



Experimental Study to Find the Effect of Different Neem (*Azadirachta indica*) based Products Against Moringa hairy Caterpillar (*Eupterotemollifera* Walker.)

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ABSTRACT

It is known fact that the Neem is a safe natural pesticide, the present study was undertaken to find the feasibility of utilizing its product in the control of insect foliage feeder *Eupterotemollifera* Walker (Moringa hairy caterpillar) in mulberry (*Morus* spp.). Therefore a comparative study was carried out by application of different neem products EC, Dust and WDP in different proportions viz., 1, 2, 3 & 4% concentration on mulberry leaves and feeding the dried leaves to the larvae of *Eupterotemollifera* Walker after 1, 24 and 48 HAS. Bioassay against the larvae of *Eupterotemollifera* Walker revealed that neem products significantly altered the feeding, larval duration and influenced the larval mortality in *Eupterotemollifera* Walker. Critical analysis of the results also reveal that, EC at 1,2,3 and specifically at 4% concentration was found to be most effective after 1 and 24 hour of spray on the leaves of mulberry (*Morus* spp.) and its subsequent feeding to *Eupterotemollifera* Walker.

Key words: Neem products, *Eupterotemollifera* Walker, Neem.

INTRODUCTION

Mulberry is an important commercial crop grown extensively as a food plant for silkworm *Bombyx mori* L. [1]. The mulberry silkworm *Bombyx mori* is a monophagous insect feeding only on mulberry leaves due to the presence of morin [2]. Mulberry, *Morus* spp is infested by a number of insect pests among these "*Eupterotemollifera* Walker" a polyphagous pest which is responsible for the highest damage to mulberry plants [3]. The Moringa hairy caterpillar, *Eupterotemollifera* Walker black headed caterpillar (Lepidoptera: Eupterotidae) is mostly prevalent during August to February in the northern plains of India. The economy of sericulture industry depends not only on high quantity but also on the quality of mulberry leaves [4]. Mulberry sericulture is one among the income assuring occupations to rural folks. It needs low capital and ensures round the year employment opportunities [5]. It is important that menace of Moringa hairy caterpillar be marginalized to increase mulberry leaf yield. But different persistent insecticides tested for their efficacy against various pests have been phased out due to their deleterious effect on the silkworm. Therefore the need arises for testing a plant origin insecticide that has minimum effect on the physiology and growth of silkworm.

The Indian neem tree, *Azadirachta indica* A. Juss has aroused considerable interest as a mean of alternative plant protection during the past two decades. The extracts of fruits and leaves cause inhibition of feeding and oviposition, growth disruption and sterility in insects. It exhibits repellent activity at the higher concentration and phagostimulatory effect at the lower level. Many commercial formulations are used in the diversified agro-climatic region of the world. Use of neem derivatives is being advocated for the protection of different species of silkworm [6,7]. In the present study efficacy of different neem based products have been tested against the polyphagous insect pest Moringa hairy caterpillar of mulberry.

MATERIALS AND METHODS

The neem-based products have been bioassay against the polyphagous insect pest of mulberry, Moringa hairy caterpillar. Under the study two experiments were set up to study the effect of neem product on Moringa hairy caterpillar viz., persistence of feeding deterrence, effect on mortality rate% and total larval period (days). Moringa hairy caterpillar (*Eupterotemollifera* Walker) used in the test was collected from mulberry garden in February 2006. All the tests were carried out with neem rich insecticide (available in the form of WDP, Dust, and EC) obtained from T. Stanes and Company limited Coimbatore, Tamil Nadu. For the practical utilization of these materials water dispersible powder (WDP) and dust both based on the crushed kernel and the Emulcifiable concentration (EC) based on

neem oil were applied in different concentrations (%) on mulberry leaves, thereafter the dried leaves were fed to larvae of *Eupterotemollifera* Walker in glass petridishes using no-choice feeding bioassay technique. A batch of 7 larvae of *Eupterotemollifera* Walker (10day old 3h starved) were released in each Petridish and allowed to feed for 4hour. On termination of the experiment a leaf feeding diagram was sketched on graph paper and the observations were recorded on the mean leaf area consumed (MLAC) in cm² at 01, 24 and 48 hour after spraying (HAS). Control batches were also maintained separately.

Table 1: Persistence of feeding activity of different neem products sprayed on mulberry under Lab conditions against *Eupterotemollifera* Walker.

