CONTEMPORARY RESEARCH IN INDIA
ISSN 2231 - 2137

EFFECT OF NEEM ON BIOLOGY OF RICE MOTH *C. cephalonica*

A. S. Bagde[1]* and Mane S. S.

[1]Department of Entomology, College of Agriculture, Kolhapur

*[*2]M.Sc. Student, Department of Entomology, College of Agriculture, Kolhapur*

Received: 24/08/2017 | **Edited: 01/09/2017** | **Accepted: 07/09/2017**

Abstract: *The effect of neem leaf powder was observed on third instar larvae of rice moth C. cephalonica(st.) This neemleaf powder caused a depressive effect on the development stages of this moth. A dose level of 3.5% of this leaf powder caused 100 per cent mortality, which may be considered as extremely toxic to the pest*

Key Words: *Botanicals, Neem, Toxicity, Rice moth, Ontogeny.*

Introduction:

According to an 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 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). 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, coco beans and milled products (Atwal, 1976; Piltz, 1977; Cox et al., 1981; Allotey and Kumar, 1985; Allotey, 1991).

The use of organophosphorus and organochlorine insecticides poses problems such as poisoning in man and other animals (Pichaet & Philogene 1993), pest resistance to pesticides (Chand & Birthal 1977), and the risk of contamination causing injury to non-target organisms and pollution to our own environment, thus disturbing the ecosystem. Hence, there is an urgent need to develop safe alternatives to conventional insecticides for the protection of grain and grain products against insect infestations. Higher plants are a rich source of novel natural substances that can be used to develop environmentally safe methods for insect control (Jbilou*et al.*, 2006).

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 plants 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, *Azadirachta indica* has been selected as one of the safer substitutes to control the stored cereal pest rice-moth, *C. cephalonica.* Hence, as an objective of such present work, has been designed and conducted to investigate the effect of neem leaf powder against the ontogeny of rice-moth.

Materials and Methods:

Neem leaves were collected from farm of college of Agriculture, Kolhapur. The neem leave were separated from the branches, properly washed with fresh tap water and then air dried at room temperature for 5 to 7 days. The dried leaves were grinded to fine powder in mixer and kept in air tight containers for further use.

From the laboratory maintained culture on ground jowar mixed with 5 % yeast powder, the newly emerged males and females were transferred to oviposition chambers. Eggs laid by the females were

collected and then placed for hatching. Freshly hatched larvae of *C. cephalonica* were allowed to feed on a normal diet. On the 16th day of after larval hatching 1st and 3rd instar larvae were transferred to each similar rearing chambers (500 ml beakers) containing 500 gm. of dietary. Medium mixed and treated separately with 6 different dose levels *i.e.* 1.00, 1.50, 2.00, 2.50, 3.00 and 3.50 % of above all botanicals leaf powder, using 3 replications of each treated as well as control group. Control culture was maintained without any leaf powder treatment under identical condition. On the completion of the life cycle, number of adults emerged and dead pupae were recorded to calculate percent pupation and percent larval mortality.

The effect of botanicals on biology of rice moth was analyzed using one way ANOVA. Significant differences between the treatments were determined using Tukey's multiple range tests ($p \leq 0.05$).

Straight line regression equation was applied between different dose levels of botanicals and percent larval death/per-cent pupation per-cent pupal death and percent adult emergence to observe the significant correlation.

The mortality data of each treatment were considered and subjected to probit analysis (Finney, 1971) after computation of corrected mortality for respective treatment concentrations taking into account the mortality recorded in control using Abbott's formula (Abbott, 1925) and verified using a software programme Indostat software available with the Department of Statistics, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri to know the LD_{50} values.

Result and Discussion

Effect of Neem on biology of rice moth, *Corcyra cephalonica* (St.) under laboratory condition

The data on effect of neem on biology of rice moth, *C. cephalonica* are presented in the Table 1. It is revealed that the per cent larval mortality rate significantly increased with the increase in the neem leaf powder concentration or dose level. The toxicity of neem leaf powder increases significantly with the increase in its concentration on each developmental stage *i.e.* larva, pupa and adult, being maximum with 3.5 % neem leaf powder concentration *i.e.* highest larval mortality, followed by 3, 2.5, 1.5 and 1 percent, respectively. Per cent larval mortality of *C. cephalonica* treated with all treatments was significantly more as compared to untreated control. All the neem leaf powder *were* found to be significantly superior over untreated control.

The highest per cent larval mortality was recorded in treatment with neem leaf powder @ 3.5 % (100 per cent) which was followed by neem leaf powder @ 3 % (93.33 per cent). The next best treatments in order of their toxicity were neem leaf powder @ 2.5 % (86.66 per cent), neem leaf powder @ 2 % (69.99 per cent), neem leaf powder @ 1.5 % (56.66 per cent) and neem leaf powder @ 1 % (43.33 per cent). There was no larval mortality observed in untreated control.

