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Toxicity and repellant activity of *Cymbopogon citratus* (D.C.) Stapf. and *Murraya koenigii* Sprang. against *Callosobruchus maculatus* (F.) (Coleoptera; Bruchidae)

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ABSTRACT

Essential oils of *Cymbopogon citratus* (Lemongrass) and *Murraya koenigii* (Curry leaf) were tested for their toxicity and repellant activity against *Callosobruchus maculatus* (F.) in stored cowpea. In the contact toxicity bioassay, lemongrass oil at a concentration of 0.15 g/l caused 100 % mortality and the number of eggs laid was zero. Curry leaf oil also showed similar activity at a concentration of 0.75 g/l. In fumigant toxicity bioassays lemongrass oil at 1.5-g/l concentration and curry leaf oil at 7.5-g/l concentration caused 100 % bruchid mortality and reduced their oviposition and F_1 adult emergence. In contact toxicity bioassay, the lowest LC_{50} value of 0.026 g/l was observed for lemongrass and the LC_{50} value of curry leaf was 0.240 g/l. The results indicated that lemongrass oil was more effective as a contact toxicant on bruchids than curry leaf oil. In olfactometer and choice chamber bioassays, the % responses of bruchid decreased with increasing doses of both oils. Only 7.0 % bruchids settled in at the dosage of 160 mg in choice chamber for both lemongrass and curry leaf oils. These results suggested that the essential oils of lemongrass and curry leaf could be used as alternatives to develop less toxic treatment system to protect stored cowpea.

Key words: *Callosobruchus maculatus, Cymbopogon citratus, Murraya koenigii,* Repellency, Toxicity.

INTRODUCTION

Cymbopogon citratus (D.C.) Stapf. (lemongrass) and *Murraya koenigii* Spreng. (curry leaf) are native spice plants abundant in Sri Lanka. The essential oil of lemongrass is commercially produced using leaves, yielding 0.2 % - 0.3 % oil (Paranagama 1991). This oil has an intense lemon like odour and taste. The bulk of the oil is utilized in the isolation of citral a & b, which are used in flavor and fragrance industries. Citral a & b are the main constituents (78 %) of lemongrass oil and a significant proportion of myrcene and limonene (10 %) are also present (Paranagama 1991). The antibacterial property of lemongrass oil has previously been reported against *Staphylococcus aureus, Bacillus subtilis, Streptococcus faecalis* and *Mycobacterium avam* (Nettasingha and Paskaranathan 1976). Fungicidal activity the lemongrass has been reported against soil borne fungi such as *Pythium aphanidermatum* and *P. debrayanum* (Jayasinghe *et al.* 1999). Various preparations containing this essential oil are currently being used as repellents against houseflies, tsetse fly and mosquitoes (Osmani *et al.* 1972; Tiwari *et al.* 1966). Powdered lemongrass leaf has previously been reported to have a significant effect on the reduction of oviposition of *Callosobruchus maculatus* (Rajapakse and Emden 1997).

In Sri Lanka, curry leaves (Karapincha) are extensively used for culinary purposes. The juice of fresh leaf suppresses blood cholesterol level and is given as a remedy for diarrhoea and dysentery (MacLeod and Peris 1982). A number of studies concerning the composition and quality of curry leaf have been reported (Paranagama 1991; Wong and Tie 1993). The studies on combined gas chromatography - mass spectrometry revealed that the essential oil of curry leaf contains 53 compounds. The major constituents in the curry leaf oil has been reported to be β-caryophyllene (23.3 %), β-phellandrene (18.9), (E)-β-ocimine (12.7 %), β-thujene (5.8 %), α-humulene (4.3 %) and β-bisabolene (3.14 %) (Paranagama 1991). The toxicity of crude curry leaf oil had been studied against *Callosobruchus chinensis* in green gram and chickpea seeds with LC_{50} and LC_{90} values of 4.672 and 5.148 mg/l respectively (Namarata *et al*. 1997).

One of the most widespread species of *Callosobruchus* (Bruchidae) is the southern cowpea weevil, *C. maculatus* (F.) which is an insect closely associated with the family Leguminosae. Cowpea

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