Con. (%)	MLAC values for EC			MLAC values for Dust			MLAC values for WDP		
	01HAS	24HAS	48HAS	01HAS	24HAS	48HAS	01HAS	24HAS	48HAS
4.00	9.12	25.78	32.56	9.90	27.45	36.25	9.50	26.32	36.00
3.00	14.20	32.50	35.90	15.50	33.58	37.52	14.80	33.40	37.12
2.00	15.80	33.00	37.40	17.45	35.80	39.75	16.50	33.54	39.50
1.00	25.50	38.12	41.12	27.56	38.85	42.56	26.45	37.90	42.15
Control	32.00	46.25	-	32.50	45.50	-	31.00	45.00	-
Mean	19.32	35.13	36.74	20.58	36.23	39.02	19.65	35.23	38.69

Note- Con.- concentration, MLAC cm²-Mean leaf area consumed, HAS- Hours after spray, (-) Data not required taken due to excessive feeding.

Table 2: Efficacy of different neem products on larval duration and larval mortality
Eupterotemollifera Walker

Con. (%)	EC		Dust		WDP	
	Larval period Day	Mean larval mortality%	Larval period Day	Mean larval mortality%	Larval period Day	Mean larval mortality%
4.00	71.50 ±1.32	75.50 ±1.62	71.60 ±1.52	69.50 ±1.90	71.60 ±1.72	71.00 ±1.74
3.00	70.90 ±1.52	69.80 ±1.90	70.80 ±1.60	64.23±1.94	71.00 ±1.92	68.50 ±1.64
2.00	70.00 ±1.92	52.50 ±2.45	70.45 ±1.90	49.45 ±2.21	70.56 ±2.36	51.30 ±1.96
1.00	69.00 ±1.21	39.56 ±2.62	69.00 ±2.31	38.00 ±3.12	69.12 ±3.21	36.33 ±2.36
Control	68.00 ±0.32	00	68.00 ±0.38	00	68.00 ±0.40	00
Mean	69.88	55.04	70.96	47.61	70.05	49.39

The bioactivity of neem kernel and oil is well established [8,9]. Mean leaf area consumed was determined with the help of graph paper sheet an expressed as (MLAC) in cm² following Mishra, [10]. Data for the parameters like larval period (days), larval mortality, and persistence of feeding activity were collected and analyzed. Results for the same has been presented in table-1, table-2.

RESULTS AND DISCUSSION

The results of the present study indicate, that neem compound significantly altered the growth and development of insect in dose dependent manner, similar observation were recorded by [11-13].