The some larva goes in pupation. There was no pupation observed in neem leaf powder @ 3.5 % and it was the to few extent in the treatment neem leaf powder @ 3 % (6.66 per cent) The next treatment in pupation were neem leaf powder @ 2.5% (13.33 per cent), neem leaf powder @ 2 % (29.99 per cent), neem leaf powder @ 1.5 % (43.66 per cent) and neem leaf powder @ 1 % (56.66 per cent). There was 100 per cent pupation observed in untreated control.

Pupal mortality also increased significantly with increase in neem leaf powder concentration. The next treatment in pupation were neem leaf powder @ 2.5 % (6.66 per cent) neem leaf powder @ 2 % (23.33 per cent) neem leaf powder @ 1.5 % (23.32 per cent) and neem leaf powder @ 1 % (6.66 per cent)

Rice moth, *C. cephalonica* emergence was observed with decreased neem leaf powder concentration. There was no emergence observed in neem leaf powder @ 3.5 %. and @ 3 %. The next treatments in emergence were neem leaf powder @ 2.5 % (6.66 per cent), neem leaf powder @ 2 % (6.66 per cent), neem leaf powder @ 1.5 % (19.99 per cent) and neem leaf powder @ 1 % (49.99 per cent).

Table 1: Effect of Neem (*Azadirachtaindica*) on biology of rice moth under laboratory condition

Sr. No.	Treatment No.	Treatments	Larval death	Pupation	Pupation death	Emergence
1	T_1	Neem leaf powder@ 3.5%	100.00 *(90.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
2	T_2	Neem leaf powder@ 3%	93.33 (75.36)	6.66 (15.00)	6.66 (15.00)	0.00 (0.00)
3	T_3	Neem leaf powder@ 2.5%	86.66 (68.60)	13.33 (21.41)	6.66 (14.96)	6.66 (15.29)
4	T_4	Neem leaf powder@ 2%	69.99 (56.79)	29.99 (33.21)	23.33 (28.88)	6.66 (15.00)
5	T_5	Neem leaf powder@ 1.5%	56.66 (48.83)	43.66 (41.55)	23.32 (28.90)	19.99 (26.53)
6	T_6	Neem leaf powder@ 1%	43.33 (41.16)	56.66 (48.83)	6.66 (15.00)	49.99 (45.00)
		SE±	1.14	O.43	O.16	O.16
		C.D.@5%	3.53	1.34	O.51	0.50

*Figures in parenthesis are arcsine transformed.

Thus, overall results on effect of botanicals on biology of rice moth, *C. cephalonica* indicated that treatment with neem leaf powder @ 3.5 % (100 per cent) mortality was found to be superior as compared to other treatments. However, treatment with neem leaf powder @ 3 % was found to be next effective treatment in order of toxicity effect.

Hence, the results of present study corroborate the finding of Pathak and Tiwari (2010). The observations revealed that 3.50 % dose level of neem leaf caused 100 % larval mortality indicating absolute toxicity to the pest. The data revealed that mortality rate increases with the increase in dose level of neem leaf powder. On the basis of percent larval death, pupation, pupal death and adult emergence, at different dose levels of neem leaf powder, it is possible to categories the relative effectiveness of their dose levels (Fitzpatrick and Dowell, 1981)

Toxicity of botanicals leaf powder against the ontogeny of *C. cephalonica* (St.)

The data on effect of Neem on biology of rice moth, *C. cephalonica* are presented in the Table 2. In this table Straight line regression equation was applied between different concentrations of neem leaf powder and their corresponding percent larval death, percent pupation, percent pupal death, percent emergence to observe the significant correlation.

Result presented in Table 2 revealed that a significant larval mortality was obtained with the increase of neem leaf powder concentration. The 1% dose level of neem leaf powder larval mortality was only 43.33 % while 100 % mortality was recorded at 3.50 % dose level of neem leaf powder. As the neem leaf concentration increases, a significant reduction in pupation and adult emergence did occur. Pupation was 56.66 % at 1% dose level which decreased to 6.66 % at 3.00 % dose level of the neem leaf. Similarly, 50 % adult emergences was recorded at 1 % dose level which decreased to 6.66 % at 2.50 % dose level of neem leaf powder. Percent larval death ($y = 22.27 + 23.43x$; $r = 0.99$, $P < 0.001$), pupation ($y = 77.88 + -23.48x$; $r = 0.98$; $P < 0.001$), pupal death ($y = 23.95 + -5.71x$; $r = 0.54$ $P < 0.001$) and emergence ($y = 53.73 + -17.70x$; $r = 0.86$; $P < 0.001$)

Table 2: Toxicity of Neem (Azadirachta *indica*) leaf powder against the ontogeny of *Corcyra cephalonica* (Staint.)

