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Biology and control of rice moth, *Corcyra cephalonica* (Lepidoptera: Pyralidae) by using botanical

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Abstract
Corcyra cephalonica is a secondary pest of stored grains like wheat, maize, and rice. The biological studies revealed that the life cycle of rice moth passed through four different stages i.e. egg, larva, pupa and adult. The egg duration ranged from 3-5 days. The larva passed through six instars and the average duration (days) of each instar was found to be 4.88±0.7, 4.48±0.7, 3.96±0.7, 3.70±0.6, 3.76±0.8 and 10.04±0.7 days respectively. The longevity of females was higher at 4.24±0.9 days than the males 3.52±1.0 days. The average pupal period was 11.34 days. Powdered leaves of *Ocimum tenuiflorum* (Lamiaceae) were tested for their efficacy against the stored grain insect pest *C. cephalonica*. At the higher measurements of 2.5 and 3.5 g of *Ocimum tenuiflorum* it shows 100% mortality of second instar larvae of rice moth.

Keywords: Biology and control, *Corcyra cephalonica*, botanical

Introduction
The rice moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) is one of the destructive insect pests found in stored grains, mainly cereals, including rice, and jowar. It is widely distributed in India and many other parts of the world (Osman, 1984) [13]. Since the pest predominantly attacks rice grains, it is commonly known as the rice moth. The pest in India is known to cause 5-10% of loss in stored grains (Champ & Dyte, 1977, Tooba *et. al*., 2005) [5, 21]. The annual loss of food grains in Indian godowns due to insect infestation had been recorded about five million tons of grains (Neelakanthan, 1972) [12]. The larvae damage stored grains by feeding under silken webs (Alam, 1972) [2]. At the point when infestations are high, the whole load of grains might be changed over into a webbed mass, building up a trademark awful stench and delivering the grains are unsuitable for human consumption (Alam, 1965) [1]. The rice moth is known for attacking rice, wheat, corn, sorghum, groundnut, cotton seeds, coffee, spices, cocoa beans, maize, and millets. In tropical, Asia, Africa, North America and Europe (Allotey & Kumar, 1985) [3].
Like many other lepidopterous insects, the rice moth also passes through four different stages (egg, larva, pupa, and adult) in its life cycle. The larval stage of *C. cephalonica* causes serious damage to grains by feeding, leaving dense and tough silk threads in grains (Ayyar, 1934; Prevett, 1964) [4, 14]. The damage is mainly caused by the larvae which feed on grains under silken webs and convert them to mere frass making them unfit for human consumption (Frenemore & Prakash, 1992) [7]. The use of insecticides against storage pests has not been proved effective as the chemicals are unsafe to humans and are known to cause various types of environmental and health hazards (Tillman & Mulrooney, 2000) [20]. In recent years, the use of synthetic pesticides for pest management has become highly controversial. These insecticides are known to cause environmental hazards, the pesticides are well known for accumulating at different levels of the ecosystem, and causing pesticide resistance in insects. The insects exposed to insecticides, for long-duration not only develop resistance against the specific insecticides but also generate cross-resistance against a group of insecticides. To beat these problems, attempts were made to find alternate methods of insect pest control like cultural method, biological control, use of antifeedant and plant extracts, etc (Rathore, 1978; Kalyanasundaram and Das, 1985; Sahayaraj and Paulraj, 2001;) [15, 9, 17]. Many plants possess chemical substances with remarkable biological activities that provide protection and resistance against pests and herbivores (Dwivedi and Garg, 2003) [6]. So, the present investigation was conducted to study the Biology and control of the rice moth, *Corcyra*.

Materials and methods

Mass-rearing of rice moth *Corcyra cephalonica*

The stock culture, of rice moth was maintained on broken maize and yeast at 30 ºC and 60% R. H during the period of studies in the Entomology laboratory Lovely Professional University. From the stock culture, male and female moths of *Corcyra cephalonica* were differentiated and kept in separate containers for further studies.

