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Adequacy of Nimbecidine and Cartaphydrochloride against Lepidopteran Insect, Ariadne Merione

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Abstract: The production of pesticides started in India in 1952 with the establishment of a plant for the production of BHC near Calcutta and India is now the second largest manufacturer of pesticides in Asia after China and ranks twelfth globally (Mathur 1999). In India use of chemical compound pesticides is more and herbal pesticides is less. (Md. Wasim aktar et,al,. 2009). The risks found in chemical compound pesticides include production workers, formulators, sprayers, mixers, loaders and agricultural farm workers. During manufacture and formulation, the possibility of hazards may be higher because the processes involved are not risk free. Many pesticides have been associated with health and environmental issues. The numerous negative health effects that have been associated with chemical pesticides include dermatological, gastrointestinal, neurological, carcinogenic, respiratory, reproductive and endocrine effects. (Polyxeni Nicolopoulou Stamati 2016).
Keywords: Lepidoptera, butterfly, chemical, environment, mortality.

I. INTRODUCTION

Chemical pesticides play a significant role in agricultural production by controlling insect pest. However, these pesticides have a shown chronic effect on living organism and the environment. These effect have restricted the use of many pesticide (Isman et. al.1990;Katyal and Satake, 1996).

The threats posed by chemical pesticide demand on urgent search for environmentally safer alternative methods of crop protection. The injudicious use of synthetic pesticide have develop tolerance in pests, as result those pesticides are to be applied in double and triple doses (Stoll, 1988).

In addition problems such as health hazards, undesirable side effects and environmental pollution are caused by continuous use of synthetic chemical pesticide. This has attracted the attention of scientist, who are now experimenting and working on application of botanical pesticides for crop protection (Nas, 2004).The use of locally available plants in the control of pests is an ancient technology in many parts of the world (Roy et al, 2005).Most of the botanical pesticides are non selective poisons that target abroad range of pests. Especially, the secondary metabolite of several plants are found to be effective alternatives to synthetic pesticides (Letemia and Isman 2004).The action of various botanical pesticides and plant derived compound on pest insects is exerted through many way such as antifeedant (Raja et al,2005), larvicidal (Kabaru and Gichia 2001), ovicidal and oviposition deterrent activities (Pavunraj et al, 2006), repellent (Schmutterer 1995) and others. Some botanical pesticide have an effect on juvenile hormone and ecdysis action (Williams et al. 1986). They also disrupt insect growth by antagonizing juvenile hormone action (Bowers et al,1975).

The use of neem tree Azadiracta indica as a source of natural insecticides was discovered approximately thirty year ago (Ascher, 1993) Pest control using extracts from the neem tree is currently practiced in more than 55 countries throughout the world (Stoll,2000).

Azadiractine, a chemical derived from neem plant has been the most widely studied chemical of plant origin and has been found to be toxic to insect pest belonging to orders, Coleoptera (beetles and their larvae), Lepidoptera Orthoptera and (nymph and adults of grasshoppers and locust). Nimbicidine is a totally natural neem oil based product with azadiractine an active ingredients (Elhag, 2006) reported that Nimbecidine 0.03% when used against Thrips tabaci at 4 ml per liter gave good results in reducing a Thrips tabaci population in onion fields. Cartaphydrocloride, a chemical derived from annelid Lumbrineria heteropoda and Nimbecidine were evaluated in the present studies against caster butterfly , Ariadne merione, one of the pests on caster plant. The larvicidal properties of cartaphydrochloride have been reported by (Endo 1983).

Cartaphydrochloride is a highly effective broad spectrum, low toxic and residual insecticide, causing paralysis, by ganglion blocking action of central nervous system. It is a systemic insecticides with stomach and contact action. Insects discontinue feeding and die of starvation. Cartaphydrochloride is used at 0.14 to 1.00 Kg/ha for controlling of chewing and sucking insects (particularly Lepidoptera),at almost all stages of development ,on many crops including rice (Chilosuppressalis Cnaphalocrossis medinalis , Lissorhaptus oryzophilus and leaf beetle) potatoes , cabbage and other vegetable (Agromyzidae Leptiotarsa decemlineata and Plutellaxylo stella) ; also on soybeans ,peanut ,sunflowers , maize ,sugar beet , wheat pear barley, poem fruit, citrus fruit , wines, chestnuts , ginger, tea, cotton and sugar cane.

