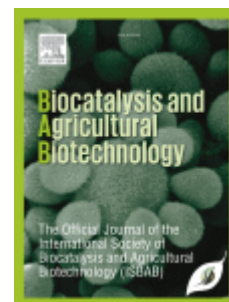


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### Insecticidal effect of selected medicinal plants on *Sitophilus zeamais* Mostschulsky in stored maize

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### Abstract

The aim of this study was to determine the insecticidal effect and phytochemical analysis of ten medicinal plant extracts against the maize weevil, *Sitophilus zeamais* (**Order: Coleoptera Family: Curculionidae**) on stored maize by using contact and repellency bioassays together with the evaluation of the Minimum Concentration of Lethality (MCL) of highly active Annona muricata. Out of the ten medicinal plant species tested, methanol extract of Annona muricata showed the highest mortality (100%) within 7 days. Repellency bioassay was done by using a Y-shaped glass tube. Ocimum selloi showed

maximum ( $57.80 \pm 21.2$ ) repellency for the *Sitophilus zeamais*, while Ailanthus altissima and Eugenia caryophyllata showed significant repulsion ( $46.67 \pm 17.6$ ) for this insect. The highly active methanol extract of *A. muricata* at the concentrations of 1000, 800, 600, 400, 200, and 100 ppm was tested against *Sitophilus zeamais* on stored maize and a 100% mortality was observed at a minimum concentration of 600 ppm. Preliminary results suggest that medicinal plants could be exploited for the isolation of insecticidal compounds. Phytochemical analysis was performed to ensure the presence of alkaloids, flavonoids, tannins, and saponins.

## Introduction

*Zea mays* L., or Indian corn, is one of the major cereal crops widely cultivated in dry areas of Sri Lanka. It provides a national extent of 23 000–28 000 ha with an annual production of around 35 000 tones (Ranaweera, 1988). However, *Sitophilus zeamais* is a globally important pest (Bohinc et al., 2020), and the farmers have suffered a lot due to the tremendous loss caused by *Sitophilus zeamais* or maize weevil (Suleiman et al., 2012) in the stored maize. It damages stored grains in the stores by reducing their availability, quality, or value (Yang and Tang, 1988). Most medicinal plants are widely used as medicines or sources of medicinal compounds. Only a few plants can be found as pesticides. These plants are mainly practiced in two ways in the fields. Firstly, the active compounds that are responsible for the insecticidal effects are isolated, identified, and chemically synthesized. Secondly, plant crude products of aqueous or organic extracts are used directly (Yang and Tang, 1988).

Nowadays, a huge amount of synthetic pesticides is being used for the management different insect pests, which have many negative effects on the biotic and abiotic components of the environment. Some of these effect include; bioaccumulation and bio magnification of toxic chemicals, reduction of biodiversity and nitrogen fixation, pesticide resistance in some pests, changes in biological balances, phytotoxicity, destruction of wild life, higher cost of application, destruction of non-target fauna, and pest resurgence

(Risman, 2006). Plant-derived pesticides, on the other hand, have numerous advantages, including residue-free food and a safe environment, effect on only target insects, low application cost, easy biodegradability, and greater availability (Pavela, 2016). Research is, therefore, geared towards finding insecticidal properties in botanicals. *Annona* is a genus of tropical fruit trees belonging to the family Annonaceae, of which there are approximately 119 species (SawantTrupti and DongreRajendra, 2014). In both *in vitro* and *in vivo* studies, aqueous extracts of *Annona muricata* L. leaves and root bark were found to be potentially toxic inhibitors of the mitochondrial respiratory chain. Experimental studies have confirmed that an isoquinoline derivative, annonacin, is the major acetogenin found in *Annona muricata* as a toxic agent (Badrie and Schauss, 2010). Even though, the seed is reported to have strong insecticidal effects, there are very limited data available on the insecticidal effects of leaves of *A. muricata*. Therefore, the study was aimed at investigating the insecticidal activity and phytochemical analysis of medicinal plant extracts against *Sitophilus zeamais* on stored maize by using contact and repellency bioassay together with evaluation of the Minimum Concentration of Lethality (MCL) of highly active *A. muricata*.