Indian Journal of Applied Entomology **26**(1) : 63–67 (2012)

EFFECT OF NEEM LEAF, JATROPHA SEED POWDERS AND COW URINE ON THE GROWTH AND DEVELOPMENT OF RICE MOTH, *CORCYRA CEPHALONICA* (ST.) IN STORED WHEAT

MONIKA AWASTHI AND RUCHIRA TIWARI*

* Department of Entomology, GB Pant University of Agriculture and Technology, Pantnagar, 263145, (U.S. Nagar, Uttarakhand)

ABSTRACT

The effect of neem leaf and jatropha seed powder alone and their extracts prepared in cow urine (with concentration 5% and 10%) was studied on the growth and development of rice moth, *Corcyra cephalonica* (St.) on stored wheat. All the treatments were effective against the tested larval stages of *C. cephalonica*. The neonate larvae were more sensitive. The survival rate (%) of the larvae decreased with increasing concentration. Neem alone and neem with cow urine treated cereal grains (5% and 10%) were most effective as 100 per cent mortality of larvae occurred at early stages without feeding on the treated grains. The survival of larvae, pupae and their weight were significantly less with extended larval as well as pupal developmental period and growth index.

Key words: *Corcyra cephalonica,* cow urine, growth and development, jatropha, neem, wheat

INTRODUCTION

Among the various stored grain insect–pests, rice moth, *Corcyra dephalonica* (Stainton) (Lepidoptera: Pyralidae) is cosmopolitan in distribution and causes damage to variety of stored commodities. Apart from rice, it feeds on maize, wheat, groundnut and sorghum being responsible for considerable damage in godowns and ware-houses (Atwal and Dhaliwal, 1997).

Considering the hazardous effects of chemicals used for control of stored insect pests, it becomes necessary to evaluate plant materials such as neem, jatropha, onion, and others against *C. cephalonica* as grain protectants (Sharma and Bhargava, 2001, Bhargava *et al.*, 2005 and Sandhya, 2009). Cow urine alone and neem leaves and jatropha seed extracts in cow urine were evaluated for controlling this pest in stored wheat. An experiment was thus undertaken to assess the effect of neem leaf and jatropha seed powders alone and their cow urine extracts on the growth and development of different stages of *C. cephalonica* in stored wheat.

MATERIALS AND METHODS

The experiment was conducted in the Department of Entomology, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar. The culture of *C. cephalonica* was maintained on sorghum, the most preferred host of the pest in the laboratory at 28 ± 2°C temperature and 75 ± 5 per cent relative humidity. Freshly emerged adults were collected from stock culture and were caged together in an inverted glass covered with mosquito net for mating. Eggs laid were kept in a glass beaker to obtain neonate larvae for conducting the experiments.

The experiment was conducted on susceptible wheat variety (PBW550) under laboratory conditions. Neem leaves (*Azardiracta indica* L.) and seeds of Jatropha (*Jatropha curcas* L.) were collected from the University campus and nearby areas of Pantnagar; whereas, cow urine was collected from desi breed cow. Treatments were cow urine (5% and 10%), neem leaf powder extract in cow urine (5% and 10%), jatropha seed powder extract in cow urine (5% and 10%), neem leaf powder and jatropha seed powder (5 gm and 10 gm/ 100 g of grains, respectively along with control (untreated) grains.

Bioassay: The required quantity of powders of neem leaf and jatropha seed alone and their extracts in cow urine was mixed with 500 g sterilized and conditioned grain of wheat, rice and sorghum separately. The grain was taken in polythene bags and treated with a thin coating of powders and cow urine plant extracts. The treated grains were considered as a grain lot for taking out requisite amount of grains for further studies. The treated grains were stored in glass containers having lids. An aliquot of 10 g grain for each treatment was drawn and kept in glass vials (10 × 2.5 cm), replicated thrice. Twenty newly hatched larvae were introduced in each replicate and allowed to

develop till adult emergence. Assessment of efficacy of plant extracts was based on the larval period, larval survival, larval weight, pupal survival, pupal period, pupal weight and adult emergence as compared to these parameters in control. Per cent larval and pupal survival was calculated on the basis of number of larvae pupated from the inoculated larvae and number of larvae emerged from pupated larvae. Growth index of *C. cephalonica* was calculated separately on all treated commodities by using the following formula:

$$\text{Growth index} = \frac{\text{Adult emergence (\%)}}{\text{Total developmental period (days)}}$$

The per cent grain damage was calculated by taking at random 50 grains in triplicate from the different treated commodities after adult emergence of *C. cephalonica* and was compared with the grain damage in control. Quality deterioration was also checked by observing the per cent webbing caused by the larvae of *C. cephalonica* in the treated commodities.

