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# INSECTICIDAL ACTIVITY OF PHYTOPESTICIDES AS COMPARERD TO PYRETHROID BY DIRECT APPLICATION METHOD ON PULSE BEETLE *CALLOSOBRUCHUS ANALIS* (FABRICIUS, 1781)

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## ABSTRACT

Insecticidal activity of two phytopesticides *Acorus calamus* (AC) essential oil Biosal® (Neem formulation-NF) (Neem pesticide registered by (APTA) and Pyrethroid Deltamethrin (DM) was tested against *Callosobruchus analis* by Direct application method (DAM). The $LC_{50}$ values of (AC) and (NF) was found to be 0.15608 µl/cm$^2$, 1.338504 µl/cm$^2$ and the $LC_{50}$ value of (DM) was found to be 0.03352 µl/cm$^2$.

**Key-words**: Insecticidal activity, pyrethroid, mung bean, pulse beetle, neem formulatin.

## INTRODUCTION

*Callosobruchus analis* (Fabricius, 1781) of the insect, please. It is a major pest of wild range of stored seeds, especially *Vigna radiata* green mung. *C.analis* causes very serious damage to pulses in Pakistan, India and many countries. *C.analis* cause significant losses in grains both quantitative and qualitative. Pandey (1986) worked on effects of some plant extracts against pulse beetle *Callosobruchus chinensis* L. Islam *et al.* (1990) reported insecticide and anti feedant bioactivities of neem oils and their relationship to azadirachitin content. Ahmed *et al.* (1999) worked on effects of plant oils on oviposition preference and larval survivorship of *Callosobruchus chinensis* (Coleoptera: Bruchidae) on azuki bean. Park *et al.* (2003) worked on insecticidal activity of asarone identified in *Acorus graminicus* rhizome against three coleopteran stored product insects. Abdullah and Muhammad (2004) assessed the toxic potentials of some plants powders on survival and development of *Callosobruchus maculates*. Ratanasekera and Rajapakse (2009) reported the repellent properties of plant oil vapours on *Callosobruchus maculates* F. (Coleoptera: Bruchidae in stored green gram (*Vigna radiata* Walp). In 1990s new pyrethroid were synthesized, but they provoked insect resistance. The disadvantage of pesticide contamination in the environment and human health risks other aspects can be added. Misuse of non selective chemicals can wipeout the natural and mites have now developed resistance to one or more major synthetic pesticide. Because pyrethroid and other developed pesticides were expensive many of them were harmful but cheaper. Deltamethrin is harmful as compared to phytopesticides (Ray and Philip, 2000). Arif *et al.* (2011) reported toxicity of two phytopesticides the *Acorus calamus* and Biosal (Neem pesticides) as compared to deltamethrin by Glass film method. The present study presents a comparative study of phytopesticide and pyrethroid against pulse beetle *Callosobruchus analis* by direct application.

## MATERIALS AND METHODS

The initial culture of *Callosobruchus analis* (F.) was taken from the Toxicology Laboratory of Department of Zoology, and reared at 30 ± 1.0°C on mung grains (*Vigna radiata*). The insect were kept in 1 liter glass jar. The mouth of jar was 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 adults were died soon and the new adults emerged in 25-30 days. After emergence the new adults were transferred to the jar containing fresh grains.

Biosal® and *Acorus calamus* were used as 100% and 0.1% stock solution of deltamethrin was prepared in distilled water. After preliminary trials, five concentration 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, 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 and 6 sets of petri dished were set. Then with variable volume each (2-10%) concentration was applied on direct mung seeds, while sixth petri dish was not treated i.e.

control (Ctl). Then 10 pairs of *Callosobruchus analis* were released for egg laying, the dishes were placed at 30°C ± 1.0°C temperature. Mortality was recorded daily. The procedure was followed for standard and candidate new phytopesticides, in addition another experiment with pyrethroid was also conducted.