Adult longevity, Incubation period and fecundity

The total fecundity of female moths was recorded during the oviposition period. The duration of adult life was recorded from the day of the emergence of adults till death. Five percent of the honey solution was provided to adults as food. Ten moths of each gender were observed for recording their longevity and the average longevity of each gender was calculated.

The Incubation period was counted as the number of days between the laying of egg till their hatching. For finding out the incubation period Ten Petri-dishes, each containing 50 eggs of rice moth were observed and the average incubation period was calculated.

Duration of larval instars and pupal period

The newly emerged larvae were transferred into jars for studying the larval instars and their duration. The larval duration was recorded in days from the hatching of eggs till the formation of pupae. To find out the duration of different larval instars, observations were made on the casting of exuviae daily and thus, the duration of different larval instars and total larval periods were recorded.

The time duration between pupae formation and the emergence of moths was considered as the pupal period. For observing the pupal period, the last instar larvae were removed and placed in twenty-five containers having ten pupae in each and average pupal periods were also calculated.

Efficacy of the botanical leaf powder on *Corcyra Cephalonia*

Preparation of leaf powder Fresh leaves of *Ocimum tenuiflorum was* collected from the university garden and nearby locality. They were washed with distilled water, shade- dried and ground to a fine powder using a mixer. These mixers are kept in airtight containers. Different concentrations ranging from 0.5 g to 3.5g (0.5, 1.5, 2.5 and 3.5 g) per 30 g maize grains (broken) were selected for assessing the insecticidal effects of one botanical against rice moth (Harminder *et al*., 2019) [8].

Experimental design for Mortality Percentage (Insecticidal property) Five sets were set up simultaneously with four concentrations of each plant leaf powder (0.5, 1.5, 2.5 and 3.5 g) and control in small 250 ml plastic vials. Each vial was also containing 30 g of fresh broken rice with a few yeast granules. All six stages of 10 larvae were separated from stock cultures and transferred to pre-treated vials. Control cultures without any leaf powder treatment were also maintained along with the same experimental conditions. These vials were checked at regular intervals of 24 hours to see the toxic effect of these plant powders. The number of dead larvae was removed after noting. This was continued till all the 10 larvae were dead in each experimental set. The mortality percentage was calculated using the below formula.

$$\text{Mortality (\%)} = \frac{\text{Number of larvae of dead}}{\text{Total no. of larvae}} \times 10$$

Results and discussion

Biology of *Corcyra cephalonica*

Adult Longevity, Incubation period and fecundity

The female lived slightly longer than males (Table 1). The results revealed that the longevity of males ranged from 1 to 5 days and on average of it survived for 3.52 days. The female longevity ranged from 3 to 6 days with an average of 4.24 days. The adult moths were comparatively small, uniformly dark grey in colour with a few dark lines of hairs. The females were larger than the male. The incubation period of eggs ranged from 3 to 5 days with an average of 4.12 days under laboratory conditions (Table 1). A single female of *C. cephalonica* laid eggs ranging from 64 to 182 eggs with an average of 122.08 eggs per female during her lifetime. The freshly laid eggs were elliptical in shape and white in colour. Just before hatching colour of the eggs changed to black.

Table 1: Adult longevity, Egg duration and fecundity per female of *C. cephalonica*

Duration	Range (days)	Mean ±SD (days)
Incubation period	3-5	4.12±0.66
Fecundity (No. of eggs)	64-182	122.08±37.2
Adult longevity(days)		
Male	1-5	3.52±1.0
Female	3-6	4.24±0.9

