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To study the antifeedant activity of Nimbicidine and Ultineem against IInd Instar larvae of *Spilosoma obliqua* (Walker) (Lepidoptera: Arctiidae)

Dinesh Kumar Bhardwaj, Sunita Kumari

P.G. Deptt of Zoology, Dolphin (P.G.) Institute of Biomedical and Natural Sciences, Dehradun, Uttarakhand, India

Abstract
The neem based biocides contains promising pest-control substances found effective against many economically important pests and safe environment. These biocides are ecofriendly and do not interfere with the parasite-predator of this pest. Amongst various method used to evaluate antifeedant activity of neem formulation, treated larvae fed on treated leaves showed maximum antifeedant activity 8.01% and 15.81% food consumption on concentration 0.8% of Ultineem (azadirachtin 1%) and Nimbicidine (azadirachtin 0.03%) respectively. Azadirachtin 1% was most effective followed by azadirachtin .03%. Amongst various concentration 0.8% was most promising followed by 0.4% in case of both formulations. Thus the present studies also show that the antifeedant activity decreased with the decrease in the concentration of the compound. The trend of effectiveness of neem pesticides was azadirachtin 1% › .03%. Second instar larvae were most responsive. Azadirachtin 1%, azadirachtin 0.03% @ 0.4 to 0.8% were best treatments to check the population of *S. obliqua*.

Keywords: *Spilosoma oblique*, Bihar Hairy Caterpillar, antifeedant activity, Neem

1. Introduction
Spilosoma obliqua commonly known as Bihar, hairy caterpillar, is one of the most serious polyphagous pest insect causing damage to a variety of oil seed crops in India. Pesticides are being used extensively in the control of crop pests. Synthetic insecticides are used widely for the control of various insect pests because they can be applied whenever and wherever needed. The production and consumption of pesticides has greatly increased. Tewari (1992) [15], Vietmeyer (1992) [17], Puri (1999) [8] and Schmutterer (2002) [10] reported that neem is effective in the management of insects and pests. They concluded that the bitter principles of neem have seven types of activities (i) antifeedant (ii) attractant (iii) repellent (iv) insecticide (v) nematicides (vi) growth disrupter and (vii) antimicrobial. Sule (2012) [13] showed that the effectiveness of neem is dependent on the part of plant used. The contribution of pesticides to increase agricultural production cannot be denied, but synthetic pesticides have also caused ecological damage, also induced serious health hazard among worker during manufacture, formulation and field application (Ansari and Kumar., 1988) [2]. To overcome the problem of Synthetic chemical hazards, one of the best control measures is the use of plant origin product. The popularity of the plant product is increasing day by day because of their biodegradability, Singh *et al*. (2001) [12] Introduced the 200 plants with insecticidal activity are known. Among the natural product, one of the most natural compound is Azadirachtin, an active compound extracted from the *Azadirachta indica*, it is effective against target pest and safer to the man and environment.

2. Material and Method
The antifeedant activity of neem formulation was studied by using three different methods of second instar larvae. These are Treated leaves Treated caterpillar, untreated leaves Treated caterpillar and Treated leaves untreated caterpillar on concentration 0.8%, 0.4%, 0.2% and 0.1%. The insect larvae of each instar were released over leaf circles and sprayed with an atomizer to the point of drip separately. Thus treated larvae were removed and placed in separate petridishes and provided with fresh castor leaf circles which acted as first method.
The fresh untreated larvae were released over treated leaves, it served as second method. In third case the treated larvae were left feeding over treated leaves. Ten larvae per replicate were used, and the experiment was replicate thrice. Untreated larvae fed on untreated leaf circle were used as control. Observation were recorded daily upto 8th day of treatment after 48 hours of treatment fresh food circles were provided daily in sufficient number, uniformly. Consumption of food is estimated as per method of Benjamin *et al*. (1968) [3].

3. Result

Table 1: Antifeedant activity of Nimbicidine pesticide (Azadirachtin .03%) against 2nd instar larvae of *S. obliqua.*

Treated leaves Treated caterpillar						
Conc. In %	**I Day**	**II Day**	**III Day**	**IV Day**	**V Day**	**Mean**
0.8	22.16	7.07	3.77	24.83	21.22	15.81
0.4	26.41	11.32	10.37	37.73	50.94	27.35
0.2	28.39	14.71	11.79	43.67	68.39	33.39
0.1	34.43	23.77	18.01	46.88	73.96	39.41
Untreated leaves Treated caterpillar						
0.8	36.79	19.33	30.66	25.37	48.67	32.16
0.4	45.28	22.73	16.50	28.30	53.39	33.24
0.2	48.79	32.64	22.64	36.50	60.09	40.13
0.1	55.84	45.71	44.81	49.52	79.52	55.08
Treated leaves untreated caterpillar						
0.8	18.39	8.49	18.39	30.18	52.83	25.66
0.4	39.62	17.45	26.69	47.64	69.24	40.13
0.2	41.98	22.73	38.67	48.11	80.09	46.32
0.1	43.56	30.84	46.22	53.96	87.83	52.48
Control	46.69	52.83	63.67	80.66	94.33	67.64

Table 2: Antifeedant activity of Ultineem pesticide against 2nd instar larvae of *S. obliqua*.