Effect of bioproducts on 5th instar larvae: Ten, 5th instar larvae of approximately similar size, weight and physiological state of *C. cephalonica* were starved for 24 hours and then weighed and introduced to 10 cm diameter petri dishes containing 20 g of treated food grains (5% and 10%, separately) for each commodity in triplicate. The petri dishes were tightly closed with rubber bands. After 72 hours of feeding on the treated grains on the different commodities the weight of the larvae was taken after again starved them for 24 hours so as to devoid their guts of residual faecal material and their weight were taken to determine the weight gain till pupation. The weight gained was calculated by subtracting the weight of introduced larvae before feeding from the weight of larvae after feeding till pupation. Data were subjected to Complete Randomized Design (CRD) after suitable transformations using programme STPR2.

RESULTS AND DISCUSSION

The different parameters of growth and development of neonate larvae of *C. cephalonica* on treated wheat grains were presented in Table 1. The per cent larval survival of neonate larvae on treated wheat grains ranged from 6.67 to 33.33 per cent with 80.0 per cent larval survival in untreated control. The neonate larvae couldn't survive in NLP (5% and 10%), NLCUE (5% and 10%). The average larval weight on treated wheat grains was observed in JSP 5% (22.38 mg) followed by JSCUE 5% (21.36 mg), JSP 10% (20.52 mg) and JSCUE 10% (20.12 mg) with the least average larval weight in CU 10% (12.00 mg) and CU 5% (14.00 mg) in comparison to untreated wheat grains (32.12 mg). The average larval period was recorded significantly more on treated wheat grains being highest in JSCUE 10% (50.67 days) followed by JSP 10% and JSCUE 5% (50.33 days), JSP 5% (49.00 days), CU 5% (48.33 days and CU 10% (48.00 days) in comparison to untreated control (39.65 days).

Considering the survival of pupae, all treatments were effective, however, highest survival (73.33%) was observed in untreated control followed by 13.33 per cent with JSCUE 5% and JSP and 6.67 per cent with CU at 5% concentration. In most of the treatments (CU 10%, 5% and 10% NLP, 10% JSP, 5% and 10% NLCUE and 10% JSCUE) the pupae failed to survive therefore seemed to be most effective treatments. The significantly highest pupal weight of 17.38 mg was recorded in untreated control followed by 12.25 mg for 5% CU, 11.50 mg for 5% JSP and 8.00 mg for 5% JSCUE. The mean pupal period was observed as 8.00 to 10.00 days in treated wheat grains; whereas in control it was 8.50 days. The maximum adult emergence (73.33%) was recorded in the untreated control. In the treatments it was recorded to the ext of 6.67 per cent as evinced by the treatments *viz.* CU 5%; JSP 5% and JSCUE 5%. Similarly, the growth index was also very low in treated grains as it varied from 0.11 to 0.12 in comparison to 1.52 in untreated control with very less grain webbing (5.00–10.00%) by the larvae during the developmental period. However, grain webbing was observed to the extent of 80.00 per cent in the untreated control. Singh and Kumar (1997) found that neem seed kernal powder @ 4g/100g seeds and leaf powder at 5g/100g seeds protected maize for 5 months against *R. dominica*. Amin *et al.* (2000) also reported that powdered leaves of neem provided adequate protection of wheat grain and the higher doses gave higher effects of deterrence.

The data pertaining to the efficacy of plant extracts on the growth of 5th larval instar of *C. cephalonica* on treated wheat grains presented in Table–2 revealed the least average larval weight in NLCUE 10% (8.00 mg) and the highest average larval weight of 32.50 mg in untreated control. In NLP (10%) all larvae died and pupal survival was observed nil. In NLCUE (10%) all pupae died with very less per cent larval survival (20.67); whereas on the other hand pupal survival among the treatments was recorded from 10.00–63.33 per cent with highest pupal survival (90.00%) in untreated control. The pupal weight was also significantly less among the treated grains (ranging from 9.50–16.50 mg) in comparison to control (20.60 mg). It was observed that no adult emergence occurred in NLP (5% and 10%) and NLCUE. The highest adult emergence (88.00%) was noted in untreated control. It was also observed that the survived pupae and emerged adults were mostly deformed. The survival rate of the larvae decreased with increasing concentration that clearly

