

Application of Plant-Based Pesticide using Citronella (*Cymbopogon nardus* L.) Extract to Control Insect Pests on Rice Plants

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ABSTRACT

The main enemy in rice production is the attack of stinky bugs, brown planthoppers, grasshoppers, ladybugs, aphids and others. This attack inhibits the growth of rice plants, thereby reducing production or even thwarting the harvest. Chemical pesticide application is able to reduce pests and diseases. However, the long-term use of chemical pesticides can disrupt the ecosystem. This study aims to study the application of plant-based pesticide to the presence of pests and predatory insects for ciherang rice plants. The research was begun with the preparation of plant-based pesticide from lemon grass extract obtained by mixing citronella with water at a weight ratio of 2:1. The extract was mixed with water at ratio of 1 liter for 50 ml of citronella extract. The application of plant-based pesticide was carried out by spraying 21-DAP (day after planting) rice plants at two plots sizing 400 m² each. The types and numbers of pests and predatory insects were observed before and every pesticide application. Spraying and observation were carried out weekly for 5 weeks starting at 21 DAP. The results showed a decrease of insect in experimental plots A and B after the application of pesticide. After the fourth application, only one type of insect (green grasshopper) was found in plot A and no insect were found in plot B. However, four types of insects were found in the control plot. The application of citronella-based pesticide did not disturb the population of predatory insects that were still found in plot A and B (8 tails) at the end of the observation.

Key words: insect, predator, lemon grass, rice.

1. Introduction

Rice is the main food crop to produce white rice which is the staple food of Indonesian people. However, Indonesia still routinely imports rice from Thailand, Vietnam and the Philippines to meet national rice needs. This is due to the low productivity of Indonesia's rice plants. One of the threats that haunts rice farmers is the attack of pests, especially insects, or plant diseases. Pest/disease attacks are a common condition in the rice cultivation. Pests and diseases can cause total harvesting failure. Insect pests use rice plants a place to breed or a source of food by sucking nutrients from plant tissues, making holes in plants, damaging leaves and so on. Some insect pests that stick to plants also carry diseases, so that the plants grow unoptimally.

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In general, plant pest control is carried out by using chemical pesticides. However, the application of chemical pesticides in crop cultivation has an adverse impact on the surrounding environment. The prolonged and excessive use of chemicals increases resistance of insect pests such that chemical pesticides has little effect on pest control. In addition, application of chemical pesticides also disrupts the surrounding ecosystem (Arif, 2015). For example, chemical pesticides kill not only insect pests, but also predatory insects which are useful in insect pest control. Chemical pesticides also contaminate the soil, affecting their texture and ability to hold water, and inhibit the development of decomposer microorganisms. This certainly affects the availability of nitrogen and other nutrients in the soil. For that reason, a solution is needed to overcome the problem of insect pests in rice plants which is able to sustainably prevent environmental damage. The use of plant-based pesticides is one of the solutions in controlling plant pests. The content of plant-based pesticides is not desired by insect pests.

One of the popular plants that is easy to cultivate and can be used as a pesticide is citronella (*Cymbopogon nardus* L.). This plant contains citronellol which causes a distinctive odor and is disliked by insect pests. This odor can irritate and reduce the destructive power of insect pests to plant tissue. Sahabuddin and Anshary (2010) state that extract of citronella leaves at a concentration of 8.5% can cause a mortality of 66.67% and inhibits the eating activity of larvae by 82.66%. Other study stated that the use of citronella and cloves extracts causes pest mortality more than 50% with average efficacy of 89.29% and the loss of pepper fruit yield decreased to 4.1% (Rohimatun and Laba, 2013). Nurmansyah (2011) said that citronella extract with a concentration of 0.2% caused 91.62% mortality of *Helopeltis antonii* at six hours after application. Zahro *et al.* (2016) found that citronella leaf extract can suppress larvae appetite, inhibit pupa and imago development, and interfere the imago reproductive system in cabbage cultivation. Pinheiro *et al.* (2013) said that citronella contains monoterpenes (citronellal, limonene and geraniol) which provide plant defense from pests. Research conducted by Koul and Walia (2009) demonstrated that plant-based pesticides inhibited the growth of insect pests and pathogens. This impact will inhibit the development of insect pests. Another study on non-chemical pest control was conducted by Telaumbanua *et al.* (2020) using automatic insect pest traps. The use of citronella extract can be combined with these traps to support the implementation of the automatic pest trapping system.

This current study aims to determine the effect of pesticide application based on citronella extract on the types and numbers of insect pests and predatory insects in the cultivation of rice (Ciherang varieties). Through this research, it is expected to know the effectiveness of pesticides from citronella extract in controlling pests of rice plants.

2. Material and Method

2.1. Materials

This research was conducted at the Experimental Field for Food and Horticulture Crops Protection of Agriculture Service, Pringsewu Regency, Indonesia (Figure 1). The materials used were citronella (Figure 2) and water without a mixture of other ingredients. Citronella is very