Lepidoptera that include moth and butterfly, are the second most diverse pest insect order. There is hardly any cultivated plant that is not attacked by at least one Lepidopteron pest. As pollinator of many plants, adult moths and butterflies are usually beneficial insects that feed on nectar. The caterpillars however are the most destructive, as they as chewing mouth parts that are suitable for feeding on various parts of a plant.

Many lepidopteron insects are serious pests on various crop plants and are responsible for heavy destruction of these plants. Ariadne merione is one on of the lepidopteran insect pest on castor plant.

Nimbecidine and Cartaphydrochloride were evaluated in the present studies against Ariadne merione.

II. MATERIAL AND METHOD

A Lepidopteron pest on castor plant (*Ricinus communis*) namely, *Ariadne merione*, belonging to family Nymphylidae was used as a test insect.

Ariadne merione, also known as the Common Castor, is an orange butterfly with brown lines whose larvae feed almost exclusively on leaves of Castor.

Ricinus communis.

This species is found in south-eastern Asia. Its wingspan ranges between 30–35mm. Like other butterflies in the Nymphalidae family, its front two legs are small and unused, effectively making it four-legged.

A. Life cycle

Ariadne merione is a specific pest of the castor seed plant *Ricinus communis*. The life cycle includes egg, larva, pupa and adult stages.

B. Adult

Both male and female adults were nearly identical, characterized by their reddish brown colored wings bearing black colored wavy lines.

C. Egg stage

Gravid female lay eggs singly on the surface of the castor plant mostly before midday. The eggs were round, 0.80-0.90 (0.83 ± 0.04) mm in diameter and white at the time of oviposition and turned light brown before hatching.

D. Larval stage

There were five larval stages. The larvae were cylindrical slender palebrown in colour from brownish green to dark green till it grew up to last instar stage. Body spines are green in colour, arranged in four lines on each side of the body.

E. Pupal stage

The pupal stage lasted for 5-7 day. The brown colour of pupae changed to black at the time of maturation. It was roughly angular in shape, with narrow anterior end and broad in the middle. At the broadest point, both the lateral sides were curved in word.

F. Rearing of test organism

The larvae of common castor butterfly, *Ariadne merione*, were collected from the area near old Gangapur Naka and were reared in nylon net cages (45x45x45 cm) kept in laboratory under controlled room temperature. The larvae were fed with fresh castor leaves every day. The last instar stage larvae were selected for the pesticidal treatment.

G. Host plant of Test organism: Ricinus communis (Castor oil Plant)

The castor oil plant, Ricinus communis, is a species of flowering plant belonging to family, Euphorbiaceae. It belongs to a monotypic genus, Ricinus, and subtribe, Ricininae. Castor is indigenous to the south eastern Mediterranean Basin, Eastern Africa,

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and Indian, but is widespread throughout tropical regions (and widely grown elsewhere as an ornamental plant). Its seed is the castor been which, despite its name, is not a true bean. Castor seed is the source of castor, which has a wide variety of uses. The seed contain 40% to 60% oil that is rich in triglycerides, mainly ricinolein. The seed contains Ricin, a toxin, which is also present in lower concentration throughout the plant.

H. Test insecticides

Two insecticides namely Cartaphydrochlorides 50% S.P. CALDAN 50 S and Nimbicidine were used in the present investigation. Cartaphydrochloride derived from annelids chemical compound which is neutral in nature. Nimbecidine derived from natural source Azadirecta indica. Working concentrations of insecticides were prepared from the stock solution of 10,000 ppm for each insecticide.

