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Botanical Extracts: Natural Insecticides for Management of Hemipteran Insect Pests in Lowland Rice

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Abstract: *Hemipterans insect pests such as green leafhopper and rice black bug a serious problem in the rice field in the Philippines. A study on botanical extracts was conducted to explore its potentials as natural insecticides for the control of hemipterans insect pests. The study carried out in Complete Randomized Design (CRD) with six treatments replicated three times. All data were subjected to Analysis of Variance (ANOVA) and Tukey's Honest Significant Difference (HSD) Test as a mean comparison using statistical tools for agriculture research (STAR) software. Derris roots, neem leaves compound, and thiamethoxam application offered effective control against GLH as reflected by a higher percentage of mortality. Derris roots alone, 50% control efficacy against rice black bug. A compound from lantana leaf offered a toxic-insecticidal effect against rice black bug with 36.67% survival and 63.33% mortality rate. Hence, it is interesting to note that compound from Derris roots applied at the rate of 20 ml for 10- 30 hours offered toxic effect while compound from Lantana leaves effectively controlled rice bug at 10, 20, 30, 40, and 50 hours.*

Keywords— *Botanical extracts, Natural Insecticides, Hemipterans Insects*

INTRODUCTION

Rice *(Oryza sativa* L.*)* is grown on over 145 million hectares in more than 110 countries. It occupies one-fifth of the world cropland under cereal. Over 800 species of insects in rice ecosystems have been reported worldwide. Out of these, 100 species attack rice while rest is considered as friendly insects. Almost 20 insects are considered as rice pests of economic importance (Pathak M, 1994). Insects are the most diverse group of animals living on earth. They are undoubtedly the most adaptable form of life as their number exceeds that of any other category. Among the major hemipterans, insect pests of rice are *Nilaparvata lugens* (Brown plant hopper) and *Nephotettix virescens* (Green leafhopper) belonging to order Hemiptera were identified or characterized by "Hopper burn" and "yellow-brown leaves" in the field are also major insects of rice (Jadhao, M. F., 2012). *Scotinophara coarctata* (Rice Black Bug) outbreak was first recorded in Palawan Island in 1982 (Barrion, 1982).

Different strategies are under practice to control these insect pests. Chemical control is the most commonly used and effective method, and farmers are still relying on the chemicals to control a variety of insect pests (Naranjo, 2001). However, the excessive use of insecticides may lead to serious problems such as pesticidal pollution, the mortality of natural enemies and pollinators, reduction in nitrogen fixation, and biodiversity (Miller, 2004).

Botanical plant extracts are best suited for use in organic food production among industrialized countries but can play a much greater role in the production and post-harvest protection of food products in developing countries. Insect pests affect food output directly by reducing the quality and quantity of the crop produced, or indirectly by serving as vectors of plant diseases. The use of synthetic compounds to control insect pests has led to several adverse effects, including water and soil contamination, insect resistance, and toxicity to non-target species (Zettler, 1990). Compounds from botanical plants have certain advantages, but do not remain in the environment, present low risk to the non-target organisms (beneficial predators and parasite) and are relatively non-toxic to mammals (Weinzierl, 2000). Botanical plants as reported has minimal impact on beneficial insects and very safe to the non-target organism. Hence, this study is conducted to evaluate the efficacy of botanical plant compounds against green leafhopper and rice black bug insects of lowland rice.

Methodology

Materials and Methods

The research trial was conducted at the College of Agriculture, Sultan Kudarat State University, Lutayan Campus. This study was carried out in a Complete Randomized Design (CRD) with six (6) treatments replicated three (3) times. The six treatments, namely; Neem Leaves, Derris Roots, Makabuhai Vines, Lantana Leaves, Thiamethoxam, and Untreated Control.

