EVALUATION ON THE EFFICACY OF SOME SELECTED BOTANICALS IN CONTROLLING THE COTTON MEALYBUG *PHENACOCCUS SOLENOPSIS* (TINSLEY)

M. Prishanthini and M. Vinobaba

Department of Zoology, Faculty of Science, Eastern University, Sri Lanka

Introduction

The mealybug species are widespread throughout the world. The cotton mealybug*Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae)has been described as a serious and invasive polyphagous pest with a vast host range by several authors. It has awide geographical distribution with its originin Central America (Fuchs et al,1991) followed by reports of the Caribbean andEcuador (Ben-Dov, 1994), Chile (Larrain, 2002), Argentina (Granara de Willink, 2003), Brazil (Mark and Gullan 2005). *P. solenopsis* has been described as a serious and invasive pest of shoe flower in Pakistan and India (Hodgson et al. 2008) on *Hibiscus rosa-sinensis* in Nigeria (Akintola and Ande, 2008) Latest report by the authors on the invasiveness of *P. solenopsis* has been from the Eastern region of Sri Lanka (Prishanthini and Vinobaba, 2009) on ornamentals, vegetable crops, and weeds, and in China (Wang *et al.* 2009; Wu and Zhang, 2009) on shoe flower.Reliance on synthetic chemicals to control pests has also given rise to a number of problems such as destruction of beneficial non-target organisms (parasitoids and predators) and can lead to secondary outbreaks of pests that are normally under natural control resulting in their rapid proliferation. Scientists are now experimenting and working to protect insect infestation by indigenous plant materials (Roy *et al.*, 2005). There are many research evidences on the application of botanical pesticides against various mealybugs. Therefore present study conducted to evaluate the efficacy of some of the selected, locally available botanical pesticides in controlling mealybugs in the homegardens.

Methodology

The botanicals used in this experiment were, *Ocimum sanctum* L. (Lamiaceae), *Azadirachta indica* A. Juss. (Meliaceae),*Calotropis gigantea* R. Br. (Asclepidaceae), *Nicotina tabacum* Linn. (Solanaceae) and *Alium sativum* Linn. (Amaryllidaceae). Leaves of *Ocimumsanctum* (Tulasi) and *Azadiracta indica* (Neem) and *Calotropis sp.* were collected from the home gardens of Batticaloa. The dried leaves of Tobacco (*Nicotina tabacum*) and Garlic cloves were bought from local market. The leaves collected were cleaned and allowed to dry under solar radiation for one week. Then the dried materials were powdered and stored separately in dark bottles for extraction.Extracts of the 50 g of powdered botanicals were prepared using ethanol extraction method.Dried extracts were weighed and the stock solutions were prepared. Further dilutions were made with 0.2, 0.4, 0.6, 0.8, 1.0, 1.2 and 1.5 percentages concentrations. Dilutions prepared were applied over approximately 10-12 cm length terminal portions of the Shoe flower stems (*Hibiscus rosa-sinenesis*) infected with the *P.solenopsis* adults. The mortality records were obtained in percentage values. The most effective botanical solution which has the lowest LC_{50} (concentration which cause lethality of 50% of the mealybug population) was used for the field trial.Shoe flower plants (20 Nos) of 50- 60 cm height were infected with 20 adult female mealybugs and after 35 days of development the numbers of adult females, and nymphs were counted using hand lens. Solution was prepared and applied over the mealybug colonies and the mealy bug mortality was counted at 24, 48 and 72 hours after initial application. For all the data obtained the

differences among the mortality of mealybugs at all treatments were subjected to analysis of variance (one way ANOVA) and differences among means were considered significant at a probability level of five percent ($p \leq 0.05$). Probit analysis was carried out to determine the LC_{50} values of each botanical. Statistical package Minitab 14.0 was used for all these statistical analyses.