I. Larval treatment

The test insect larvae were starved for 24 hours before treating them with insecticides. The set of 10 larvae each was treated with different concentrations of insecticides. 3gm of castor leaves were weighed by balance and dipped in 50 ppm , 100 ppm, 200ppm, and 300ppm, for 30 seconds . The excess of insecticide was shaken off from the leaves and the leaves were dried in shade. Larvae of each set were fed with the treated leaves for 24 hours and then fed daily with fresh untreated leaves of castor. LC50 was measured after 24 hours to the 96 hours including the control. For each set the readings were taken in triplicates. In control treatment, the leaves were dipped in distilled water. The treated larvae were provided with fresh castor leaves and mortality was recorded every 24 hours till up to 96 hours.

J. Test concentrations of Cartaphydrochloride

Stock Solution: 50ppm – 0.05 gm of cartaphydrochloridedissolved in 100 ml distilled water.
100ppm - 0.1 gm of cartaphydrochloride dissolved in 100ml distilled water.
200ppm - 0.2 gm of cartaphydrochloride dissolved in 100 ml distilled water and
300ppm –0.3 gm of cartaphydrochloride dissolved in 100 ml distilled water.

K. Test Concentrations Of Nimbecidine

Stock solution: 1000ppm
50ppm- 1.25ml of Nimbecidine dissolved in 50ml of distilled water.
100ppm-2.50ml of Nimbecidine dissolved in 50ml of distilled water.
200ppm- 5ml of Nimbecidine dissolved in 50ml of distilled water and
300ppm-7.5ml of Nimbecidine dissolved in 50ml of distilled water.

Fig No.1 Rearing of larvae of *Ariadne merione* for Cartaphydrochloride

Fig No.2 Rearing of larvae of *Ariadne merione* for Nimbecidine

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Fig No.3 Larvae of *Ariadne merione* treated with 50 ppm by Cartaphydrochloride

Fig No.:4 Larvae of *Ariadne merione* treated with 50 ppm by Nimbecidine

Fig No.5 Larvae of *Ariadne merione* treated with 100 ppm by Cartaphydrochloride

Fig No.6 Larvae of *Ariadne merione* treated with 100 ppm by Nimbecidine

Fig No.: Larvae of *Ariadne merione* treated with 200 ppm by Cartaphydrochloride

Fig No.: Larvae of *Ariadne merione* treated with 200 ppm by Nimbecidine

L. Statastical Analysis

Statistical analysis was done by Paired 'T' test, and Regression equations.

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III. RESULT AND DISCUSSION

TABLE NO 1: Dose –mortality response of larvae of *Ariadnae merione* to Cartaphydrochloride

Concentration in (ppm) C	Log. Concentration	Observed Mortality (%)	Expected Probit value
24 Hrs reading			
50	1.6990	20	4.16
100	2.0000	40	4.75
200	2.3010	60	5.25
300	2.4771	80	5.84
48 Hrs reading			
50	1.6990	30	4.48
100	2.0000	60	5.25
200	2.3010	70	5.52
300	2.4771	90	6.28
72 Hrs reading			
50	1.6990	40	4.75
100	2.0000	70	5.52
200	2.3010	90	6.28
300	2.4771	100	8.09
96 Hrs reading			
50	1.6990	50	5.00
100	2.0000	70	5.52
200	2.3010	100	8.09
300	2.4771	100	8.09

A. Intrinsic toxicity of Cartaphydrochloride

The result in table no.1 reveal that the last instar larvae of *Ariedne merion*, when fed with leaves of *Ricinus communis* dipped in graded concentration of cartaphydrochloridevaries from 50-300ppm,The LC_{50} value for last instar were 50% mortality found at 96hrs for the 50ppm concentration and 70% mortality for 100ppm for 96hrs and 100% mortality for 200ppm and 100% mortality for 300ppm at96hrs.

The LC_{50} value for last instar larvae were 2.40, 2.16, 1.91, 1.80 and1.70 at 24hrs, 48hrs, 72hrs and 96hrs at different concentration. (Table No: 3).

