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Effect of Extracts of Argemone Mexicana leaves on the Development of Corcyra Cephalonica (Stainton) for the Protection of the Stored Grains

KEYWORDS: Corcyra cephalonica, Argemone mexicana

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ABSTRACT *Extracts from leaves of Argemone mexicana were tested against 4th instar caterpillars (Larvae) of Corcyra cephalonica.100% larval mortality was observed after treatment with Methanol extract at 2 ml/kg rice while 90 % larvicidal and 10% pupicidal effect was observed after treatment with Chloroform extract at the same dose. The methanol extract can be used to control the infestation of Corcyra cephalonica in rice.*

Introduction
Insect pest infestation causes losses in quantity and quality of food commodities and changes its chemical composition, affecting the nutritive value of the produce (Howe, 1965; Swaminathan, 1977; Scott, 1991). Insect activity also leads to contamination of the produce by fecal and excretory matter.

According to the FAO study, world - wide loss in store approximates 10% of all stored grain, i.e., 13 million tons of grain lost due to insects or 100 million tons due to failure to store properly (Wolpert, 1967). The rice moth, Corcyra cephalonica (Staint.) is a notorious pest of stored cereals and cereal commodities in India as well as in other tropical and subtropical regions of the world. This moth was first identified and reported by Stainton (1866), who named it Melissoblaptes cephalonica. The only recognized species of this genus is Cephalonica. Ayyar (1919a) made the first record of Corcyra cephalonica. Its larval stages cause serious damage to rice, gram, sorghum, maize, ground nut, cotton seeds, peanuts, linseeds, raisins, nutmeg, chocolates, army biscuits, wheat, coffee, cocoa beans and milled products (Atwal, 1976; Piltz, 1977; Cox et al., 1981; Allotey and Kumar, 1985; Allotey, 1991).

The continuous use of chemical pesticides for control of stored grain pests has resulted serious problems such as hazards to the environment including human health and non-target organisms (Sighamony et al., 1986).

Hence, there is urgent need for safe but effective, biodegradable pesticides with no toxic effect on non-target organisms. This has created a world-wide interest in the development of alternative strategies, including the search for new type of insecticides, and the re-evaluation and use of age-old, traditional botanical pest control agents (Heyde et al., 1983). Botanical insecticides are broad-spectrum in pest control, and many are safe to apply, unique in action and can be easily processed and used. Locally available plant materials have been widely used in the pest to protect stored produce against damage by insect infestation (Golob and Webley, 1980). The main advantage of botanicals is that they are easily produced by farmers and small-scale industries and are potentially less expensive.

In the present study, Argemone mexicana has been selected as one of the safer substitutes to control the stored pest rice moth, Corcyra cephalonica.

Materials and Methods
The culture was maintained on Rice grains with 10-12 percent moisture content, kept in plastic jars of 10 kg capacity. Fresh leaves of Argemone mexicana were collected from the field near Aurangabad and were dried in the shade and then in the oven. The dried leaves were powdered in the grinder and powders of all plant materials were stored in the airtight polyethylene bags. The powder was packed in filter paper and extract was extracted in Soxhlet apparatus in 1:10 ratio i.e. 20 gm powder in 200 ml solvent. After eight hours of continuous extraction the final extract was kept open to evaporate the solvent and remaining as stock solution extract was stored at 4°C in a refrigerator until use. Extracts were extracted in chloroform, methanol, ethanol and acetone were stored after evaporation of solvent in refrigerator.

The leaves of Argemone mexicana extract were separately mixed with 25 gm rice grains at 0.0, 0.5, 1, 1.5 and 2ml/Kg and were placed into 250 grams capacity plastic bottles then 10 C. cephalonica larvae were placed into the plastic bottles and covered with a piece of muslin cloth and rubber band to prevent escapes. The experiment was conducted under laboratory environment as mentioned above. The percentage of larvae mortality, pupation mortality and number of adult emerged were recorded.

Observations and Results
Increased larval mortality was observed with the increase in concentration of extracts of Argemone mexicana. In Argemone mexicana leaf extract in Chloroform at 0.5 ml concentration, 20% larval mortality was recorded whereas at 2 ml concentration 90% mortality was recorded. As the concentration increased, a significant reduction in pupation and adult emergence was observed. Pupation was 80% at 0.5 ml concentration which decreased to 10% at 2 ml concentration of the A. mexicana. Correspondingly no adult emergences were recorded at 2 ml concentration of A. mexicana because pupal mortality increased insignificantly with the increase of the concentration. At 0.5 ml concentration, 10% pupal mortality which increased to 100% at 2 ml concentration of A. mexicana in chloroform extract and no adult emergence.