Discussion and Conclusion

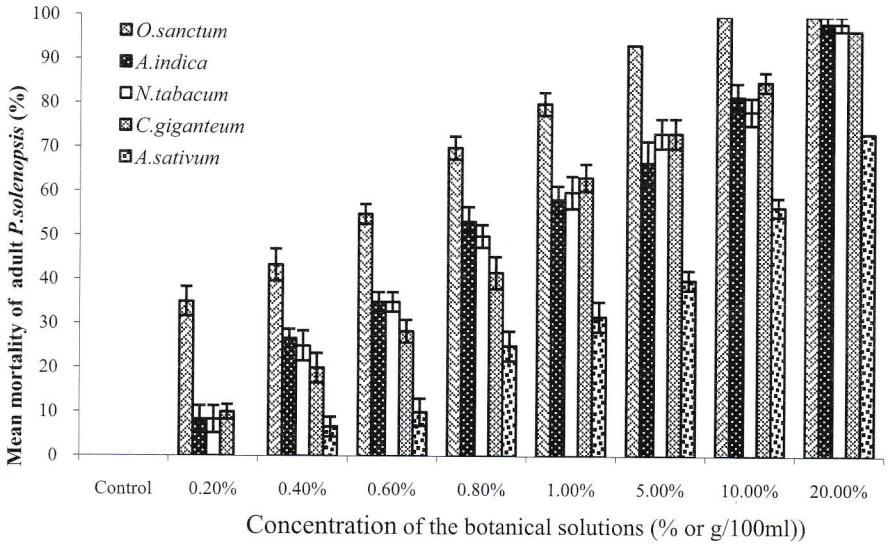
The results revealed that the treatments are significantly differing among themselves in causing mortality of *P.solenopsis*. ($p<0.05$) except at 0.2% concentration ($p=0.230$). Figure1 shows the comparison of percentage mean mortalities to different botanicals at different concentrations at 24 hrs after initial applications. Mortality rates increased with increasing concentrations for all botanicals LC50values obtained from probit analysis for mortality values after 24 hours of each botanical applied are given in the table 1. According to the results of probit analysis the botanical *O.sanctum* has the lowest value i.e.0.60 % solution. Among all, the *Ocimum sanctum* and soap mixed solution was found to be more effective against *P.solenopsis* with the lowest LC_{50} value.

In the field experiment the 0.6% solution of *Ocimum sanctum* which is the LC_{50} value obtained from the laboratory experiments was field applied on healthy shoe flower plants of same age and height.In this trial the 0.6% Tulasi, *Ocimum sanctum* solution caused 39.42% adult morality and 72.21% nymphal mortality to *P.solenopsis*. Adult mortality under field conditions was lower than that of under laboratory conditions. Use of Tulasi for pest control has long history and has both repellent and herbicidal properties. The essential oils from the species of this genus contain linalool, linalol, linoleic acid, *p*-cymene, estragosol, eucalyptol, eugenol, citral, thujone, ocimene, camphor, methyl chavicol, oleic acid, and many other terpenes as active ingredients, all of which are effective repellents (Moore and Lenglet, 2004).Generally contact pesticides are less effective against mealybugs because of their cryptic habitats in plants and the water proof waxy layer over the body (Tanwar *et al*, 2007).The soap solution added at low concentration increases the effectiveness of the botanical solution. Soap facilitates the solubility of the active ingredient and acts as a sticking agent (Nhachi and Kasilo, 1996), breaks down the protective wax cover and also acts as a surfactant.

Table 1: LC_{50}values (after 24 hrs) for the botanicals obtained from Probit Analysis

Name of Botanical	LC_{50}
O.sanctum	0.60
N.tabacum	0.89
C.gigantea	0.95
A.sativum	1.15
A.indica	0.82

As a conclusion it can be stated that *O.sanctum* was effective significantly at lower concentrations and 0.6% concentration of the *O.sanctum* solution was resulted a significant nymphal mortality in the field conditions. The botanicals used in this study such as *A.indica, O.sanctum, C.gigantea, N.tabacum* and *A.sativum* were showed different levels of insecticidal activities.



Based on these results development of new formulations with the combinations of these botanicals which can be produced and applied using simple methods applicable to local public will be very useful. Moreover, analyzing new botanicals from different plant origins and least toxic chemicals for their efficacy against the mealybugs are also necessary to reduce use of the toxic chemical insecticides. More research on the active ingredients, pesticide preparations, application rates and environmental impact of botanical pesticides are a prerequisite for sustainable agriculture.

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