Research Paper Agricultural Science

Effect of Insecticides on Adult Ground Nut Beetle in Storage Condition

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ABSTRACT

Ground nut seed beetle is a serious pest of ground nut in stored condition. The groundnut seed infestation by Caryedon serratus (Coleoptera) whose larva develop within the seed by consuming the reserves contained in the cotyledon, brings about great losses from 70 to 83% between 4 and 6 months of storage .The experiment on the management of the ground nut beetle was conducted in the laboratory condition. The purpose of this study was to identify the relative efficacy of five popular chemicals used in storage condition to determine their LC50 doses to the adult beetles. Relative toxicity of these insecticides followed by cypermethrin, chlorpyriphos, endosulfan, deltamethrin and mlathion.

KEYWORDS Insecticides, Relative toxicity, Ground nut beetle, cotyledon, Adult , Larvae

INTRODUCTION

Groundnut is among the oil seed productions which contribute more widely to the covering of nutritional needs (in particular, proteinic and calorific). Groundnut is rich in vitamins, minerals and oil. Its other importance is in the livestock industry, fibre production and restoration of soil fertility/erosion control (Okigbo, 1978). Out of the different types of losses from sowing to post harvest operation, the loss in stored condition is most important. More than 400 arthropod species are reported as preharvest pest and 80 species are as post harvest pest of G.nut (Redlinger and Davis 1982). Such losses reached 70% in 6 months of storage .(Ouedraogo et al., 2010) Though most of the insect pests attack kernels, Caryedon serratus is the only major pest of groundnut that infests unshelled nuts. Insect infestation in groundnut is well known for causing direct loss, but indirect loss in terms of quality of the produce also impacts its trade and use. The heat and moisture generated by a large insect population in storage also increases the risk of mould growth, which indirectly spoils the quality through mycotoxin contamination, rendering the stock unfit for human and animal consumption. It infests groundnut by making characteristic round holes on them which cause qualitative and quantitative losses. According to the results obtained, there was up to 90% damage more than 60% weight loss. (Oaya et al.,2012).However, few or no attempts have been made to measure the degree of losses caused by these insects (Caryedon serratus) either in farmers store or in a large scale commercial storage. Therefore, it is imperative to look at the damage potential and the loss caused by this insect pest (Caryedon serratus) and the control measures on stored groundnut, which is a important economic crops.

MATERIALS AND METHODS

Studies were conducted on the efficacy of some safer insecticides to control the groundnut seed beetle Caryedon serratus (Oliv.) .

The groundnut seed beetle is one of die obnoxious pest and multiplies rapidly under Orissa climatic conditions inflicting damage both in die larval and adult stages. The test insect is defined by its very broad hind femur, serrated antenna and elytra that do not completely cover the last part of die abdomen. The different insecticides taken for the experiment is listed in the table 1.

Table-1 List of insecticides used for base-line toxicity.

Sl. No.	Insecticides	Trade name	Strength of insecticides tried (%)
1	Endosulfan	Hildan 35 EC	0.0004 to 0.8
2	Malathion	Suthion 50EC	0.001 to 0.01
3	Chlorpyriphos	Tafaban 20EC	0.0005 to 0.05
4	Cypermethrin	Ralothin 25EC	0.0002 to 0.008
5	Deltamethrin	Decis 2.8EC	0.001 to 0.08

All the above insecticides used in the experiment were in emulsifiable concentrate form. The amount of insecticide required to make a given percentage of active ingredient in a spray mixture, calculated as per the formula.

$$\text{Amount of insecticide required in cc} = \frac{(n \times 10 \times X)}{Y}$$

Where n = number of cc. of water to be used by 10.

X = percentage of active ingredient wanted in spray materials.

Y = percentage of active ingredient in insecticides (commercial product)

Clean petridishes with Watt's man filter papers were directly sprayed under Potter's tower using Ice. of different concentrations of each insecticides with fluid in each spraying, which are leveled according to their concentrations. Then these were allowed to dry for 30 minutes and then 20 adult groundnut beetles were released to each petridishes for another 30 minutes. After that the treated beetles were taken out and released to another petridishes with some groundnut pods, which are leveled according to previous concentrations. Mortality percentages of beetles were calculated after 72 hours.