Treated leaves Treated caterpillar						
	I	II	III	IV	V	Mean
0.8	3.77	5.66	7.07	8.49	15.09	8.01
0.4	10.37	12.73	9.43	13.67	22.64	13.77
0.2	13.20	10.37	11.32	23.20	31.22	17.86
0.1	14.15	16.60	19.90	31.79	41.29	24.75
Untreated leaves Treated caterpillar						
0.8	10.37	6.60	4.71	9.43	14.16	9.05
0.4	15.66	11.79	5.18	17.07	16.09	14.95
0.2	26.50	24.05	41.03	26.88	29.24	29.54
0.1	30.37	35.94	53.20	39.33	41.22	40.01
Treated leaves untreated caterpillar						
0.8	4.71	8.96	9.43	15.09	17.92	11.22
0.4	7.07	9.43	28.30	35.84	37.73	21.79
0.2	13.67	29.24	45.28	43.11	46.64	35.59
0.1	18.86	35.37	56.22	57.16	59.52	45.43
Control	49.52	59.90	73.58	93.86	98.11	74.99

4. Discussion

In case of Nimbicidine (azadirachtin 0.03%) and Ultineem (azadirachtin 1%) treated larvae fed on treated leaves shows the maximum antifeedant activity on 0.8% at second instar larvae. Irrespective of dosages these two formulations were promising, mean value of percent reduction in food consumption being 15.81and 8.01 of Nimbicidine (azadirachtin 0.03%) and Ultineem (azadirachtin 1%) respectively. Fresh larvae fed on treated food or treated larvae fed on fresh food showed not much difference in antifeedant property in both pesticides (Table 1 & 2).

The antifeedant activity of neem based pesticides formulations containing azadirachtin.03% and azadirachtin1% was determined against second instar larvae of *S. obliqua* using three different methods namely, treated larvae fed on treated food; untreated larvae fed on treated food and treated larvae fed on untreated food. The antifeedant activity was more when treated larvae fed on treated food in general. The other two methods were comparatively less effective. Azadirachtin 1% was most effective followed by azadirachtin .03%. Amongst various concentration 08% was most promising followed by 04% in case of both formulations. Thus the present studies also show that the antifeedant activity decreased with the decrease in the concentration of the compound. From the present findings it is concluded that azadirachtin 1% and azadirachtin .03%@ 0.4 to0.8% were best treatment to check the population built up of *S. obliqua.*

Bhathal and Singh (1994) [4] have evaluated the feeding deterrent activity of Neemmark (80% neem extracts qotes miscible formulation containing azadirachtin as active principle) against 3rd instar laevae of *S. obliqua* by leaf dipping method. The antifeedant activity was found 26.5%, 61.1% and 86% at 1.25%, 2.5% and 5% concentrations respectively.

Rwamputa *et al.* (1989) [9] reported that the neem kernel extracts at 1.0% concentration afforded complete protection against defoliation by all instars of *Heteronygmia dissimilis* and 0.5% seed kernel and 1.0% leaf extract offered only partially protection against later instar. Tripathi and Rizvi (1985) [16] revealed that the plant extract of Ailanthus excels in acetone gave the best protection (89.7%) to castor against *S. obliqua.*

Mohanty *et al.* (1988) [6] reported the concentration required to give 50 percent inhibition of feeding for *Psoralea corylifolia* (0.80%) or lentil (1.5%) against *S.obliqua*. Tripathi and Singh (1994) have also determined antifeedant activity of 2% crude neem extract third instar larvae of *S. obliqua*. They have reported 99% protection to caster leaves. The variation in antifeedant activity evaluated in the present study is due to different neem formulation and method of testing.

Sharma *et al.* (1999) have established that 0.5% extracts of neem leaves reduced the chitin content of cuticle in case of *H. armigera*. Sunderaraj *et al.* (1995) have also evaluated antifeedant activity antifeedant activity of neem seed kernel (NSK) extract prepared indifferent solvents against *Tragama siva* Lefebvre and *Patialus tecomella* Pajnimethonal extract 0.5% was found most effective both the pests.

Mosaddeque (1995) reported that neem oil significantly reduced the food consumption of the larvae of *S. obliqua* and the food consumption decreased more with the highest concentration. He concluded that reduction of food consumption might be due to the antifeedant activity of neem oil.

Chowdhury *et al.* (2001) [5] also stated that azadirachtin, the major constituent of neem exhibited significant antifeedant activity against *Spilosoma obliqua* [*Spilarctia obliqua*] larvae.

The results showed by Ali *et al.* (2008) [1] that all the larval instars of jute hairy caterpillar were highly susceptible to nimbicidine and the susceptibility gradually increased with the increase of concentration.

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