A COMPARATIVE STUDY OF *ACORUS CALAMUS* OIL, BIOSAL AND DELTAMETHRIN ON MORTALITY OF *CALLOSOBRUCHUS ANALIS* BY FILTER PAPER IMPREGNATION METHOD

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Abstract

Mortality effect of three pesticides *Acorus calamus* (AC) essential oil and Biosal® (Neem formulation=NF) (Neem pesticides registered by APTA) and Deltamethrin (DM) was tested against *Callosobruchus analis* by Filter paper impregnation method (FIM) after 24 hours of treatment. The mortalities were observed after 24 hours treatment of (AC) 30%, 44%,65%, 84%, 92%, mortalities were observed after 24 hours treatment of Biosal® 34%, 53%, 60%, 72%, 89% whereas the mortalities were found after 24 hours treatment of deltamethrin 24%, 38%, 49% 76%, 81%. The LC_{50} value of (AC) and (NF) was found to be 0.09999 µl/cm^2, 6.94503 µl/cm^2 respectively whereas LC_{50} value of (DM) was observed as 0.034721 µl/cm^2.

Introduction

In storage mung (*Vigna radiata*) is severally damaged by several bruchids of which is most the common in Karachi area is *Callosobruchus analis*. In present work *Acorus calamus*, Biosal and Deltamethrin were tested against *C.analis*. Many researchers worked on phytopesticide in different countries. Das (1989) worked on effect the duration of storing chickpea seeds treated with neem oil on the oviposition of bruchis *Callosobruchus chinensis* Linn. (Bruchidae: Coleoptera) Ahmed *et al.* (1993) reported the efficacy of edible and non edible oils against the pulse beetle *Callosobruchus chinensis* (Coleoptera: Bruchidae) Juneja and Patel (1994) worked on botanical material as protactant of green gram, *Vigna radiate* (L.) wikzek against pulse beetles, *Callosobruchus analis* Fabricius. Lale and Abdulrehman (1999) worked on evaluation of (*Azadirachta indica* A.. Juss) seed oil obtained by different methods and neem powder for the management of *Callosobruchus muculatus* (F.) (Coleoptera:Bruchidae) in stored cowpea. Keita *et al* (2000) have investigated the effect of various essential oil on *Callosobruchus maculates.* (F.) Sathyaseelan *et al.* (2008) reported the efficacy of some plant indigenous pesticidal plants against pulse beetle *Callosobruchus chinensis* L. on gren gram. The pyrethroid or commercial pesticides are hazards to our environment.Pyrethroid induced paraesthesia a local or central toxic effect have been repotted by Wilks (2000). Karnatak *et al.* (1991) worked on relative toxicity of some organophosphorus and synthetic pyrethroid insecticide against *Sitophilus oryzae*. In Pakistan the problem of resistance is being experienced by researchers. The present work phytopesticides and pyrethroid used for experiments. The phytopesticides are more effective and safe our environment as compared to pyrethroid. Ajayi and Olonisakin (2011) reported the Bio-activity of tree essential oils extracted from edible seeds on the rust red flour beetles, *Tribolium castaneum* (Herbest). Islam (2012) reported the control stored grain insect (*Callosobruchus maculates* Fab. and *Sitophilus oryzae* Motch) using fruit and seeds of *Capsicum spp.*

Materials and Methods

The present research work was carried out in Biological Research Centre and Department of Zoology University of Karachi. The initial culture of *Callosobruchus analis* was taken from the Toxicology Laboratory of Department of Zoology, University of Karachi and reared at 30 ± 1.0°C on mung grains (*Vigna radiata*). The insect were kept in 1 liter glass jar. The mouth of jars were covered with a piece of muslin cloth tied by means of rubber band. Grains of *Vigna radiata* were used as food and egg laying media. The eggs were laid but the adults died soon and the new adults emerged in 25-30 days. After emergence the new adults were transferred to the jar containing fresh grains. After preliminary trials, five concentrations of each insecticide were selected for final treatment. These concentration were prepared with the help of Charles's equation $C_1 V_1 = C_2 V_2$. Biosal® was used as 0.125, 0.25, 0.5, 1.0, and 1.5%. *Acorus calamus* oil was used as 0.03471, 0.06943, 0.125, 0.25, 0.5%. Deltamethrin solutions were prepared from original sample as 0.00312 0.00625, 0.0125, 0.0250, 0.050%. A 50 gm of seeds were taken in 90mm petri dishes. 6 sets of petri dished were set while 6th petri dish was not treated i.e. control. Then 10 pairs of *Callosobruchus analis* were released for egg laying, the dishes were placed at 30°C ± 1.0°C temperature. Mortality was taken daily. The different volume of Neem formulation, *Acorus calamus* oil and Deltamethrin was used as dose. For toxicity, the mortality was calculated using.