Preparation of Plant Extracts

Botanical plant parts such as neem leaves, derris roots, makabuhai vines, and lantana leaves were collected locally in the area. Plant parts were washed to remove the impurities. Plants parts were ground separately into a fine powder with mortar and pestle. The resulted solution of each plant extracts was prepared by mixing 100 g powder in a 1 liter of water solution. The mixture was thoroughly mixed

and for 24 hours and filtered thoroughly with the use of muslin cloth to remove the impurities (Fiaz *et al.*, 2012). Ten (10) ml of liquid soap was added to the compound to improve stickiness consistency on the surface of the leaves of the treated plants (Mochiah *et al*., 2013).

Insect collection and preparation of insect cage

The rice green leafhopper and rice black bug were collected early in the morning at the rice field and subsequently reared in an insect cage. The insect cage was made of muslin cloth measuring one meter long and one meter wide. To make the insect cage durable, bamboo sticks were used in each corner. One meter zipper was made in the center of the cage to facilitate data collection. Adult rice green leafhopper and rice black bug were used in the bioassays. To avoid bias before the application of treatments, adult rice green leafhopper and rice black bug were conditioned for one day with a rice plant that served as the food inside the cages.

Statistical analysis

The Analysis of Variance (ANOVA) and Tukey's Honest Significant Difference (HSD) test were used to analyze the data statistically at 5% probability level.

Data Collection

To determine the mortality and survival percentage of green leafhopper and rice black bug. This was done at 10, 20, 30, 40, and 50 hours after the application of the treatments by counting the number of killed and survived based on 15 samples of rice green leafhopper and rice black bug per treatments.

RESULTS AND DISCUSSIONS

Survival and Mortality Percentage
of Green Leafhopper

Survival percentage of green leafhopper as affected by the application of different botanical plant compounds (Table 1). Assessment after 10,20,30,40 and 50 hours showed no significant differences among the treatments. The numerical percentage survival rate ranged from 66.67 to 100.00%, respectively. All botanical plant compounds and thiamethoxam showed higher survival percentage rates with means ranged from 96.67 to 100.00%, respectively. Results indicate that green leafhopper can tolerate the effect of botanical plant extracts as reflected by the lower toxicity effect and high percentage survival rate. This means that green leafhopper can resist the effect of the compound from botanical extracts this might be due to frequent use of formulated Insecticides. Khaliq, A., (2014), on his study, observed that plant extracts need relatively more days to be effective against sucking insects.

Mortality percentage of green leafhopper (Figure 2.) revealed no significant differences among the different treatments used. Mortality percentage of green leafhopper after application of botanical plant compound extracts applied at different application time intervals was evenly distributed ranged from 0.00 to 36.67%. Numerically, derris roots and neem leaves compound extracts application showed high mortality than other botanical plant extracts. Thiamethoxam offered effective control against GLH as reflected by a higher percentage of mortality. This result was similar to the study of (Saito and Luchini, 1998), that rotenone is effective in controlling beetles and caterpillars, but its toxicity may be more or less active according to the insect species, and its action may take a little while to appear.