**FORMULA USED:**

% Mortality = Average mortality / Total insects × 100

**RESULTS AND DISCUSSION**

The toxicity of *Acorus calamus* after 24 hours of treatment against *Callosobruchus analis* by Direct application method were found to be 35%, 43%, 60%, 61%, 63% at the dose of 0.3466, 0.6944, 0.1388, 0.2777, 0.5555 µl/cm$^2$. The toxicity of Biosal were found to be 35%, 42%, 55% 81% 92% at the dose of 0.4166, 0.8333, 1.666, 3.333, 6.666 µl/cm$^2$ after 24 hours of treatment against *Callosobruchus analis* by Direct application method. The toxicity of Deltamethrin after 24 hours of treatment were found to be 29, 35, 49, 66, 92% at the dose of 0.00693, 0.01388, .0.02777, 0.0555, 0.111 µl/cm$^2$ against *Callosobruchus analis.* Shown in table 1.The $LC_{50}$ of *Acorus calamus* was 0.15608 µl/cm$^2$ $LC_{50}$ of Biosal was 1.338504 µl/cm$^2$ and the $LC_{50}$ of Deltamethrin as 0.03352 µl/cm$^2$ (Figs. 1, 2 and 3).

Table 1. Toxicity of *Acorus calamus* Biosal and Deltamethrin against *Callosobruchus analis* after 24 hours of treatment by Direct application method.

| | ***Acorus calamus*** | | | **Biosal** | | | **Deltamethrin** | | |
|---|---|---|---|---|---|---|---|---|---|
| **S.No** | **Dose** | **Mortality %** | **S.E** | **Dose** | **Mortality %** | **S.E** | **Dose** | **Mortality %** | **S.E** |
| | Control | | | | | | | | |
| | 0.346 | 35% | 1.00 | 0.416 | 35% | 1.051 | 0.006 | 29% | 0.945 |
| | 0.694 | 43% | 0.814 | 0.833 | 42% | 0.511 | 0.138 | 35% | 0.448 |
| | 0.138 | 60% | 0.896 | 1.666 | 55% | 0.896 | 0.027 | 49% | 0.672 |
| | 0.277 | 61% | 2.25 | 3.333 | 81% | 1.160 | 0.055 | 66% | 1.500 |
| | O.555 | 63% | 2.98 | 6.666 | 92% | 0.511 | 0.111 | 92% | 0.245 |

Naqvi *et al.* (1990) reported the effect of Neem factor against *C.analis* for toxicity determination and residual effects. The $LC_{50}$ was found to be 40 mg/cm$^2$. It was observed that the residual effect at high dose (80 mg/cm$^2$) was upto 4 days. In the present study the $LC_{50}$ value of *A.calamus* and Biosal was 0.158 µl/cm$^2$ 1.338504 µl/cm$^2$by DAM. The result may be due to the difference in the methodology and method of application was also different.

Su (1991) evaluated the toxicity of calamus oil against 4 species of stored product insects *Callosobruchus maculates* (F.), *Sitophilus oryzae* and *Tribolium canfusum* topically applied was highly toxic to *L. serricorne* 100% mortality at 30 µg insect and toxic to *Callosobruchus maculates* and *S. oryzae* with 98.3% and 61.7% mortality respectively. In the present study *A. calamus* was used against *C. analis* mortalities were observed 35%, 43%, 60% 61%, 63% at the dose of 0.3466, 0.6944, 0.1388, 0.2777, 0.555 µl/cm$^2$. Present study compared may be due to similar pesticide and test species. Gul-e-Ruksana *et al* (1993) repoted the toxicity of neem oil, deltamethrin (pyrethroid), dimethoate (OP) against *Callosobruchus analis* under laboratory conditions. The $LD_{50}$ of these compound after 24 hours of treatment were found to be 46.25%, 0.00628% and 0.000084082% for neem oil, deltamethrin and dimethoate respectively. In the present study Neem pesticide ans deltamethrin were used and $LC_{50}$ value calculated as 1.338504 µl/cm$^2$ foe neem and 0.03352 µl/cm$^2$ for deltamethrin after 24 hours of treatment. Present study comparable may be due to similar pesticide and insects. Tabassum *et al* (1997) reported the residual effect of phytopesticide Neem fraction (Nimolicine) and dimilin against store grain pest *Callosobruchus analis* by two different method glass film method and filter impregnation method. Maximum mortality was observed as 40% after 24 hours of nimolicine treated insects by both method, whereas dimilin treatment mortality was observed after 24 hours of treatment by glass film method, while 30% mortality was observed by filter impregnation method after 24 hours of treatment. In the present study mortalities were observed after 24 hours treatment of *Acorus calamus*, Biosal and Deltamethrin against *C.analis* 35%, 43%, 60%, 61%, 63% for *A.calamus*, 35%, 42%, 55%, 81%, 92% for Biosal and 29!, 35% 49%, 66%, 92% for deltamethrin by direct application method. Present result was not compared may be due to different methodology.

