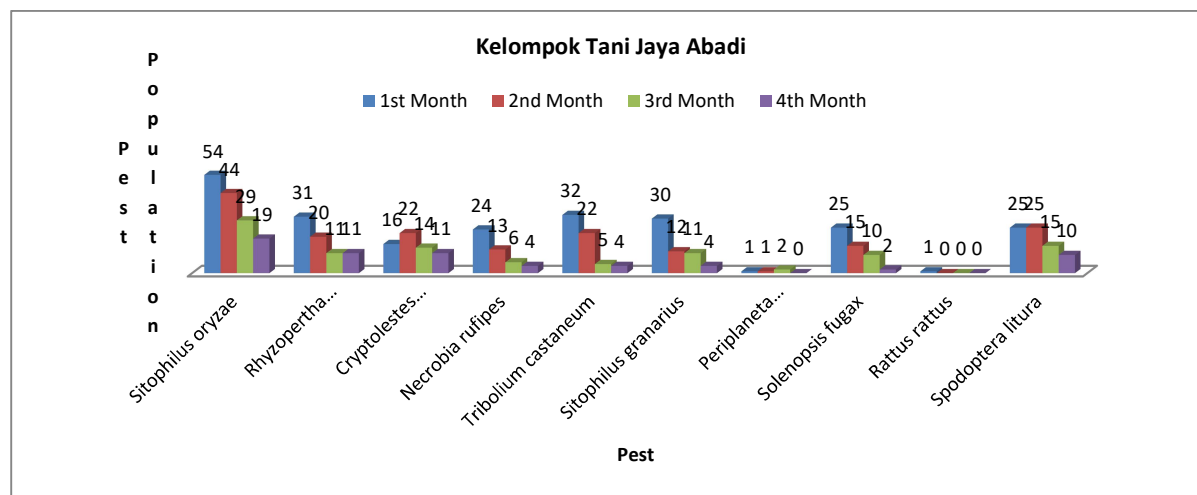


Figure 3. Warehouse pest population in the Lembengan Village Tani jaya Abadi

Tani Jaya Abadi Group Lembengan Village including *Sitophilus oryzae* pests, *Rhyzopertha dominica*, *Cryptolestes ferrugineus*, *Necrobia rufipes*, *Tribolium castaneum*, *Sitophilus granaries*, *Periplaneta amiricana*, *Solenopsis fugax*, *Rattus rattus diardi*, *Spodoptera litura* consisting of 6 types of Coleoptera order, 1 type of Blattodea order, 1 type of order of Hymenoptera, 1 type of order Rodentia, and 1 type of order Lepidoptera (Figure 3).

#### 4. Conclusion

The application of full trap technology that has been carried out on both partners includes rice warehouse sanitation counseling, full trap installation activities which include light trap and bucked trap, as well as counseling on grain storage storage facilities. The results of the evaluation of the full trap installation showed that several warehouse pests trapped were *Sitophilus oryzae*, *Rhyzopertha dominica*, *Cryptolestes ferrugineus*, *Necrobia rufipes*, *Tribolium castaneum*, *Sitophilus granaries*, *Periplaneta amiricana*, *Solenopsis fugax*, *Rattus rattus diardi*, *Spodoptera litura*.

#### Acknowledgment

The Authors would like to acknowledge the financial support from Directorate of Research and Community Service, Directorate General of Research and Development Strengthening, Ministry of Research, Technology and Higher Education, In accordance with the Community Service Program Implementation Funding Agreement Number: 071 / SP2H / PPM / DRPM / 2018, March 9, 2018.

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