Neem leaf powder dose (%)	Total no. of larvae	Larval death (%)	Pupation (%)	Pupation death (%)	Emergence (%)
Control	30	0	100	0	100
3.5	30	100 .00	0.00	0.00	0.00

3	30	93.33 ± 4.70	6.66	6.66	0.00
2.5	30	86.66 ± 1.17	13.33± 0.24	6.66 ±0.47	6.66 ± 0.47
2	30	69.99 ± 2.35	29.99± 0.24	23.33±0.47	6.66
1.5	30	56.66 ± 1.18	43.66± 4.00	23.32 ±0.70	19.99 ± 23
1	30	43.33 ± 4.70	56.66± 0.47	6.66	49.99 ± 47
	Regression Equation	y=22.27+ 23.43x	y=77.88+ -23.48x	Y= 23.95+ - 5.71X	y= 53.73+ 17.70x

Note - Values have been expressed as the mean SD ± of three replicates. Straight line regression equation was applied between different concentrations of neem leaf powder.

Thus, overall results on effect of botanicals on biology of rice moth, *C. cephalonica* indicated that treatment with neem leaf powder @ 3.5 % (100 per cent) mortality was found to be superior as compared to other treatments

Hence, the data revealed that different dose levels of neem leaf exerted a depressive effect on the life cycle stages of *C. cephalonica.* It also deserves mention that 3.50 % dose level of neem leaf powder caused 100 % larval mortality and hence, this dose level may be used for the effective control of *C. cephalonica* in stored product.

Toxicity of Neem to rice moth, *C. cephalonica* under laboratory condition

The result from the data given in Table No 3 and graphically depicted in Fig. 3 The neem tested their toxicity in laboratory condition against Rice moth, *C. cephalonica*. The chi square (X^2) test was found significant; therefore, the used neem leaf powder doses were homogenous. The Fiducial limit of neem leaf concentration was in the range of 1.0105 -1.5675 whereas, the LD50 value for rice moth, *C. cephalonica* 1.2890. The slope of concentration probit (LCP) line (b) was 0.14.

Table 3: Toxicity of Neem to rice moth, Corcyra cephalonica (Staint.) under laboratory condition

Sr. No.	Botanicals	LD_{50} (Fiducial limit)	Slope ± SE (b)	Hetero-Genity (X^2)	Regression Equation
1	Neem	1.2890 (1.0105 -1.5675)	0.14	0.8983	Y= 3.7793x + 4.6380

References

Abbott, W. S. 1925 .A method of computing effectiveness of an insecticide. J. of .Economic Entomol, 18:265-267

Allotey, J. 1991. Development and fecundity of therice-moth, *C.cephalonica Discovery innovation,* 3: 123 - 126.

Allotey, J. and Kumar, F. 1985. Competition between*C. cephalonica*and *Ephestiacautella*(Walker) in Cocoa beans. *Insect Science and Its application,* 6 : 627- 632.

Atwal, A.S. 1976. Agriculture pests of India and South East Asia, Kalyani Publishers, Delhi, 502.

Ayyar, T. V. R. 1919a. Report of proceeding of the third Entomological Meeting, Pusa (India).323.

ChandR and Birthal SP 1997.Pesticideuse in Indian agriculture in relation to growth in area of production and technological change. Indian J. of Agril Economics 52(3): 488-498

Cox, P. D., Crawford, L. A., Gjesturd, G., Bell, C. H. and Bowley, C. R. 1981. The influence Of temperature andhumidity on the life cycle of *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). *Bulletin of Entomological Research,* 71: 171 - 181.

Finney D.J. 1971 .Statistical methods in biological Assay 2nd Edn. London: Griffin 668p.

Golob, P. and Webley, D. J. 1980. The use of plants and minerals as traditional protectants of stored products. Tropical products institute, London, 32.

JbilouR, Ennabili A. and Sayaha F .2006. Insecticidal activity of four medicinal plant extracts against *Triboliumcastaneum* (Herbst) (Coleoptera: Tenebrionidae).African J. of Biotechnol 5(10): 936-940.

Pathak C.S., Tiwari S.K. 2010 Toxicological effects of neemAzadirachtaindicaA.Juss leaf powder against the ontogeny of *C.cephalonica* (Lepidoptera – Pyralide) J. of Biopesticide 3 (3):617-621.

PichaetW and PhilogeneJRB 1993. A natural path to pesticides. IDRC Reports (Canadian Collaboration for development). 21(2).

Wolpert, V. 1967. Needless losses. FarEastern. Economical. Review .55:411-412.