Bioactivity of the essential oil of lemongrass, (*Cymbopogon citratus*) against rice weevil - *Sitophilus oryzae* (L.) and grain moth - *Sitotroga cerealella* (Olivier)

K.H.T.Jayaratne, P.A.Paranagama,
Department of Chemistry, University of Kelaniya, Kelaniya.
L.Nugeliyadde
Rice Research and Development Institute, Bathalagoda.
K.P.Abeywickrama
Department of Botany, University of Kelaniya, Kelaniya.

ABSTRACT

Rice weevil, *Sitophilus oryzae* and grain moth, *Sitotroga cerealella* are the most destructive and common insect pests in rice and paddy. At present Phosphine and Pirimiphos methyl, are used to control these pests. As synthetic pesticides create various problems it is necessary to look into alternative strategies in controlling pests of stored grain.

The objective of the present study was to evaluate the insecticidal and repellent action of the essential oil of *Cymbopogon citratus* (lemongrass) against *S. oryzae* and insecticidal action of the test oil against *S. cerealella.* Repellent activity of the oil was tested using the olfactometer and the choice chamber bioassays. The insecticidal action was tested using fumigant and the contact toxicity tests. The essential oil for bioassays was extracted by steam distillation of air-dried samples of the leaves of *C. citratus.*

The results showed a significantly higher repellent activity of the essential oil of *C. citratus* against rice weevil at concentrations higher than 75 mg/250 ml of air (0.3 mg/ml). In the fumigant toxicity test, the percentage mortality was 89 at 2.5 g/l where as in the contact toxicity test more than 80% mortality was observed at 25g/m^2 concentration of the test oil. The LC_{50} values of the lemongrass oil due to the fumigant and the contact toxicities were 1.14 g/l and 7.8 g/m^2 respectively for the rice weevil.

In fumigant and contact toxicity tests, the percentage mortality of grain moths was 100, at doses of 12 mg/l and 114 mg/m^2 respectively. The

LC_{50} values for fumigant and contact toxicities were 6.8 mg/l and 92 mg/m^2 respectively against grain moths.

Bioassays revealed the insecticidal potential of the essential oil of *C. citratus* against *Sitophilus oryzae* and *Sitotroga cerealella*. Further the results demonstrated the repellent action of the same essential oil against rice weevil - *Sitophilus oryzae*. Future studies are needed to identify bioactive compounds of lemongrass oil before the oil could be formulated as an insecticide and / or repellent to manage pests associated with stored rice and paddy.

Key words - *Sitophilus oryzae* (rice weevil), *Sitotroga cerealella* (grain moth), rice, paddy, *Cymbopogon citratus*

Financial assistance by National Science Foundation (NSF) for the research grant no. RG/2000/C/01, National Research Council (NRC) and Third World Academy of Science (TWAS) are acknowledged.

Effect of volatile constituents of curry leaf, *Murraya koenigii* on cowpea seed bruchid, *Callosobruchus maculatus* (F.) in stored cowpea.

AACK Adhikari, PA Paranagama
Department of Chemistry, University of Kelaniya.
KP Abeywickrama
Department of Botany, University of Kelaniya
KANP Bandara
Entomology Division, HORDI, Gannoruwa.

ABSTRACT

During our effort to develop botanicals with insecticidal/ repellant properties, a series of laboratory experiments were conducted to investigate the effect of curry leaf volatiles against *C. maculatus* (seed bruchid) (Coleoptera: Bruchidae) in stored cowpea. The insecticidal properties of the curry leaf volatiles were studied using fumigant toxicity, contact toxicity and repellent bioassays (Choice Chamber and Olfactometer bioassays). Experimental design of fumigant and contact toxicity assays was Complete Randomized Design (CRD).

In contact and fumigant toxicity bioassay the percentage of mortality was 100, for the concentrations of 2.48 g/m^2 and 1.50 g/l of curry leaf volatiles. The data were significantly different from controls of both contact (5.0%) and fumigant (1.7%) toxicity bioassays, ($p<0.005$). Similar pattern of data was obtained for oviposition and F_1 generation in curry leaf treated samples. The LC_{50} values of the volatile constituents due to contact and fumigant toxicity tests on adult bruchid were, 0.630 g/m^2 and 0.519 g/l respectively.

The results of Choice Chamber bioassay demonstrated the repellent effect of curry leaf volatiles on cowpea bruchids. The percentage bruchid responded was significantly reduced with the increasing dose from 0.04 to 0.64 mg/ml, of volatile in both Choice Chamber (22.4 - 4.0%) and Olfactometer (37.0 - 4.9%) bioassays. The egg deposition on cowpea seeds was completely inhibited with respected to the control at a concentration of 0.64 mg/ml of the curry leaf volatile during the Choice Chamber bioassay ($p<0.005$- ANOVA and Tukey's pair wise comparison test).

Since the test oil showed significant insecticidal and repellent effects, it could be used to develop a treatment system to manage bruchids in stored cowpea. However, further studies are needed to identify the bioactive compound(s) in the test oil using gas chromatography.

Key words: Bruchids- *Callosobruchus maculatus*, Cowpea, Curry leaf, *Murraya koenigii*.

Financial assistance by, Council for Agricultural Research Policy (CARP) for research grant number 12/440/329 and National Research Council (NRC) are acknowledged.