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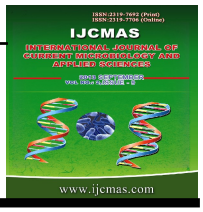

Original Research Article

Effect of pesticides on the reproductive performance and longevity of *Bombyx mori*

P.Kumutha[1], C.Padmalatha[2]*, K.Chairman[3], A.J.A.Ranjit Singh[3]

[1]Department of Zoology, Govindammal Aditanar College for Women, Tiruchendur, Tamilnadu, India
[2]Department of Zoology, M.V.M. Govt. Arts and Science College for Women, Dindugal, Tamilnadu, India
[3]Department of Zoology, Sri Paramakalyani College, Alwarkuchi, Tirunelveli, Tamilnaudu, India
***Corresponding author e-mail:** chairmanspkc@gmail.com*

A B S T R A C T

Environmental pollutants, like pesticides had been found to be destructive on different aspects of life. Silkworm, as beneficial insects are no exception. Due to this many problems had appeared in sericulture as a result of the pesticide application to cultivations, especially when mulberry trees grow next to cultivated plants. Most pesticides with different mode of action, affected insect reproduction even in minute doses. With this concern in the present study was designed to find out the toxicity of two pesticides, Dichlorovos and Vijay neem were evaluated using standard procedures. The present study revealed that the adults emerged from silkworm larvae fed with pesticides treated leaves provided less number of eggs, less number of hatched eggs compared to control

Keywords

Dichlorovos; Neem Pesticide; Silkworm; Environmental pollutants.

Introduction

Environmental pollutants, like pesticides, had been found to be destructive on different aspects of life. Silk worms, as beneficial insects are no exception. Due to this many problems had appeared in sericulture as a result of the pesticide applications to cultivations, especially when mulberry trees grow next to cultivated plants. Most pesticides with different mode of action, affected insect reproduction even in minute doses.

Exposure to residue of insecticides in mulberry leaves could affect growth, reproduction and quality of Economic characteristics of cocoon, eclosion and fecundity (Bhosale *et al*., 1988).

Several insecticides have ovicidal effect (Smirnoff., 1983 and Alford and Holmes., 1986, Venkaria and Yyar., 1985, Patel and patel ., 1989, Mala et al., 1993, Fakhri and Murad.,2002, Murugan et al., 1993,

Jeyabalan and Murugan 1997, Narayan 1972, Sundararaj *et al*., 1995).Hence in the present investigation an attempt has been made to study the fecundity, hatchability and adult longevity of silk worm larvae fed with pesticides treated mulberry leaves.

Materials and Methods

Eggs of multivoltine silkworm breed, LXCSR2 were procured from Government sericulture unit, Tenkasi and raised upto second instars in the rearing house. Standard rearing practices were followed (Krishna Swami, 1971). Two insecticides Dichlorovos 76% (EC) and 0.03% (300 ppm (Azn) were used.Third instar silkworms (soon after the II Ecdysis) of uniform size from a pooled batch were divided into ten groups of 20 larvae each and treated with insecticides. Initial experiments were done by feeding the silkworms with insecticides sprayed leaves.Control larvae were maintained.

Mulberry leaves treated with graded concentration of Dichlorovos (0.0001,0.0002,0.0003,0.0004 and 0.0005%) and Vijay neem 0.001 ,0.002,0.003,0.004 and 0.005%)were fed to silkworms for only one time to the third instar silkworm and were allowed to pupate in a collapsible mountage. Moths that emerged from the treated groups were allowed to mate. The paired moths were decoupled after 3 hours (Narasimhanna, 1988).

The female moths were kept for oviposition. The eggs were subjected to acid treatment. Treated eggs were incubated in an incubator at 25 ± 1ºc, 75-80% humidity and normal photoperiod of 12L: 12D (Krishnaswami et. al., 1973; Jolly 1986). The number of larvae hatched in a single day and the number of unhatched eggs were recorded. The longevity of adult females were also recorded.

Results and Discussion

The present study revealed that the adults emerged from silk worm larvae fed with pesticides treated leaves produced less number of eggs. Number of eggs laid by control moth was 547±4.12. Whereas the eggs laid by moths emerged from larvae fed with Dichlorovos treated leaves were 533±1.43, 529±6.36, 519±5.67, 504.4±2.84 and 485±4.71 for concentrations of 0.0001%, 0.0002%, 0.0003, 0.0004% and 0.0005% respectively (Table.1,).

The one way ANOVA result showed significant changes with respect to fecundity and the pesticide administered (F' Value 240.172) A similar condition was noticed for fecundity rates of moths emerged from larvae fed with neem pesticide treated leaves Among the eggs laid by control worms 15.20±1.43 percent was found to be unfertilized. But in Dichlorovos treated cases a maximum of 43.40±1.16 percent eggs were unfertilized at a concentration of 0.0005% and 45.60±2.94 percent eggs were unfertilized at a concentration of 0.005% Neem pesticide (Table 1).

The one way ANOVA result showed significant changes with respect to unfertilised eggs and the pesticide administered (F' Value52.793). Application of pesticides also affected the number of hatched eggs. The egg hatchability in the control moth was 511.10±3.25. Whereas the hatched eggs laid by moths emerged from larvae fed with Dichlorovos treated leaves were

490.30±6.25, 462.50±9.08, 447.80±15.14, 405.80±10.14 and 386.50±9.34 for the concentrations of 0.0001%, 0.0002%, 0.0003%, 0.0004% and 0.0005% respectively. (Table1). A similar condition was noticed for the number of hatched eggs laid by the larvae fed with Vijay neem(Table.1).