Formula used:

$$\text{For \% mortality} = \frac{\text{Average mortality}}{\text{Total insects}} \times 100$$

Table 1. Toxicity of *Acorus calamus* oil, Biosal and Deltamethrin against *Callosobruchus analis* after 24 hours of treatment by Filter Impregnation method.

Acorus calamus				Biosal			Deltamethrin		
S.No	**Dosein µl/cm^2**	**Mortality %**	**S.D**	**Dose in µl/cm^2**	**Mortality %**	**S.D**	**Dose in µl/cm^2**	**Mortality %**	**S.D**
0	Control	-	-	Control	-	-	Control	-	-
1	0.34	30	1.00	3.33	34	1.30	0.0069	24	1.30
2	0.69	44	1.30	6.66	53	1.14	0.013	38	1.51
3	0.13	65	2.23	9.99	60	1.73	0.027	49	1.48
4	0.27	84	1.30	13.33	72	1.10	0.05	76	1.30
5	0.55	92	1.14	16.66	89	0.83	0.11	81	0.83

Fig.1

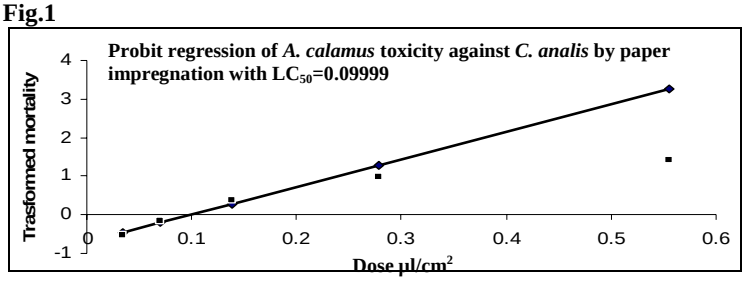


Fig.2

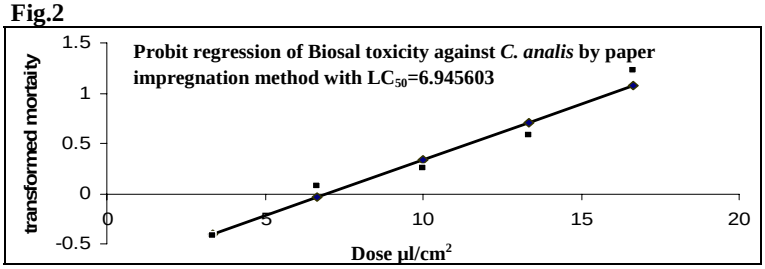
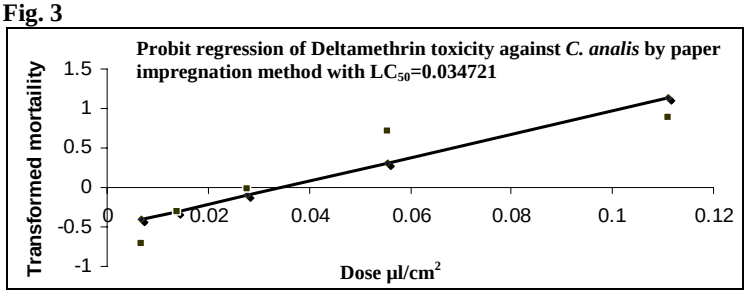