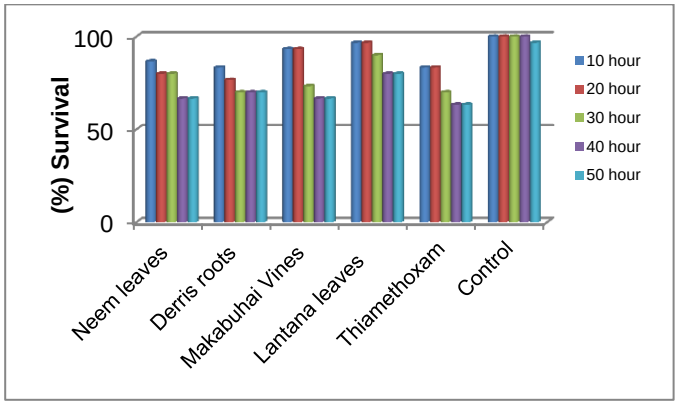

Figure 1. Survival percentage of green leafhopper in all observation hours

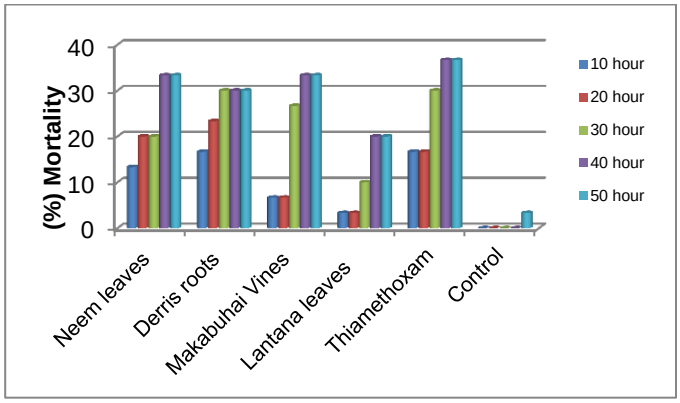

Figure 2. Mortality percentage of green leafhopper in all observation hours

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Percentage Survival and Mortality of Rice Black Bug

Survival percentage of Rice black bug after the application of botanical plant compound extracts (Figure 3). After 10, 20, 30, 40, and 50 hours application of the botanical plant compound extracts, a compound from Derris root effectively controlled rice black bug as reflected by its significantly lower survival percentage in all extended time of exposure. It was followed by the application of compounds from makabuhai vines and lantana leaves having lower survival rates which were comparable or better than the compound from neem leaves extract and thiamethoxam. This result confirmed with the study of (Philogene, 2004), that rotenone is highly toxic to insects because it acts on the nervous system and mechanisms of cell respiration. Furthermore, (Ducrot, 2004), reported that rotenone can exert antifeedant, and can potentially affect the biological activity or hormonal changes, causing the death of the insects. This means that Derris roots and other compounds from plant extracts offered knocked down and residual effect against rice black bug which can be a potential option in the management of rice bug.

Mortality percentage of rice black bug (Figure 4). Assessment after 10, 20, 30, 40, and 50 hours application of compounds from botanical plant extracts, Derris roots offered higher toxicity against rice black bug as reflected by the significantly higher mortality percentage in all the hours of exposure. However, compounds from makabuhai vines and lantana leave extracts were comparable to thiamethoxam which higher toxicity against the rice black bug. The result tends to study of (Suhayon, J., 2020), that botanical compounds application offered residual control against whiteflies. Neem tree leaves extract application could affect or influence the infestation of EFSB and can still kill the major insect pests in eggplant.