The one way ANOVA result showed significant changes with respect to number of hatched eggs and the pesticide administered (F' Value 447.253). Pesticide application increased the number of unhatched eggs. The number of unhatched eggs laid by the control moth were 21.00±2.28 where as the unhatched eggs laid by moths emerged from larvae fed with Dichlorovos treated leaves were 26.30±1.37 , 40.20±3.72, 42.80±1.14, 68.30±5.29 , 55.20± 3.72 for the concentrations of 0.0001%, 0.0002%, 0.0003%, 0.0004% and 0.0005% respectively (Table 1). A similar condition was noticed for the number of unhatched eggs laid by the larvae fed with Vijay neem pesticide. Number of unhatched eggs was highly increased than the number of unhatched eggs seen in Dichlorovos treated larvae. (Table 1).The one way ANOVA result showed significant changes with respect to number of unhatched eggs and the pesticide administered (F value 198.821).

Application of pesticide also reduced hatching percentage. The hatching percentage of eggs laid by the control moth were 93.39% where as the hatching percentage of eggs laid by the moths emerged from larvae fed with Dichlorovos treated leaves were 91.86%, 87.40%, 80.45% and 79.67% for the concentrations of 0.0001%,0.0002%,0.0003%,0.0004% and 0.0005% respectively. (Table 1)The same condition was noticed for the hatching percentage of eggs laid by the larvae fed with vijay neem. The one way ANOVA result showed significant changes with respect to hatching percentage of eggs and the pesticide administered. (F value 132.275)In the present study, the hatching of the treated eggs was reduced significantly. . These results are in accordance with the observations of Singh and Yadav (1995)). The insecticide inhibited a number of enzyme systems in different insects in addition to those involved in Chitin synthesis. Mohanraj *et al*., (2000) observed a considerable dose based reduction in the hatchability of eggs treated with neem formulation, eco neem. Pesticides affect female longevity.

The adult female longevity of control *B.mori* was 5.7±0.80 days (Table 2). It decreased in moth that developed from third instar larvae administered with Dichlorovos and Vijay neem at different concentrations.Egg production decreased in most of the cases which might be due to impaired vitellogenesis leading to reduced number of eggs.

The decrease in fecundity and reduction in hatching percentage helped in the management of lepidopteron pests. Based on the present observation, the field application of the target insecticide should be carefully quantified when ever is applied.Use neem pesticide to control pest compare to chemical pesticides.

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Table.1 Effect of Pesticides on Reproductive Performance of Silkworm Bombyxmori [mean ± SD) (n=20 moths)

Pesticide	Concentra-tion in %	Total number of eggs	Unfertilized eggs	Hatched eggs	Unhatched eggs	Hatching %
Control	-	547±4.12	15.20±1.42	511.10±3.25	21.00±2.28	93.39%
Dichloro-vos	0.0001	533±1.43 (2.46)	17.10±1.49 (-12.5)	490.30±6.25 (4.06)	26.30±1.37 (-25.23)	91.86% (1.64)
	0.0002	529 ± 6.36 (3.32)	26.30±2.85 (-73.02)	462.50±9.08 (9.50)	40.20±3.72 (-91.42)	87.40% (6.41)
	0.0003	519.20±5.67 (5.11)	28.60±2.15 (-88.15)	447.80±15.14 (12.38)	42.80±1.14 (-103.80)	86.24% (7.66)
	0.0004	504.40±2.84 (7.82)	35.30±1.93 (-132.23)	405.80±10.14 (20.60)	68.30±5.29 (-225.23)	80.45% (13.86)
	0.0005	485±4.71 (11.34)	43.40±1.16 (-185.52)	386.50±9.34 (24.37)	55.20±3.72 (-162.85)	79.67% (14.69)
Vijay neem	0.001	505.40±5.52 (7.63)	29.30±2.80 (-92.76)	440.50±20.25 (13.81)	35.60±2.14 (-69.52)	86.98% (6.86)
	0.002	494±6.13 (9.72)	34.20±1.58 (-125)	419.10±23.17 (18.00)	37.70±3.17 (-79.52)	84.83% (9.16)
	0.003	404.70±5.61 (26.04)	38.40±2.35 (-152.63)	326.00±17.15 (36.21)	40.30±3.08 (-91.90)	80.55% (13.75)
	0.004	395.20±3.15 (27.77)	40.40±1.98 (-163.81)	298.00±7.12 (41.69)	57.10±4.34 (-171.90)	75.40% (19.26)
	0.005	350.60±5.14 (35.92)	45.60±2.94 (-200.00)	256.40±18.34 (49.83)	48.60±4.70 (-131.42)	73.13% (21.69)
F-value		Sig	Sig	Sig	Sig	Sig
CD at 5% level		26.0744	7.8440	23.6662	5.9026	3.4840

Table.2 Longevity (in days) of female bombyx mori emerged from larvae fed with pesticide treated mulberry leaves (mean ±SD) percentage change over control is given in parenthesis

Pesticide	Concentration of Pesticide %	Adult female longevity (days)	% Change over control
Control	-	5.7±0.80	-
Dichlorovos	0.0001	5.5±0.73	(-3.50)
	0.0002	5.0±0.81	(-12.2)
	0.0003	4.9±0.56	(-14.03)
	0.0004	4.6±0.51	(-19.29)
	0.0005	4.3±0.44	(-24.56)
Vijay neem	0.001	4.8±0.58	(-15.78)
	0.002	4.7±0.52	(-17.54)
	0.003	4.4±0.41	(-22.80)
	0.004	4.2±0.26	(-26.31)
	0.005	3.9±0.12	(-31.57)

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