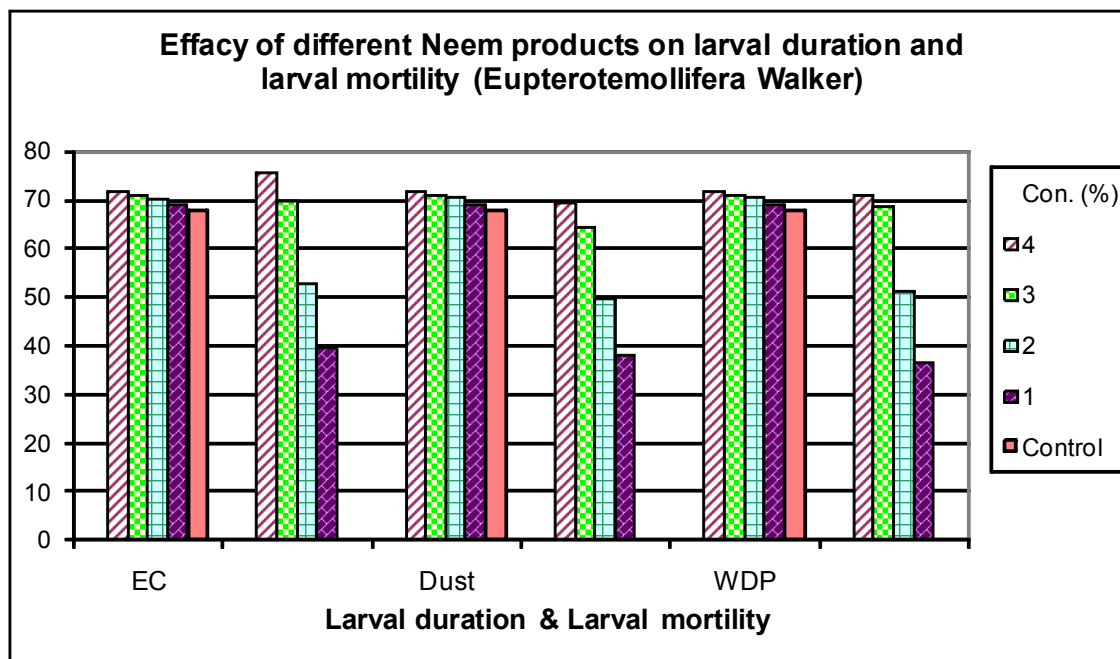
The results (table-1) studied for parameter viz. Persistence of feeding activity of different neem products sprayed on mulberry under Lab conditions against *Eupterotemollifera* Walker viz., Emulcifiable concentration (EC), Dust and Water dispersible powder (WDP) in different concentrations (%) after 1, 24 and 48 hour spraying showed varied results for the parameters studied. The mean leaf area consumption by the pest had differential pattern in function to time on application of 4.00, 3.00, 2.00 and 1.00 % concentrations of EC, WDP and Dust. On perusal of the data (table-1) EC had best inhibitory affects at 4% conc. Application viz., 9.12, 25.78, 32.56 followed by WDP 9.50, 26.32, 36.00 and Dust 9.90, 27.45, 36.25. At 3% concentration the values had best results for EC 14.20, 32.50, 35.90 followed by WDP 14.80, 33.40, 37.12 and Dust 15.50, 33.58, 37.52. Again at 2% EC showed comparatively better results 15.80, 33.00, 41.12, WDP, 16.50, 33.54, 39.50, Dust 17.45, 35.80, 39.75 and At 1% EC has best results 25.50, 38.12, 41.12 followed by WDP 26.45, 37.90, 42.15, Dust 27.56,

38.85, 42.56. In Control mean leaf area consumption was found at 32.00, 46.25 and (-) data not recorded due to irrelevance (excessive feeding) as shown in graph-1.

On critical analysis of the results table-2, for the parameter studied viz. larval duration and larval mortality %. The present study found highest mortality % on application of 4% concentration of the different neem products (EC 75.50%, dust 69.50%, WDP 71.00%). It was observed that EC was found to be most effective against *Eupterotemollifera* Walker in all the concentrations used during the study. Mortality increased with increase in neem concentration, a similar result was reported by [14,11,15,16,17,18,19].

Larval duration (days) was prolonged in the case of application of different neem products (4%- EC 71.50, dust 71.60, WDP71.60, 3%- EC 70.90, dust 70.80, WDP71.00, 2%- EC 70.00, dust 70.45, WDP 70.56 and 1%- EC 69.00, dust 69.00, WDP 69.12 days) in comparison to control (68 days). Azadirachtin is a botanical growth inhibitor, which induces dramatic change in insect growth, development and reproduction [20-22]. The larval period was prolonged for 1-5 days for different doses concentration. Similar trend were observed by Thangavelue and Singh, [23] in *B. zebina* Walker. In the end the study draws the conclusion that EC at higher concentration is effective against *Eupterotemollifera* Walker for inhibition of feeding, prolonging larval period and controlling the insect population. Further work is underway, to find affect of these products on mulberry silkworm *Bombyx mori*.

Graph-1



REFERENCES

1. Earanna, N. and Govindan, R. (2002) Role of bio-fertilizers in Mulberry production- A Review. *Indian J Seric.*, Vol., **41** (2): 92-99.
2. Tribhuwan, S. and Mathur, S. K. (1989) The Morin factor in mulberry that attracted the *Bombyx Mori* L. *Indian Silk* **28**(5): 39-40.
3. Handbook on pest and disease control of mulberry and silkworm, published by United Nations; Economic and Social Commission for Asia and the Pacific. Pp-18-19.
4. Das, P.K., Vijaya Raghawan, K and Jolly, M.S. (1983) Preliminary observation on the effect of feeding with washed and dusty mulberry leaves on the performance of Four races of silkworm. *Bombyx mori* (L.) *National seminar on silk research and development (Abstract)* March 10-13, Bangalore. India p-111.
5. Hanumappa H.G. and Erappa. S. (1985) Economic issues in Sericulture: study of Karnataka. *Economic and political weekly* **20**(31): 3122-3224.
6. Singh, R.N., Karnan .P., Kulshrestha, V. and Sinha, S.S. (1993) Neem to control pest of tasar. *Indian silk* **12**:42-44.
7. Srivastava, R.P. and Mishra, S.K. (2000) Possibility of using neem formulation in mulberry sericulture. Pp 165-172. In Kleeberg. H. and C. P. W. Zbitz (Eds) Practice oriented result on use and production of neem ingredient and pheromones. Druk and Graphic, Giessen, Germany, pp238.
8. Saxena, R. C., Liquido, N. J. and Justto, H. D. (1981) Neem seed oil a potential antifeedent for the control of rice brown plant hopper, *Nilaparvata lugens*. *Proc. 1st Int. Neem Conf- Rottach- Egern.*(1980). Pp 171-188.