In methanol extract at 0.5 ml concentration, larval mortality was 10% while 100% mortality was recorded at 2 ml concentration of A. mexicana. As the concentration increased a significant reduction in pupation and adult emergence occured. Pupation was 90% at 0.5 ml concentration which decreased to 80% at 1.5 ml concentration of the A. mexicana, 10% pupal mortality was observed. At 2 ml concentration of extract 100% larval mortality was observed.

Chloroform and methanol extracts showed highest mortality of larva and pupa as compared with acetone and ethanol extracts.

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Table 1 Efficacy of leaf extracts of Argemone mexicana in Chloroform, Acetone, Methanol and Ethanol solvent against larval to adult mortality of Corcyra cephalonica.

Solvent	Extract in ml/ kg of rice	Larval Mortality (%)	Pupation (%)	Pupal Mortality (%)	Adult Emergence (%)
Chloroform	Control	0	100	0	100
	0.5	20	80	10	70
	1.0	30	70	20	50
	1.5	50	50	20	30
	2.0	90	10	10	0
Acetone	Control	0	100	0	100
	0.5	10	90	10	80
	1.0	20	80	10	70
	1.5	50	50	30	20
	2.0	70	30	20	10
Methanol	Control	0	100	0	100
	0.5	10	90	0	90
	1.0	10	90	0	90
	1.5	20	80	10	70
	2.0	100	0	0	0
Ethanol	Control	0	100	0	100
	0.5	10	90	0	90
	1.0	20	80	10	70
	1.5	20	80	10	70
	2.0	20	80	40	40

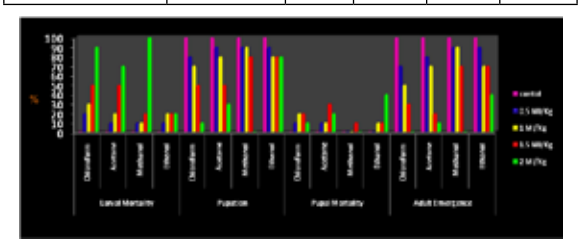

Figure 1: Efficacy of leaf extract of Argemone mexicana in Chloroform, Acetone, Methanol and Ethanol solvent against larval to adult mortality of Corcyra cephalonica.

Figure 2: Control (a) larvae, (b) Male and, (c) Female of Corcyra cephalonica.

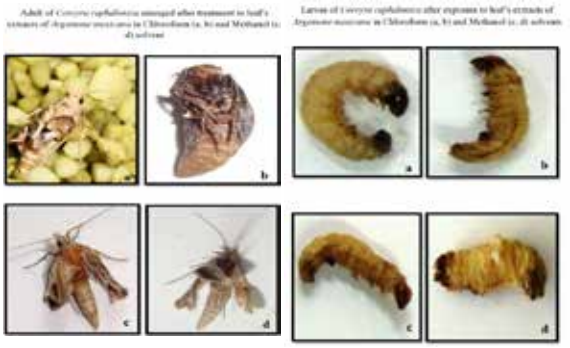

Figure 3: Larvae of C. cephalonica after treatment with leafs extracts of A. mexicana in chloroform (a, b) and methanol (c, d) solvent.

Figure 4: Adult of C. cephalonica emerged after treatment with leafs extracts of A. mexicana in chloroform (a, b) and methanol (c, d) solvent.

Discussion

The present investigation showed the effect of different dose levels of Argemone mexicana extracts in methanol and chloroform on the larval, pupal and adult stages of Corcyra cephalonica. As the concentration increased, a significant reduction in pupation and adult emergence was observed (Table 1). Body became paralyzed and black skin and black colour was observed in the leg region, shrinkage of body segments.

Though azadirachtin was found to be toxic to larval and adult stages of Cryptolestes pusillus (Schon.) yet larval stages were more susceptible than the adult stage (Rahman et al. 2005). Similarly other bioactive principles like and rographolide affect pupal and adult transformation of C. cephalonica (Jagajothi and Martin, 2010).

The toxicity of botanical extract increases significantly with the increase in its dose level on each developmental stage i.e. larva, pupa and adult (Shukla et al. 2011). Jadhav (2009) found plant extracts proved to be toxic and the effect of all was similar, i.e. the larvae became black that resulted in their death. Freshly emerged larvae were more sensitive. Percentage survival rate of the larvae decreased with increasing concentration.

The pupal and adult deformities had been observed in Bombyx mori by Koul et. al., (1987) in Aulacophora foveicollies by Gujar and Mehrotra, (1983) and in Aedes aegypti by Naqvi, (1986). Plant extracts in general appear to show insecticidal property and are increasingly being used as an alternative to the synthetic chemical insecticide.Number of workers has reported varying degree of egg hatch inhibition of different plant extracts in C. cephalonica (Kumar, 1977; Kumar and Jain, 2004).

In the investigation it may be concluded that extract of leaves of Argemone mexicana in methanol can be used to control the infestation of Corcyra cephalonica in rice.

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