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Resistance of Dryland Rice to Stem Borer (*Scirpophaga incertulas* Wlk.) Using Organic Fertilizer

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Abstract - Rice stem borer is one of the important pests that attack plants so as to reduce production. One way to control pests is to use organic fertilizers that make the plant stronger and healthier. This study was conducted to determine the effects of organic fertilizers with various doses without the use of pesticides in controlling stem borer, *Scirpophaga incertulas.* Methods using split-split plot design which consists of two levels of the whole plot factor (solid and liquid organic fertilizers), two levels of the subplot factor (conventional and industry, Tiens and Mitraflora), and four levels of the sub-subplot factor of conventional and industry (5, 10, 15, 20 tonnes/ha), and one level of the sub-subplot factor of Tiens and Mitraflora (each 2 ml/l). Based on the results Statistical analysis there were no significant differences among treatments and this shows that the use of organic fertilizers that only a dose of 5 tonnes/ha is sufficient available nutrients that make plants more robust and resistant to control stem borer, besides that can reduce production costs and friendly to the environment when compared with using inorganic fertilizers.
Index Terms *- rice stem borer, Scirpophaga incertulas, organic fertilizers, plant resistance*

I. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important meals in Indonesia because about 200 million people depend on rice a source of energy. Rice is not just food commodities, but also a strategic commodity that has political sensitivity, economic an d social vulnerability is high, then the slightest disruption of rice production, the supply was interrupted, and the selling price increases (1). The fact is today the selling price of rice in the market is increasing.

In Indonesia, rice plants in a massive try in each area both in the fields and in dry fields. Rice grows well in the tropics and sub-tropics, especially in places that can be irrigated throughout the year or which have high rainfall. Increased production of rice plants in Indonesia that was developed through expansion and intensification always obstructed due to pests and diseases. Insect pests that were previously classified as not important pests, then developed into an important pests (2). One type of rice stem borer found in North Sulawesi is *scirpophaga incertulas.* This pest can destroy vegetative and generative stages in growth of a rice plant. S. incertulas attack on the vegetative stage causing the death of tillers (called 'sundep'), and the generative stage cause panicles appear white (called 'beluk') so that it can not produce grains (3).

Several control techniques that have been done to control rice stem borer, among others, sanitation, use of resistant varieties, chemical fertilizers and pesticides. However, these methods can not fully eradicate pests. One thing that can not be denied is the use of pesticides can lead to resistance, resurgence, residual effects, and environmental pollution. In suppressing the development of the rice stem borer population, provided one alternative environmentally friendly pest control is the use of organic fertilizers to make rice plants more robust and resistant to pests, and can increase the production of rice. Soil organic fertilizers will more easily absorb nutrients and more friable and better soil aeration. In addition to the land itupula will more easily retain water and dried. If further observed also aktvitas microbes will be higher compared to land that is not given organic fertilizer. An important benefit of organic fertilizer is that it can improve the physical, chemical and biological properties of soil (4).

Based on the above it is necessary to investigate the effectiveness of the use of organic fertilizers with various doses and without the use of chemical pesticides in the control of rice stem borer that can produce rice production that is safe for human health and create a sustainable environment.

II. MATERIALS AND METHODS

2.1 Place of Research

Field research was conducted on the land near the mountain forest in the village Masarang Paslaten, East Tomohon Sub District, Tomohon City, North Sulawesi Province, while the analysis of the soil and solid and liquid fertilizers were conducted in the Laboratory of Chemistry and Soil Fertility, Soil Science Department, Faculty of Agriculture, University of Sam Ratulangi.

2.2 Research Procedure

This experiment using split-split plot design which consists of two levels of the whole plot factors (solid and liquid organic fertilizers), two levels of the subplot factor (solid organic fertilizer: homemade and industry, liquid organic fertilizers: Tiens and Mitraflora), and four levels of the sub-sub plot factor of conventional and industrial organic fertlizers (5, 10, 15, 20 tonnes/ha) and one level of the sub-sub plot factor of liquid organic fertilizers (Tiens and Mitraflora (each 2 ml/l). Each experiment was repeated three times for a total of 48 experimental plots.