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TABLE NO 2: Dose- mortality response of larvae *Ariadne merione* to Nimbecidine

Concentration in (ppm)	Log. Concentration	Observed mortality (%)	Expected probit value
24 Hrs reading			
50	1.6990	00	00
100	2.0000	20	4.16
200	2.3010	40	4.75
300	2.4771	60	5.25
48 Hrs reading			
50	1.6990	20	4.16
100	2.0000	40	4.75
200	2.3010	60	5.25
300	2.4771	80	5.84
72 Hrs reading			
50	1.6990	20	4.1
100	2.0000	60	5.25
200	2.3010	80	5.84
300	2.4771	80	5.84
96 Hrs reading			
50	1.6990	40	4.75
100	2.0000	80	5.84
200	2.3010	100	8.09
300	2.4771	100	8.09

B. *Intrinsic toxicity of Nimbecidine*

The result in Table no. 2 , reveal that the last instar larvae of *Ariadne merion* whene fed with leaves of Ricinus communis dipped in gradient concentration of Nimbecidine varied from 50-300ppm.

The LC_{50} value for last instar were 50% mortality no found for the 50ppm concentration, here found only 40% mortality and 80% mortality for 100ppmfor 96hrs, 100%mortality found at the 200 and 300ppm.

The LC_{50} value for last instar larvae were 2.16, 1.90, 1.80 and 1.70 at 24hrs 48hrs 72hrs and 96hrs at different concentration. (Table No: 4).

TABLE NO 3: The LC 50 value and regression equation for *Ariadne merione* treated with Cartaphydrochloride.

Exposure Period in hrs.	LC_{50} (ppm)	Regression equation Y=Probit kill X=Log. Conc.	Slope function	r^2
24	2.16	Y=2.072x+0.608	2.072	0.982
48	1.90	Y=2.120x+0.893	2.120	0.940
72	1.80	Y=3.946x+2.195	3.946	0.879
96	1.70	Y=4.562x-2.992	4.562	0.898

TABLE NO. 4: The LC_{50} value and regression equation for *Araidnae merione* treated with Nimbecidine

Exposure period in hrs	LC_{50} (ppm)	Regression equation Y= Probit killed X=Log. Conc.	Slope Function	r^2
24	2.40	Y=6.384x-9.989	6.384	0.828
48	2.16	Y=2.072x+0.608	2.072	0.982
72	1.91	Y=2.278x+0.4	2.278	0.904
96	1.80	Y=4.752x-3.378	4.752	0.898

TABLE NO 5: Result of paired 't' test

	LC50 of Nimbecidine	LC50 of cartap hydrochloride
Mean	2.0675	1.8925
SD	0.2680	0.1979
SEM	0.1340	0.0989
N	4	4

SD =Standard deviation
SEM =Standard error Mean
Two table P value= 0.0229*
*= Significant
95%confidence interval- 0.0496 +- 0.3039
Larvicidal effect of cartaphydrochloride and Neem products against various Lepidopteran insects has been widely studied earlier. In the present investigation efficacy of Nimbecidine and cartaphydrochloride has been studied.
The results of the present investigation reveals that when larvae of castor butterfly were treated with different concentrations of Nimbecidine and Cartaphydrochloride, Cartaphydrochloride was found to be more toxic than Nimbecidine.
Nimbecidine 0.03% at 200-300ppm,
100 -200ppm, 50-100ppm and 50-100ppm gave 50% mortality at 24hrs, 48hrs,72hrs and 96hrs respectively and
Cartaphydrochloride 50% SP at 100-200ppm, 50-100ppm, 50-100ppm, and 50ppm gave 50% mortality at 24hrs, 48hrs, 72hrs and 96hrs respectively.
Similar results were also reported by(Pankaj Sood et al, 2004).
Effective action of various Neem insecticides against lepidopteran insects have been reported by (LeventEfil et al, 2005.).

IV. CONCLUSION

The indiscriminate use of various chemical insecticides have posed serious problems and threat to non-target insects.
The results of the present investigation have shown that the plant and animal derived insecticides can be more effective in controlling the insect pests as well as less harmful to the non-target insects and the environment too.

V. SUGGESTION

Use of Herbal pesticides is better than chemical compound pesticides for keep the good health no risk in operating of manufacturer worker, agricultural worker, as well as effect on non harmful insects and control the environmental and water pollution.

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