Table 1. Growth and development of neonate (0–24 hrs.) larvae of *C. cephalonica* on treated wheat grains

S. No.	Treatments	Dose (%)	Larval survival (%)	Av. larval weight (mg)	Av. larval period (days)	Pupal survival (%)	Mean pupal weight (mg)	Mean pupal period (days)	Adult emergence (%)	Total dev. period (days)	GI	Webbing (%)
1.	(CU)	5%	6.67 (14.96)	14.00	48.33	6.67 (14.96)	12.25	9.50	6.67 (14.96)	57.83 (49.50)	0.12	5.00
2.	(CU)	10%	6.67 (14.96)	12.00	48.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
3.	(NLP)	5%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	(NLP)	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.	(JSP)	5%	26.67 (31.08)	22.38	49.00	13.33 (21.40)	11.50	10.00	6.67* (14.96)	57.50 (49.29)	0.12	10.00
6.	(JSP)	10%	13.33 (21.40)	20.52	50.33	0.00	0.00	0.00	0.00	0.00	0.00	5.00
7.	(NLCUE)	5%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.	(NLCUE)	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.	(JSCUE)	5%	33.33 (35.25)	21.36	50.33	13.33 (21.41)	8.00	9.00	6.67 (14.97)	59.33 (50.37)	0.11	15.00
10.	(JSCUE)	10%	26.67 (31.07)	20.12	50.67	0.00	0.00	0.00	0.00	0.00	0.00	10.00
11.	Control	–	80.00 (63.43)	32.12	39.65	73.33 (61.60)	17.38	8.50	73.33 (58.88)	48.17 (43.94)	1.52	80.00
	Sem		0.174 (0.124)	0.246 (0.210)	0.129 (0.752)	0.946 (0.862)	0.174 (0.184)	0.407 (0.530)	0.666 (0.543)	0.942 (0.769)		
	CD 5%		0.366 (0.510)	0.722 (0.617)	0.380 (0.220)	0.771 (2.53)	0.510 (0.540)	1.194 (1.556)	0.195 (0.159)	0.276 (0.225)		
	CV		1.71 (1.120)	3.29 (2.15)	0.737 (0.467)	4.96 (11.96)	6.75 (4.31)	0.66 (11.83)	0.136 (0.998)	0.805 (0.758)		

Table 2. Growth of 5th instar larvae of *C. cephalonica* on treated wheat

Treatments		Conc. (%)	Initial larval weight (mg)	Final larval weight (mg)	Larval survival (%)	Pupal survival (%)	Pupal weight (mg)	Adult emergence (%)
T1	CU	5	21.00	24.50	90.00 (71.57)	63.33 (50.77)	16.50	53.33 (45.00)
T2	CU	10	21.00	22.00	83.67 (70.57)	56.566 (46.80)	16.00	46.66 (45.00)
T3	NLP	5	21.00	14.50	40.37 (39.28)	10.66 (18.45)	10.00	0.00
T4	NLP	10	20.00	8.30	0.00	0.00	0.00	0.00
T5	JSP	5	21.00	16.50	60.33 (50.77)	30.33 (45.00)	12.50	30.00 (33.22)
T6	JSP	10	21.00	18.40	70.00 (56.79)	50.00 (50.00)	12.00	23.33 (26.59)
T7	NLCUE	5	20.00	9.60	30.00 (33.22)	13.33 (18.45)	9.50	0.00
T8	NLCUE	10	20.00	8.00	20.67 (26.58)	0.00	0.00	0.00
T9	JSCUE	5	20.00	23.00	50.00 (45.00)	30.00 (33.22)	15.00	20.00 (26.59)
T10	JSCUE	10	21.00	20.00	40.00 (39.24)	30.00 (33.22)	14.50	10.00 (18.45)
T11	Control	–	21.00	32.50	90.00 (71.57)	90.00 (71.57)	20.60	80.00 (70.50)
	SEm			2.643 (2.90)	12.03 (11.43)	13.85 (11.24)	.107 (.101)	.426 (.292)
	CD 5%			7.759 (8.52)	42.96 (66.17)	40.63 (31.59)	.316 (.298)	1.25 (.857)
	CV			27.00 (21.3)	61.88 (60.85)	32.97 (67.65)	.162 (.983)	2.812 (2.003)