Duration of larval instars, total pupal period

It was revealed that larval stages of *C. cephalonica* passed through six instars, before transforming into the pupal stage. Newly hatched larvae were light creamish white in colour. The first larval instar took 4 to 6 days to become the second instar on Maize. The second instar larva was dirty white in colour and having deep yellowish-brown coloured the head capsule. The second instar larvae moulted to third instar in 4 to 6 days with an average of 4.48 days. Similarly, the duration of third instar larvae range from 3 to 5 days with an average of 3.96 days. The third instar was having a head capsule which dark brown in colour. The fourth instar larva was dirty white having a dark borderline. The Mandibles were darker and the eyes conspicuously dark. In this stage, larva was less active and seeks hiding places more eagerly when exposed to light. The fifth instar larva, the setae were brownish in colour, mandibles and head capsules were darker in colour than the previous stage. The sixth instar larva was dirty white in colour, cylindrical in shape, slightly tapered towards ends and reddish-brown head capsule with dark distinct mandibles. Fourth, fifth and sixth instar larvae took 3 to 5 days, 3 to 6 days and 9-11 days with an average of 3.76 and 10.04 days, respectively. The total larval period ranged from 27-35 days with an average of 31.04 days. The pupal period of *C. cephalonica* ranged between 9 to 14 days with an overall average of 11. 12 days. The results revealed that the rice moth completed its life cycle in 48.6 days. Similarly, Teotia & Singh, (1975) [19] reported 44.97 days on maize at 26.5ºC and 73 percent humidity. Ray, (1994) [16] also worked on rice moth biology using maize. The result revealed that 50.03 days were required by rice moth to complete its life cycle on maize.

Table 2: Duration of different larval instars, Total larval and pupal period of *C. cephalonica*

Stages	Range (days)	Mean ±SD (days)
Larval instars		
I	4-6	4.88±0.7
II	4-6	4.48±0.7
III	3-5	3.96±0.7
IV	3-5	3.70±0.6
V	3-6	3.76±0.8
VI	9-11	10.04±0.4
Total larval period	26-35	31.04±2.4
Pupal period	9-14	11.12±1.6

Effect of *Ocimum tenuiflorum* leaf powder on different larval stages of *C. cephalonica*

The impact *Ocimum tenuiflorum* leaf powder was concentrated on *C. cephalonica* larval mortality. In the first instar of rice moth, 68 and 82% mortality was recorded at 0.5 and 1.5 g, while 100% mortality was recorded at 1.5 and 2.5 g separately. In the second instar, mortality was 67 and 73% at 0.5 and 1.5 g, though 100% mortality was recorded at 2.0 g. In the third instar, mortality was 44 and 56% at 0.5 and 1.5 g, though 87 and 90% mortality was recorded at 1.5 and 2.5 g respectively. In fourth instar, mortality was 35 and 49% at 1.5 and 2.5 g respectively. In fifth and sixth instar no mortality was recorded at 0.5 and 1.5 g. But at 2.5 g leaf powder mortality was recorded as 25 and 20% respectively. While at 3.5 g leaf powder mortality was recorded as 22 and 18 % respectively (Table 3).

Table 3: Toxic effect of *Ocimum tenuiflorum* leaf powder against larvae of *Corcyra cephalonica*

Percentage of larvae mortality in different doses					
Instar	**0.5 g**	**1.5 g**	**2.5 g**	**3.0 g**	**Control**
1th	68	82	100	100	0
2nd	67	73	91	100	0
3rd	44	56	87	90	0
4th	35	49	39	68	0
5th	0	0	25	20	0
6th	0	0	22	18	0

Khani *et al*., (2012) [11] reported that *Piper nigrum* and *Jatropha curcas* extricates a decreased population of rice moth. Khan and Qamar (2015) [10] detailed that *Argemone mexicana*, and *Parthenium hysterophorus* decreased feeding or act as an antifeedant. Hence to control this store grain pests substitute technique, for example, utilization of botanicals as antifeedants and larvicidal. The persistent utilization of chemical insecticides for control of stored grain insects has come about difficult problems such as dangers to the environment including non-target organisms and human wellbeing (Sighamony *et al*., 1986) [18].