9. Jotwani, M.G. and K. P. Srivastava (1984) A review of neem research in India in relation to insect. *Proc. 2nd Int. Neem Conf- Rauschholzihausen*. pp 43-56.
10. Mishra, S.K. (1995) Growth and development of *Bombyx mori* L. And two insect pests on different mulberry genotypes and use of botanicals in mulberry sericulture systems. Thesis M.Sc. G. P.U.A &T., Pantnagar, Uttaranchal. Pp122.
11. Wilps, H. (1986) Growth and adult moulting of larvae and pupa of the blow fly *Phormia terraenovae* in relation to Azadirachtin concentration. *Proc.3rd Int. Neem Conf. Nairobi*. Pp. 299 - 314.
12. Garcia, E.S. and H. Rembold (1984) The effect of Azadirachtin on ecdysis, of *Rhodnius prolixuz*. *J. Insect. Physiol.* **30**: 939 - 94.
13. Schluter, U., H.J. Bidman and S. Grewse (1985) Azadirachtin affect growth and development endocrine events and moulting of the tobacco hornworm, *Manduca Sexta*. *Insect. Physiol.* **31**: 773-777.
14. Bidman, H.J.G. Kauser, P. Mobus and J. Koolman (1986) Effect of Azadirachtin on blowfly larvae and pupae. *Proc.3rd Int. Neem Conf. Nairobi*, p. 253-271.
15. Miller, J.A. and W.F. Chamberlain (1989). Azadirachtin as a larvacide against the house fly, stable fly and horn fly (Diptera: Muscidae). *J. Econ. Ento.* **82**: 1375-1378.
16. Chavan, S.R. (1983) Chemistry of alkanes separated from leaf of *Azadirachta indica* and their larvacidal and insecticidal activity against mosquito. *Proc. 2nd Int. Neem Conf. Rauschholzihausen*. Pp- 59-66.
17. Akou-Edi, E. (1983). Effect neem seed powder and oil on *Tribolium confusum* and *Sitophilus zeamais*. *Proc. 2nd Int. Neem Conf- Rauschholzihausen*, p. 445-452.
18. Rangaswami, G; Narasimhanna, M. N; Kasivissanathan, K and Sastry, C.R. (1976) *Mulberry Cultivation Manual on Sericulture Vol. 1*, Food and Agriculture Organization of United Nations, Rome, pp 72:73.
19. Gaaboub, I. A. and D. K. Hayes (1984) Biological activity of Azadirachtin, component of neem tree inhibiting moulting in the face fly *Musca autumnalis*. Der Geer (Diptera: Muscidae). *Envir. Ent.* **13**: 803-812.
20. H. Rembold (1994) Azadirachtin- A botanical growth inhibitor and its relation to biosemiotics. *Proc Indian Science Acad. B*, **60** (5): 471-476.
21. Jaiswal, K., Dhama, S.S., Upadhyay, S. and Gangwar, S.K. (2004) Application of different Neem formulations for the control of insect pest (*Ergolis meriona* C.) population infesting castor (*Ricinus communis*) plant. Proceeding, National Workshop on Potential and Strategies for Sustainable Development of Yanya Silk in Himalayan States: pp. 93-95.
22. Jaiswal, K., Upadhyay, S. Dhama, S. S. and Gangwar, S. K. (2005) Comparative study to find the effect of different neem (*Azadirachta indica*) based products against *Diacrisia oblique* Walk. Paper Presented in Indian Science Congress: 2005. (Late abs. 2).
23. Thangavelu, K. and R. N. Singh (1994). Integrated pest management in tasar culture. *Annals Ent.* **9**(2): 59-65.