demonstrated the tested leaf extracts at their higher concentrations had high antifeedant activity. The plant extracts killed the neonate larvae before they could reach the next instar. The neem treated cereal grains were most effective as both the stages of *C. cephalonica* larvae couldn't survive. The larval and pupal period was observed more in treated grains than the untreated control. Neem had a strong antifeedant action for the different stages of *C. cephalonica* larvae as cent per cent mortality was observed in NLP (5%), NLP (10%), NLCUE (5% and 10%) after 4–5 days of feeding on the neem treated cereal grains. The other treatments including JSP and JSCUE and CU showed effective growth regulating and antifeedant effect against larvae of *C. cephalonica* as observed by the prolonged larval and pupal periods, reduction in larval weight, pupal weight, larval survival, adult emergence, total developmental period and growth index.

Similar results were observed by Bunker and Bhargava (2004) recording that vegetable oils significantly prolonged the duration of the cycle of *C. cephalonica* on treated sorghum grains with reduction in adult emergence and oviposition with no adverse effect on the germination of sorghum seeds upto 150 days of treatment. Chanda and Chakravarty (1998) and Kumar and Jain (2004) found NKP and NLP @ 0.1 to 5.0 per cent effective against *C. cephalonica* by causing adverse effect on the growth and development *viz.* increased developmental period, higher mortality and less per cent adult emergence. They also observed that neem seed extract disrupted the growth and metamorphosis by producing abnormal adults with crippled or underdeveloped wings. Meena and Bhargava (2010) reported that neem leaf and kernel powder decreased the fecundity and longevity of male and female adults of *C. cephalonica* when fed on treated sorghum food.

Cow urine and cow dung is not prominently in use to control insect pests under storage conditions but Yadav and Mahla (2005) successfully used biogas in the control of stored grain insect pests such as *Rhizopertha*

dominica, Sitotroga cerealella, Corcyra cephalonica infesting paddy which was carried out in 100 kg capacity of PVC bins over a period of 8 months. It was observed that it had no adverse effect on seed germination of paddy.

REFERENCES

Amin, M.R., Shahijan, M., El Taj, H.F., Iqbal, T.M.T. and Hussain, M.A. 2000. Use of Akenda, biskatli and neem leaves as botanical insecticide against lesser grain borer. *Bangladesh Journal of Entomology*, **10**: 1–13.

Atwal, A.S. and Dhaliwal, G.S. 1997. Agriculture pest of South Asia and there management. Kalyani Publishers, Ludhiana, pp. 380–381.

Bhargava, M.C., Akhter Hussain, Choudhary, R.K. (2005). Effect of plant products on food utilization of *Corcyra cephalonica* (Stanton). *Journal of Plant Protection and Environment*, **2**: 72–74.

Bunker, G.K. and M.C. Bhargava. 2004. Effectiveness of some vegetable oils on *Corcyra cephalonica*. *Indian Journal of Applied Entomology*, **18**: 150–154.

Chanda, S. and Chakravorty, S. 1998. Food with neem oil affects life and development of rie moth, *Corcyra cephalonica* (Stain.) (Lepidoptera: Pyralidae). *Entomon*. **23**: 153–156.

Kumar, V. and Jain, K.L. 2004. Growth regulatory effect of neem against *Corcyra cephalonica*. *Indian Journal of Applied Entomology*, **18**: 73–74.

Meena, B.L. and Bhargava, M.C. 2010. Effect of plant powders on reproductive potential of *Corcyra cephalonica* (St). (Lepidoptera: Pyralidae) on sorghum seeds. *Journal of Insect Science,* **23**: 441–446.

Sandhya Jadhav. 2009. Relative toxicity of certain plant extracts against *Corcyra cephalonica* under Laboratory conditions. Applied *Journal of Biological Science*, **35**: 89–90.

Sharma, K.C. and Bhargava, M.C. 2001. Ovicidal effect of some growth disrupting compounds on rice moth, *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae). *Indian Journal of Applied Entomology,* **15**: 24–28.

Singh, B. and Kumar, A. 1997. Plant product as protectents of wheat against lesser grain borer, *R. dominica* (Fab.). *Indian Journal of Entomology*, **11**: 69–72.

Yadav, S. and Mahla, J.C. 2005. Bioefficacy of carbondioxide concentrations and exposure periods against lesser grain borer, *Rhizopertha dominica*, (Fab.) in stored wheat. *Journal of Insect Sci.*, **18**: 84–89.