Fig. 3



Results and Discussion

Table 1. shows the toxicity of *Acorus calamus* against *Callosobruchus analis* after 24 hours of treatment by Filter paper impregnation method mortalities observed as 30%, 44%,65%, 84% 92% at the dose of 0.34, 0.69, 0.13, 0.27, 0.55 µl/cm^2 respectively. The toxicity of Biosal against *Callosobruchus analis* after 24 hours of treatment by Filter paper impregnation method mortalities observed as 34%, 53%, 60%, 72% 89% at the dose of 3.333. 6.66, 9.99, 13.33, 16.66 µl/cm^2, respectively. The toxicity of Deltamethrin against *Callosobruchus analis* after 24 hours of treatment by Filter paper impregnation method mortalities observed as 24%, 38%, 49%, 76%, 81% at the dose of 0.0069, 0.0013, 0.027, 0.055 ,0.111 µl/cm^2 respectively. The LC_{50} value of *Acorus calamus*

was 0.0999 µl/cm^2 Biosal was 6.945603 µl/cm^2.Deltamethrin was 0.03475 µl/cm^2. (Fig 1,2 and3) Bengeston *et al.* (1981) reported the pyrethroid activity against stored grains pest *Sitophilus oryzae*, *Tribolium castaneum* and *Rhyzopertha dominica* by filter paper impregnation method (FIM). The calculated LC $_{50}$ was 0.19% 1.2% and 0.08% respectively. In the present study deltamethrin was used against *Callosobruchus analis* by filter paper impregnation method. The LC $_{50}$ value found to be o.03472 µl/cm^2 .Mortalities were observed to be 24, 38, 49, 76, 81% at the dose of 0.006933, 0.01388, 0.02777, 0.0555, 0.111µl/cm^2. The result was not similar may be due to different insects. Naqvi *et al* .(1990) worked on neem factor against adults *Callosobruchus analis* for toxicity determination and residual effect. They found LC_{50} by impregnation method to be 40 µg/cm2. In the present study Biosal (neem formulation) was used against *C. analis* by FIM. The LC $_{50}$ value calculated as 6.945603 µl/cm^2. The result are not comparable - may be due to environmental differences. Akhter *et al.* (1994) reported the toxicity of neem factor (NFQ) against adult beetles *Callosobruchus analis* by two different methods used spraying on filter paper and on grains. The LC $_{50}$ was observed to be 1.8% in concentration containing 3.6 mg/g of compound in grain spraying method while LC_{50} was calculated at 0.54 concentration containing 0.0169 mg/sq. cm of the compound on the filter paper method. In present study Biosal (Neem formulation) was used against *C. analis* by filter paper impregnation method. The LC $_{50}$ value calculated as 6.945603 µl/cm^2. The result was not compared may be due to different temperature and environmental condition. Ahmad *et al.* (1998) reported the effect of cypermethrin (synthetic pyrethroid) and *Acorus calamus* extract (AC-HeX-1) against *Sitophilus oryzae* by using filter paper impregnation method. The LC_{50} value were found to be 19 µg/cm^2 for cypermethrin and 35000 µg/cm^2 for *Acorus calamus* extract respectively. In the present study *Acorus calamus* oil used against *C. analis* by FIM. The LC $_{50}$ value calculated as 0.09999 µl/cm^2 and mortalities were observed as 30, 44, 65, 84, 92% at the dose of 0.3466, 0.6944, 0.1388, 0.2777, 0.555µl/cm^2. The result was not compare may be due to different insect. Tabassum *et al.* (1998) reported the effect of neem compound (NfC and NC) and Dimilin of *Callosobruchus analis* by two method filter paper impregnation and glass film method. The LC_{50} value was calculated as (39.2%, 7.16% and 13.5µg/cm^2) for NfC, NC and dimilin by filter paper impregnation method, while 10 µg/cm^2 for NC and dimilin by glass film method. In the present study Biosal (Neem formulation) was used against *Calllosobruchus analis* by FIM method. The LC_{50} value calculated as 6.945603 µl/cm^2. The result was comparable may be due to similar insect and methodology. Iiboudo *et al.* (2010) reported the toxicity of essential oil extracted from *Ocimum americanum* against *C. maculates* adults LC $_{50}$ value observed as 0.23 µl/L, while oils from *Hyptis suaveolens*, *Hyptis spicigera* and *Lippia multiflora* LC_{50} value observed as 1.30 µl/L, 5.53µl/L and 6.44 µl/L. In the present study phytopesticides used against *C.analis*. The present study support the above study that the phytopesticides are effective.

Conclusion

It could be concluded that *Acorus calamus* oil and Biosal® (Neem pesticide) are safer alternative pesticides for controlling insect pest as compared to deltamethrin. They do not pollute the environment.

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