Land used previously cleared of weeds, plowed, hoed and raked up the average, made beds with planting techniques Jajar Legowo, as recommended in the making within the rice planting organic, because it will make it easier to monitor as well as well as a spacing between two rows of 40 cm (legowo). The size of each plot were 2.5 x 5 m. Created as many as 48 experimental plots.

Making the rice seed planting hole using 'tugal' and 'tugal' holes each were given two rice seed. Fertilizing with solid organic fertilizer made one week before planting appropriate treatment dose, whereas for liquid organic fertilizer after the plant put out two rice leaves. Plant maintenance includes weeding, replanting and watering.

Plant parameters measured were percentage of stem borer vegetative stage the rice plants begin to generative. Observations were made every week done at age 2 HST. Percentage pests calculated by the formula:

$$P = \frac{n}{N} \times 100\ \% \quad \text{..... 1}$$

Where P = percentages of pest attack, n = tillers number were attacked by pests, and N = total number of tillers.

III. RESULTS AND DISCUSSION

S. incertulas attacks on each plot were presented in Figure 1. Informations in Figure 1 show that the

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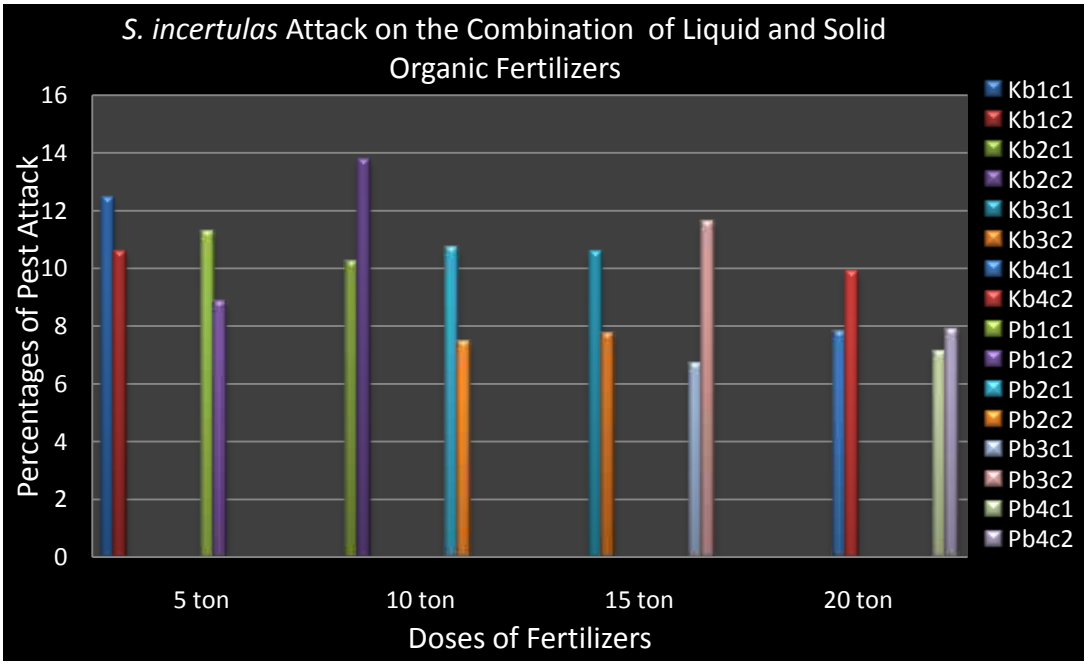