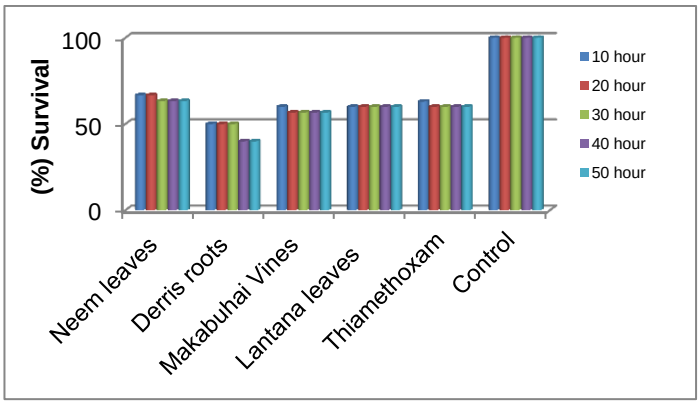

Figure 3. Survival percentage of rice black bug in all observation hours

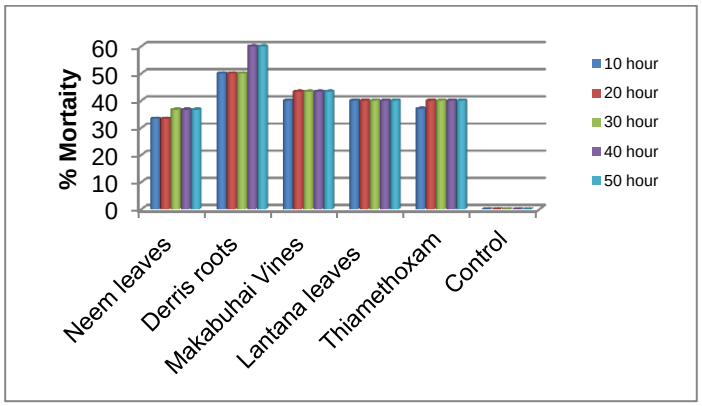

Figure 4. Mortality percentage of rice black bug in all observation hours

Conclusion

The investigation result of botanical extracts shows that compound from Derris root and Lantana leaves extracts can effectively control rice black bug. Hence, a compound from Derris roots applied at the rate of 20 ml for 10 - 30 hours offered toxic effect on green leafhopper while compound from Lantana leaves effectively controlled rice bug at 10, 20, 30, 40, and 50 hours. This proved that the application of Botanical extract as natural insecticides effectively controlled the hemipterans insect pest and can be a substitute in synthetic insecticides for the management of insect pests in lowland rice.

REFERENCES

1. Barrion, A. T.; Mochida, O.; Litsinger, J. A. & dela Cruz, N. (1982)., The Malayan black bug Scotinophara coarctata (F.) (Hemiptera: Pentatomidae): a new rice pest in the Philippines. Int. Rice Res. Newsl. 7(6): 6-7.

2. Dua V.K, Pandy A.C, Dash A.P., (2010). Adulticidal activity of essential oil of *Lantana camara* leaves against mosquitoes. Indian J Med Res. 2010; 131: 434-439.

3. Fiaz, M., A. Hameed, M. Hassan and W. Wakil., (2012). Efficacy of plant extract on some cotton pests: *Amrasca bigutulla bigutulla*and *Thrips tabaci*. Pak. J. Zool., 44(1): 277-283.

4. Guyer, D., Tuttle, A., Rouse, S., Volrath, S., Johnson, M., Potter, S., Gorlach, J.,Goff, S., Crossland, L., and Ward, E., (1998). Activation of latent transgenes in arabidopsis using a hybrid transcription factor.Genetics 149, 633-639.

5. Jadhao MF, Khurad AM., (2012), Biology of Scirpophaga Incertulas (Walker). A major pest of Rice

in Eastern Vidrbha, Maharashtra. Internal Indexed and Referred Research Journal. (1):10-14.

6. Naranjo, S.E., (2001). Conservation and evaluation of natural enemies in IPM systems for *Bemisia tabaci*. Crop Prot., 20: 835-852.

7. Miller, G.T., (2004). Sustaining the Earth, 6th ed. Thompson Learning, Inc. Pacific Grove, California.

8. Mochiah M. B., Banful B., Fening K, Amoabeng B. W, (2013). Botanicals for the management of insect pests in organic vegetable production: Journal of Entomology and Nematology Vol. 3(6), pp. 85-97.

9. Mordue A.J., Blackwell A. (1993). Azadirachtin: an update. Journal of Insect Physiology (39) 11: 903-924.

10. Morah, F.N.I. (1985). Constituents of the stem of Adenea cassia. J. of Science Education 1 pp. 177-122.

11. Olufayo, M and Akinpelumi, O., (2012). Hematology and gillpathology of *Heterobranchusbidorsals*exposed to sublethal concentrations of *Derris elliptica*leaf extract. *J Agric Bio Res.*, 2:18-24.

12. Pathak M.D, Khan Z.R, (1994). Insect pest of rice. International Research Institute, P.O box 933, Manila, Philippines. 1-17.

13. Riveros, F., and Figures, P.,(2000). Keynote address of the 18th session of IRC Nanda JS. Rice Breeding and Genetics: Research Priorities and Challenge

14. Saito, M.L., and Luchini, F. (1998).Substânciasobtidas de plantas e a procuraporpraguicidaseficientes esegurosaomeioambiente.Jaguriúna: EmbrapaCNPMA. 46pp.

15. Suhayon, J.S., and Evangelista, C.C., (2020). Toxico: Insecticidal of botanical compounds and formulated insecticides on major insect pests and beneficial arthropods in eggplant. Page No. 248-251. http://www.allsubjectjournal.com/search?keyword=7-6-35