

INVESTIGATION OF THREE SPECIES OF SRI LANKAN
PLANTS TO EVALUATE THEIR POTENTIAL USE IN THE
CONTROL OF APHIS CRACCIVORA (HOMOPTERA: APHIDIDAE).

By

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ABSTRACT

INVESTIGATION OF THREE SPECIES OF SRI LANKAN PLANTS TO EVALUATE
THEIR POTENTIAL USE IN THE CONTROL OF *APHIS CRACCIVORA*
(HOMOPTERA : APHIDIDAE)

Sixteen laboratory experiments were carried out at the Central Agricultural Research Institute, Gannoruwa, Peradeniya, Sri Lanka, from March 1985 - January 1987 to screen solvent extracts of three local plant species, viz. *Acorus calamus* L. rhizome, *Calatropis gigantea* L. flowers and *Glycosmis mauritiana* L. root bark, to evaluate their activity against laboratory cultured groundnut aphid, *Aphis craccivora* Koch. The extracts were further studied to identify the active ingredients responsible for any observed activity and to investigate their indirect toxic effects against the aphid.

All experiments were of Completely Randomized Design with three or four replicates, except the experiments used to test repellent activity, where a Randomized Complete Block Design with six replicates was used. In all the experiments, distilled water was used as the untreated control and a mixture of distilled water, pure solvent and a homogenizer was used as a standard control.

The relative aphidicidal activity of these plant extracts was evaluated by using the Potter's Precision Spray Tower method. Twenty four hours after treatment, the dichloromethane extract of *Acorus calamus* rhizome caused significantly higher mortality ($p < 0.01$) of aphids compared with the other plant extracts and the standard control. Forty eight

hours after treatment, the methanol extract of *A. calamus* rhizome and the dichloromethane extract of *G. mauritiana* root bark also caused significantly higher mortality of the aphid when compared with that of the standard control. Neither the dichloromethane extract of *C. gigantea* flowers nor the methanol extracts of *C. gigantea* flowers and *G. mauritiana* showed significant aphidicidal activity at the end of 48 h, compared with the standard control. Based on these results, the dichloromethane extract of *A. calamus* was found to be the most active plant extract and this extract was further evaluated for its activity against the insect.

The minimum effective concentration and the relative LC_{50} of this extract was found by using the same method with different concentrations of the extract and dimethoate. The minimum effective concentration was found as 2000 ppm under these experimental conditions. Relative LC_{50} studies indicated that the extract was 289 times less toxic than dimethoate.

Different methods of application were used to study the mode/s of action of the extract on the aphid. The extract was found to have a strong fumigant action, but its contact, residue and/or systemic toxicities were not significant.

The insecticidal activity of the extract was further tested by spraying aphid infested cowpea plants which were kept on a rotating table. Aphidicidal activity significantly different from standard control was not observed.

The active compounds in the dichloromethane extract of *A. calamus* were separated using medium pressure chromatography and identified by means of spectral analysis as β -asarone.

The repellent activity was investigated by counting the number of aphids settled on extract treated and on standard control treated cowpea leaves. The 4000 ppm extract had repellent activity which lasted one hour.

The effect of the extract on aphid feeding was investigated by using a slightly modified ninhydrin method. The extract had no significant effect on feeding of the aphid, when placed on treated cowpea seedlings.

Different developmental stages were separately treated with the extract (1000 ppm) and standard control to observe the effect of the extract on developments of the aphid. The extract had no significant effects on aphid development, compared with the standard control, when they were treated topically.

The effect of the 1000 ppm extract on the fecundity of *Aphis craccivora* was tested by counting the F_1 progeny of the nymphs treated as above. The topical application of the extract on 1st-instar nymphs significantly reduced the fecundity of the resulting adults, compared with the standard control.

The effect of the extract on aphid longevity was tested by recording the number of days of survival of extract treated and standard control treated one-day-old aphids. The results indicated that the extract had no significant effect on the longevity of treated adults.

It is concluded that the dichloromethane extract of *Acorus calamus* rhizome has fumigant activity against *Aphis craccivora*. Its use for the control of aphids in the field may be limited and its potential use to control *A. craccivora* under enclosed conditions should be investigated.