FIGURE 3.1 STEM BORER ATTACKS ON THE COMBINATION OF SOLID AND LIQUID ORGANIC FERTILIZER

lowest attack of *S. incertulas* (6.65%) was found in blocks that are treated with organic fertilizer manufacturer dose of 15 tonnes / ha (Pb3c1) and Tiens fertilizer. The highest attack contained in the control (synthetic inorganic fertilizers, and dose according to the size of the farmer) i.e. 59.22%. Based on the results of chemical analysis, high nutrient content in plots treated with organic fertilizers. Soil containing organic matter will encourage soil organisms competing for food and grow and thrive in these habitats, as well as increased activity is in deciphering nutrient elements thus creating a sustainable nutrient cycling. High quality land in addition to increasing crop production, also facilitate the function of nutrients in plants (5). In addition, when the soil

quality is always maintained at a high level (fertile), the health of animals and people who live in the soil / land will also be healthy or good (6). Soils often use inorganic fertilizers produce some damaging effects of the environment and human health because it is always used every growing season. Synthetic fertilizer N, P and K is quickly lost by evaporation or leaching in water drainage and this is a dangerous cause environmental pollution. The use of inorganic fertilizers continuously can affect soil structure (7).

Analysis of the diversity of *S. incertulas* attack on a combination of solid organic fertilizer, dosage and liquid fertilizers, solid organic fertilizer and dosage, solid organic fertilizer and liquid organic fertilizer and the dose was not significant (F > F 5 %). The main information of the results of this study is to only use solid organic fertilizer as much as 5 tons / ha and liquid organic fertilizer 2 ml/l is sufficient to provide nutrients for plants that make the plants more robust and resistant and is quite effective in controlling rice stem borer, because the higher the dose of organic fertilizer used means more need for fertilizers used on crops, the production cost is higher.

Organic fertilizer given to plants based on the results of the chemical analysis of the soil is to have a high nutrient content in comparison with field tests prior to fertilization. After fertilization on field tests of rice plants, the soil becomes better as organic fertilizer can improve soil structure so as to optimize plant growth, loosening the soil, can increase water absorption and improve the lives of microorganisms in nutrient tanah.Nutrients supplied to the soil if too lot and excessive or too little can make the plants more susceptible to pests and diseases. For example, if nitrogen fertilizer is given in high doses that lead to high levels of N in the crop, it would be excessive vegetative growth, reduced resistance to insect pests and certain types of insects can grow more rapidly. This danger would be less if applied using organic fertilizers that release nutrients slowly (8). Plants are fertilized with high doses of urea fertilizer urea will draw rice stem borers to lay their eggs (9).Results of research on organic paddy rice plants that sprout damage caused by rice stem borer is still relatively low because it is still below the threshold of tolerance, when dbandingkan pattern in which the farmers pest damage is high, despite being carried out by spraying insecticides (10).

Durability (resistance) of plants is classified into ecological and genetic resistance (12). The genetic resistance consists of (1) aversion, (2) antibiosis, and (3) Tolerance. Rice plants using organic fertilizers to make the plant stronger and resistant pests causing resentment caused morphologic rejection. Rice stem borer *Schirpophaga incertulas* rice plants do not like the hard skin compared to rice plants whose skin softer. Resistant properties obtained plants indirectly unfavorable pests, such as cell wall thickness and cell networks are hard because they contain silica or cuticle thus inhibiting eating pests (13). Molecules of cellulose that forms and microscopic tissues that gives plant cell walls become stronger and hold. Also due to that the main nutrient elements may be absent or less available in plants for insect life. This causes the stem borer prefers rice plant using inorganic fertilizer nutrients.

Meanwhile, the treatment using inorganic fertilizer with patterns of farmers, namely urea 200 kg/ha, TSP 100 kg/ha and KCL 50 kg/ha as comparative data, it turns out the average level of attack rice stem borer successively for three replications are 59.22%, 90.07% and 63.84%. By using inorganic fertilizer nutrients in rice stem borer attack even more than in the organic fertilizer. Organic matter not only adds nutrients to plants, but also create appropriate conditions for the plant to improve aeration, root penetration easier, increases pH, decreases Al-add, and ground into friable structure (14).

IV. CONCLUSION

Based on the research results it can be concluded that:

1. The use of a combination of solid organic fertilizer with a dose of 5 tonnes/ha and liquid fertilizer 2 ml/l is quite effective in controlling rice stem borer, *S. incertulas*, and also can reduce production costs.
2. Stem borer attack is very high on the plant given inorganic fertilizers that have passed the threshold of tolerance (above 50%), when compared with plants that are given organic fertilizer.

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