Possibility as biorational insecticide of formulated neem oil-based pellet with certain essential oils and volatile substances against the rice weevil *Sitophilus oryzae* *

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Abstract

Six formulas of neem oil-based extract mixed with various essential oils and volatile substances - NO+CL, NO+CI, , NO+CIT, NO+CA, NO+BO and NO+ME- were evaluated for their biological activities in comparison with untreated control and neem oil singly against the rice weevil *Sitophilus oryzae.* All formulas were used to fumigate the test weevils in rice container for 3 days. The effectiveness of test materials such as the percentage of seed damage, percent weight loss, number of live weevils, egg laying and adult emergence were determined.

Addition of the neem oil with cinnamon oil (NO+CI,), citronella oil(NO+CIT) or menthol (NO+ME) resulted in greater feeding and oviposition deterrence than untreated control (CONTROL) and neem oil singly(NO). Regarding the percentage of grain weight loss, number of egg laying , NO+ME treatment proved to be the best. Furthermore it showed the highest degree of inhibition effects on the adult emergence of *S. oryzae* , while NO+CI, and NO+CIT slightly deterred the hatchability of rice weevils. In total contrast with NO+ME, the formulated neem oil with borneol (NO+BO) gave consistently worst result. Mixture of neem oil and clove oil (NOCL) or camphor (NO+CA) also showed negative influence on the number of egg-laying and emerged insects. The difference between various treatments in mortality was also not significant.

Later studies with survived weevils confirmed the favorable result gained. It showed that the insects in NO+ME treatment lossed their abilities to damage their new host plants over a 24-week storage period. Their was also a decrease in number of egg laying and emerged *S. oryzae.* The formulated NO+CL, NO+CI, and NO+CIT did not differ from NO but resulted more effective than untreated control. On the other hand, NO+CA and NO+BO were ineffective to the survived weevils. The steep increase in number of egg laying along a 24-week storage period indicated that they did not prevent damage form the weevils.

Keywords : neem oil-based extract volatile substances essential oil biorational insecticide rice weevil

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