RESEARCH ARTICLE

Insecticidal activity of Three Indian plant extracts against *Collosobruchus Chinensis and C. maculatus*

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ABSTRACT

The present paper is focused on insecticidal activity of extracts from three different plant species i. e. *Tagetes erecta, Ailanthus excelsa* and *Psoralia corylifolia* relatively, against *Collosobruchus Chinensis and C. maculatus*, which are very common in most of the part of India. All three plants are treated as medicinal plants in different parts of India. *Tagetes* and *Ailanthus* also used for insecticidal activity among tribal and rural areas of Chhindwara district of Madhya Pradesh and *Psoralia* is known as a good antiseptic among them also.

Keywords: Insecticidal activity,*Tagetes erecta*, *Ailanthus excelsa, Psoralia corylifolia Callosobruchus chinensis and Collosobruchus maculatus.*

INTRODUCTION

Pulses are the main sources of Protein. India is in the top position in the production of pulses as well as consumption. It is stored at the large scale in food processing industries and at the small scale in domestic level but the main problem has been seen due to insect pests, when stored. They may not only damage the seed grain quantitively but also effect the quality like taste and colour. Pulses are the main sourse of protein in India. Therefore, there is a need to develop an effective and safe insectide which may be either repellant or phagodeterrant. Some plants are able to protect them selves from the attack of insect pests naturally by the secretion of specific chemical compounds commonly known as secondary metabolites or essential oils (Brattsten, 1983) (Diwan 2013).

There are few reports of chemical composition of *Tagetes erecta* (Gupta and Bhandari, 1974). Some other extracted yellow essential oils of steam distillation from flowers of *Tagetes erecta* (Baslas and Singh, 1980). A lot of work have been done for the discovery the insecticidal activity from plant sources: i.e.- *Lantana Camara* (Philip and Berry, 1975; Saxena *et al.,*1992a; 1992b) and *Primina interifolia* (Dixit and Saxena, 1990) against *Callosobruchus chinensis*. Some other Indian scientist have reported that some plants powders and vegetable oils

are also effective against stored grain pests (Neog and Singh, 2013) Some researchers have reported effects of some plants against various insects (Devi and Devi, 2013; Malsawmzuali *et al.,* 2013; Singh and Bindu, 2013).

The present paper, focus on insecticidal activity of three plants extracts against *Callosobruchus chinensis* and *C. maculatus* infested on *Phaseolus mungo* in the storage houses.

MATERIALS AND METHODS

Collection and extraction of plant material:

For the present study, flowers of *Tagetes erecta* (Asteraceae), leaves of *Ailanthus excelsa* (Simaroubaceae) and seeds of *Psoralia corylifolia* (Fabaceae) have been collected from local area. The parts of all three plants were shade dried at room temperature and powdered material of 40-60 mesh size was "Soxhlated" in n-hexane, benzene, and methanol. The percentage yield was calculated in each solvent. The crude was vacuum evaporated to dryness under reduced pressure. The semisolid crude extract was purified using column chromatography and TLC. The process of purification was continued till the single spot is obtained.

Statistical methods:

Chi-square test' and 'Probit Analysis' of Finney (1971), was used for the statistical evaluation of experimental data.

Biological assay methodology:

Insecticidal activity of plant extracts of three plants against *Callosobruchus chinensis* and *Callosobruchus maculatus*-

For studying the insecticidal property, 1 ml of each extracts at three different concentrations; was poured in cleaned glass tubes of 100 ml capacity and uniform film of the extract was made by rolling the vials. Freshly emerged adults (10) were then released in each of the treated vials and mouths of the vials were tied with a piece of muslin cloth and rubber band to prevent the escape of the adult. Untreated healthy gram seeds were provided to the adults during the bioassay. The mortality of the beetles was records after every 24 hours until died, the complete exhaustion of insects. All experimental bioassay have been carried out with crude extract. The data then obtained for insecticidal activity have been evaluated biostatical using Probit Analysis (Finney, 1971).

RESULTS AND DISCUSSION

Isolation of biologically active compound:-

Chromatographic separation:-

The biologically active compound obtained from the plant material was separated by column chromatic method with silica gel (16-20 mesh). Successive elution was carried out with n-hexane, petroleum ether and benzene to remove fatty acids, carotenoids and phytosteroids respectively.