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References

1. Alam MZ. Insect Pests of Rice in East Pakistan and Their Control (Revised). Agriculture Information Service, Deptt of Agril., R.K. Mission Road, Dacca-3. 1965, 62 pp
2. Alam MZ. Pests of stored grains and other stored products and their control. Agricultural Information Service, 1972.
3. Allotey J, Kumar R. Competition between *Corcyra cephalonica* (Stainton) and *Ephestia cautella* (Walker) in cocoa beans. International Journal of Tropical Insect Science. 1985;6(5):627-632.
4. Ayyar PK. A very destructive pest of stored products in South India, *Corcyra cephalonica*, Staint. (Lep.). Bulletin of Entomological Research. 1934;*25*(2):155-169.
5. Champ BR, Dyte CE. FAO global survey of pesticide susceptibility of stored grain pests. *Bulletin Phytosanitaire de la FAO (FAO)-Boletin Fitosanitario de la* FAO. 1977;22(2):49-67.
6. Dwivedi SC, Garg S. Toxicology laboratory of flower extract of *Lantana camara* on the life cycle of *Corcyra cephalonica*. Indian Journal of Entomology (India). 2003;65(3):330-334.
7. Frenmore PG, Prakash A. Applied Entomology, 1st edition. Wiley Eastern Ltd., New Delhi, India Kambham Venkateswarlu, N. Devanna; Pharmacological Evaluations (Analgesic Activity) of 'Piper beetle'. International Journal of Pharmamedix India. 1992;2(2):688-93.
8. Harminder S, Anita S, Brar JS. Efficacy of Azadirachta indica and Eucalyptus globules against *Corcyra cephalonica*. Int. J Adv. Res. Biol. Sci. 2019;6(7):119-123.
9. Kalyanasundaram M, Das PK. Larvicidal and synergistic activity of plant extracts for mosquito control. Indian J Med Res. 1985;82(1):19-23.
10. Khan I, Qamar A. Evaluation of antifeedant and larvicidal activity of some commercial biopesticides and plant extracts on Rice Moth, *Corcyra cephalonica* (stainton). Euro. J. Exp. Bio. 2015;5(5):61-68.
11. Khani M, Muhamad Awang R, Omarand D, Rahmani M. Bioactivity Effect of Piper *Nigrum L*. and *Jatropha curcas* L. Extracts against *Corcyra cephalonica*, 2012, 1-6.
12. Neelakanta J. Post-harvest technology of foodcrops-problems and perspective. *Explos Hunger*. In: Proceedings of symposium held at New Delhi, (Eds.). 1972, 102p.
13. Osman N. Assessment of damage by the rice moth *Corcyra cephalonica* (St.) on different grains at four levels of moisture content. In Proc. 7th ASEAN Tech. Seminar on Grain Post Harvest Technol, 1984, 55-61p.
14. Prevett PF. The distribution of insects in stacks of bagged groundnuts in Northern Nigeria. Bulletin of Entomological Research. 1964;54(4):689-713.
15. Rathore HS. Preliminary observations on the mosquito repellent efficacy of the leaf extract of Ocimum sanctum. Pakistan journal of zoology. 1978;10:303.

16. Ray R. Life table and intrinsic rate of increase of *Corcyra cephalonica* Stainton on maize. Environment and Ecology. 1994;12:202-202.
17. Sahayaraj K, Paulraj MG. Efficacy of chosen plants against gram pod borer *Helicoverpa armigera* Hubner (Lepidoptera: Noctuidae). Journal of Advanced Zoology. 2001;22(1):8-14.
18. Sighamony S, Anees I, Chandrakala T, Osmani Z. Efficacy of certain indigenous plant products as grain protectants against *Sitophilus oryzae* (L.) and *Rhyzopertha dominica* (F.). Journal of Stored Products Research. 1986;22(1):21-23.
19. Teotia TPS, Singh Y. Studies on growth of populations of *Corcyra cephalonica* Stainton. Indian J Ent. 1975;37:277-285.
20. Tillman PG, Mulrooney JE. Effect of selected insecticides on the natural enemies *Coleomegilla maculata* and *Hippodamia convergens* (Coleoptera: Coccinellidae), *Geocoris punctipes* (Hemiptera: Lygaeidae), and *Bracon mellitor*, Cardiochiles nigriceps, and *Cotesia marginiventri*s (Hymenoptera: Braconidae) in cotton. Journal of Economic Entomology. 2000;93(6):1638-1643.
21. Tooba H, Usmani NF, Abbas T. Screening of plant leaves as grain protectants against *Tribolium castaneum* during storage. Pakistan Journal of Botany, 2005;37(1):149-153.