Median lethal dose (LD50)

Concentration that produced mortality of groundnut seed beetle (C. serratus) above zero and below 100 percent was taken into account for computation of LC50 (lethal concentration 50). Corrected percentage mortality was converted into probits. These probit values were plotted against log concentrations and provisional regression line and a dose that will give 50% mortality (LD 50) was calculated according to D.J. finney (1952).

RESULT AND DISCUSSION

Morphology of groundnut seed beetle C. serratus studied in the laboratory. The adult female lay eggs on matured groundnut pods and glude on the surface of the shell. Eggs are small, whitish and oval shaped ad 0.03cm long and breadth 0.01cm. The larvae are creamy white in colour with brownish head. The length of last instar larvae vary from 0.50 to 0.60cm and breadth 0.30-0.40cm.The pupa in light brown in colour. The length of the pupa varied from 0.40 to 0.70cm and breadth 0.30 to 0.40cm. Both the sexes of adult beetles are dirty grey in colour. The length of adults varied from 0.40 to 0.55cm. and 0.65 to 0.70cm. and breadth 0.30 to 0.40 and 0.45 to 0.50cm in case of male and female respectively. The antennae of the beetle are serrated short and 12-segmented and number of bristles present on antennal segments. (Table - 2)

Base line toxicity of some insencticide.

Some safer insecticides like malthion, endosulfan, deltamethrin, chlorpyriphos and cypermethrin which are recommended to protect the pests in store houses were evaluated and worked out their relative to toxicity. Adult Caryedon serratus were exposed to these insecticides and finally beetles were transferred to groundnut pods. Mortality count was recorded after 24, 48 and 72 hours. Mortality values were taken into computation to calculate LC 50 values.

It is observed from table-3 that LC50 values of malathion, endosulfan, deltamethrin, chlorpyriphos and cypermethrine were 0.010276, 0.004528, 0.007404, 0.001939 and 0.000419 % respectively. The relative toxicity was 1.000, 2.2694, 1.3878, 5.2966 and 24. 5252 found in malthion, endosultan, deltamethrin chlorpyriphos and cypermethrin respectively. It is clear from results that all the insecticides were more toxic than malathion. Most toxic effect was observed in cypennethrin followed by chlorpyriphos and endosultan. Lafleur (1994) tested deltamethrin and pennethrin against C. serratus and found most effective.

In the present study cypermethrin was most toxic followed by chlorpyriphos which are to be confirmed by further investigations.

Table - 2
Measurement (cm) of C. serratus at different Life Stages.

Sl. No.	Life Stages	Length (cm)	Breadth (cm)	Head Capsule (cm)	Colour
1.	Egg	0.03	0.01		Whitish glude on the surface of pod.
2.	1st instar	0.07-0.10	0.01-0.02	0.01	Creamy White
3.	2nd instar	0.10-0.20	0.04-0.10	0.05	Creamy White
4.	3rd instar	0.30-0.40	0.10-0.15	0.10	Creamy White
5.	4th instar	0.40-0.45	0.10-0.15	0.15	Creamy White
6.	5th instar	0.50-0.60	0.20-0.30	0.20	Creamy White
7.	6th instar	0.65-1.00	0.30-0.50	0.30	Creamy White
8.	Pupa	0.40-0.70	0.30-0.40	-	Dirty White
9.	Adult				
	(a) Male	0.40-0.55	0.30-0.40	0.45	Dirty Grey
	(b) Female	0.65-0.70	0.45-0.50	0.45	Dirty Grey

Table-3
Base-line toxicity (LC50) of different insecticides to adult groundnut beetles Caryedon serratus (OHv.)

Sl. No.	Insecticide	Homogeneity	Regression equation	LC50	Fiducial limit	Slope (b)	Relative toxicity
1.	Malathion	2.19045	y=3.642+0.675x	0.010276	UL=0.024654 LL=0.004266	0.675	1.0000
2.	Endosulfan	0.593	y=4.230+0.465x	0.004528	UL=0.011235 LL==0.001824	0.465	2.2694
3.	Deltamethrin	0.4980	y=3.639+0.728x	0.007404	UL=0.015505 LL==0.003535	0.728	1.3878
4.	Chlorpyriphos	9.488	y=3.899+0.855x	0.001939	UL=0.003925 LL==0.000958	0.855	5.2996
5.	Cypeimethrin	3.367	y=4.560+0.712x	0.000419	UL=0.001129 LL=0.000152	0.712	24.5250

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