Table 1: Biostatistical analysis of three plant extracts against *Callosobruchus maculates*

Extract	Conc %	*Tagetes erecta*			*Ailanthus excelsa*			*Psoralia corylifolia*		
		24 Hrs Martality	LC_{50}	LC_{90}	24 Hrs Martality	LC_{50}	LC_{90}	24 Hrs Martality	LC_{50}	LC_{90}
n-Hexane	1.0	20			19			21		
	2.0	30	1.21	2.14	31	1.19	2.12	30	1.18	1.13
	3.0	53			54			52		
Benzene	1.0	23			22			21		
	2.0	33	1.34	2.51	34	1.31	2.49	32	1.29	2.47
	3.0	63			65			64		
Methanol	1.0	24			23			22		
	2.0	40	1.50	2.84	41	1.48	2.81	39	1.45	2.78
	3.0	66			65			64		

Level of significance (P < 0.05) Compare to the normal control group.
DF= n-1

Table 2: Biostatistical analysis of three plant extracts against *Callosobruchus chinensis.*

Extract	Conc %	*Tagetes erecta*			*Ailanthus excelsa*			*Psoralia corylifolia*		
		24 Hrs Martality	LC_{50}	LC_{90}	24 Hrs Martality	LC_{50}	LC_{90}	24 Hrs Martality	LC_{50}	LC_{90}
n-Hexane	1.0	20	1.22	2.15	19	1.20	2.13	21	1.19	1.12
	2.0	30			31			30		
	3.0	53			54			52		
Benzene	1.0	23	1.33	2.50	22	1.32	2.51	21	1.30	2.46
	2.0	33			34			32		
	3.0	63			65			64		
Methanol	1.0	24	1.51	2.83	23	1.49	2.80	22	1.46	2.79
	2.0	40			41			39		
	3.0	66			65			64		

Level of significance (P < 0.05) Compare to the normal control group.
DF= n-1

Further elution was done with ethyl acetate yielded fraction-I contaminated with chlorophylls, which was removed by treatment of active charcoal and the concentrated extract fraction- II rechromatographed on a small (4×40 cm) columns of silica gel. Elution with benzene and ethyl acetate (9;1) yielded fraction –III. The biologically active principle was isolated from fraction-III by preparative layer chromatography (PLC). The solvent system used for PLC was benzene and methanol in 9;1 with one drop of MeOH. TLC was also performed on 0.25 mm layers of silica gel G causing benzene and ethyl acetate in the ratio of 85;15. Fraction I, II, III of each plant extracts have been sent to C.D.R.I. Lucknow for further analysis, results will be shown elsewhere.

Insecticidal activity of three selected plants against *C. maculatus*:

The insecticidal activity of selected three plants in three different concentration have been analyzed biostatistically using Probit Analysis Techinique (Finney 1971). As shown in the table-1, 24hours LC_{50} value of ailanthus excels are represented as 1.21%, 1.34% and 1.50% bfor n- hexane, benzene and methanol respectively, Similarly 1.18% for n-hexane, 1.29% for benzene and 1.45% for methanolextract. Whereas, the LC_{90} value of three different extracts of *Tagetes erecta* are 2.14% for n hexane, 2.51% for benzene and 2.84% for methanol, and *Ailanthus excelsa* are came to be 2.12%; for n-hexane, 2.49% for benzene and 2.81% for methanol, Similarly 1.13% for n-hexene, 2.47% for benzene and 2.78% for Methanol respectively. From the LC_{50} value it appears that n-hexane extracts of *Ailanthus excelsa* is more effective than benzene and methanol extracts for *Callosobruchus maculatus.*

Insecticidal activity of three selected plants against *C. chinensis :*

Insecticidal activity of three plant using in three different concentrations have been analyzed biostatisticaly using Probit Analysis Techniques, Finney(1971); as shown in the Table .(2), 24 hours LC_{50} value 1.22% for n- hexane, 1.33% for benzene and 1.51% for methanol extract of *Tagetes erecta* and 1.20 % for n-hexane, 1.32 % for benzene and 1.49% for methanol extracts of *Ailanthus excelsa* plant, Similarly 1.19% for n-hexane, 1.30% for benzene and 1.46% for methanolextract. Whereas, the LC_{90} value of three different extracts of *Tagetes erecta* are 2.15% for n hexane, 2.50% for benzene and 2.83% for methanol, and *Ailanthus excelsa* are came to be 2.13%; for n-hexane, 2.51% for benzene and 2.80% for methanol, Similarly 1.12% for n-hexene, 2.46% for benzene and 2.79% for Methanol respectively. From the LC_{50} value it appears that n-hexane extracts of *Ailanthus excelsa* is more effective than benzene and methanol extracts for *Callosobruchus chinensis.*

The results when compared by T test value, it was found quite significant at 5% level; ($P < 0.05$). Methanol extract of selected plants found more effective than n-hexane and benzene extracts against *C.chinensis and C.maculatus*. The structure elucidation will be carried out by using chromatographic

techniques. Finally, the insecticidal principles shall be determined by comparing with the authentic markers.

Insecticidal activity of various indigenous products have been reported by many Indian Scientists (Saxena *et al*., 1999, Jotwani and Shrivastava, 1981, Saxena, 1992a&b). The present study is quite comparable with the activities of larvicidal activity (Diwan 2013).

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