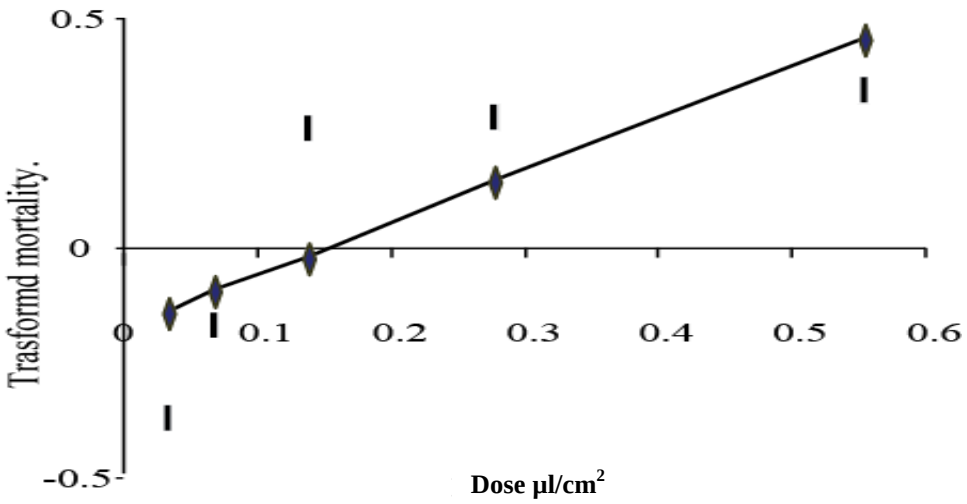


Fig.1. Probit regression of *A. calamus* toxicity against *C. anaıis* direct by direct application method with $LC_{50}$=0.15608.

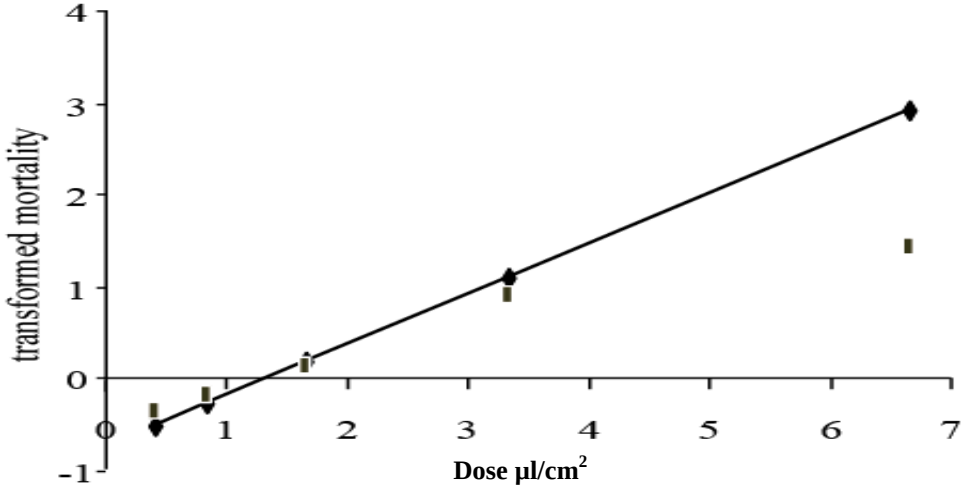


Fig.2. Probit regression of Biosal toxicity against *C. analis* by application method with $LC_{50}$=1.338504.

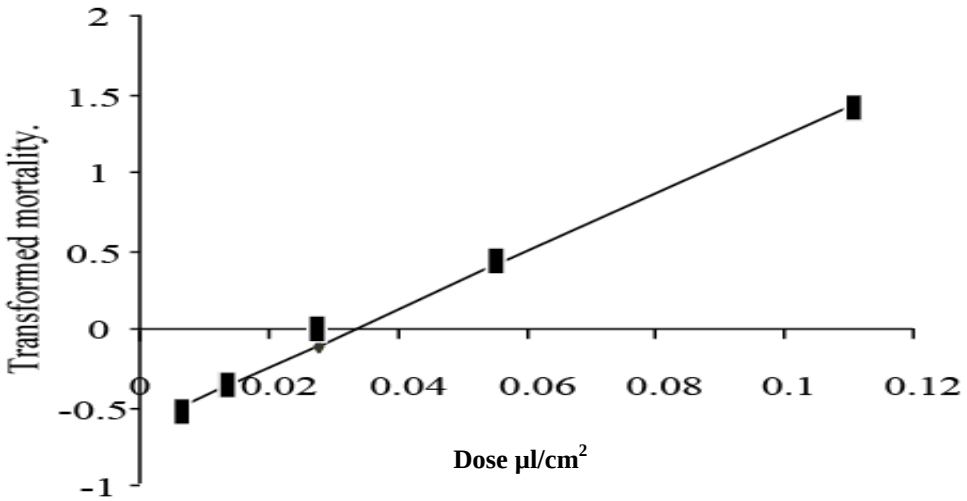


Fig.3. Probit regression of Deltamethrin toxicity against *C. analis* by direct application method with $LC_{50}$=0.03352.

Anthony *et al*. (1999) reported the effect of cyhalothrin, sevin dust and neem extract against the *Callosobruchus analis*. The $LC_{50}$ was calculated to be 0.01µg/cm 0.19µg/cm$^2$ and 250 µg/cm$^2$ for cyhalothrin, sevin, and neem extract respectively. In the present study neem formulation was used against *C. analis*. The $LC_{50}$ values was 1.3338 µl/cm$^2$ by DAM. The result was different may be due to different methods used however, the phytopesticide is less toxic as compared to conventional pesticide as in the case of present study. Swain and Baral (2004) worked on treated *Sitophilus oryzae* and *Callosobruchus chinensis* with seven plant species leaf powder, to compare efficacy as pest control agent. They reported that *Sitophilus oryzae* was reasonably controlled by begonia leaf dust. In the present study *Acorus calamus* and Neem pesticide used against *Calolosobruchus analis* mortalities were observed 35%, 43%, 60%, 61%, 63% for *A. calamus* and 35%, 42%, 55%, 81% and 92% foe Neem pesticide. In the present study support the above study that the phyopesticides were effective. Zia *et al* (2011) reported insecticidal effect of ten plant extracts against *Callosobruchus chinensis*. The plant extraction included leaves of olive (*Olea europea*), tea (*Thea chinensis*) bhang (*Canabis sativa*), elephant (*Elephanta sp*) Neem (*Azadirachta indica*), dharek (*Jacaranda mimosifolia*) and fruit of garlic (*Allium sativum*), cloves ( *Syzygium aromaticum*), black pepper (*Piper nigrum*) and red chillies (*Capsium annum*). They observed the result that black peeper was most effective treatment in controlling chickpea beetle attack followed by cloves neem and garlic. In the present study reported the insecticidal activity of neem against *C. analis*. Result shows that the phytopesticide neem effective.

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