eISSN 2581-8996
ONLINE
THE INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN MULTIDISCIPLINARY SCIENCES (IJARMS)
A BI-ANNUAL, OPEN ACCESS, PEER REVIEWED (REFEREED) JOURNAL
Vol. 5, Issue 01, Jan 2022

Conventional Insecticides and Phytochemical Insecticides against Castor semilooper (*Achaea janata*)

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Received: 10 Jan 2022, Accepted: 20 Jan 2022, Published with Peer Reviewed on line: 31 Jan 2022

Abstract

Experiments were conducted under laboratory and field conditions to find out the antifeeding, repellent and insecticidal efficacy of eight indigenous alcoholic plant origin insecticide and two conventional insecticides viz. Coleus amboinicus, Mentha longifolia, Mentha piperita, Mentha spicata, Ocimum basilicum, Ocimum canum, Pogostemon heyneanus, Salvia officinalis, Endosulfan and Phosphamidon against Castor semilooper Achaea janata and control (Benzene + emulsified water) under laboratory and field conditions, which are noxious insect pest of Castor, Ricinus communis Linn., Citrus and Guava etc.

Keywords – Pesticide, Herbicide, Insecticide, Ricinus communis etc.

Introduction

Conventional synthetic insecticides are handicapped in the environmental context by their long term persistence, high development of resistance by the insects, pests and propensity for bioaccumulation and major health concerns. India has a wide array of oil crops under cultivation. The most important oil seed crops are Groundnut, Rapeseed, Mustard, Sesame, Sunflower, Soybean, Niger, Castor and Linseed. The first seven are edible oil sources while the last two are non-edible.

Total oil seed crops are the most important communities in India, covering an area of 27 million hectare. Among the different oil seed crops growing in the country, rapeseed, mustard and the most important oil seed crops grown in an area of 6.85 million hectare with the production of 8.36 million tonnes during the year 2004-05 (Anonymous, 2006).The next important state is Uttar Pradesh, where rapeseed, mustard are grown in an area of 0.78 million hectare with the production of 0.787 million tonnes and yield is 1008/ha during the year 2003-04 (Anonymous, 2005).

The agricultural sector in our country is a major source of economic growth, which can help in raising our economy from the stagnant to the progressive stage by increasing the Gross National Product by supplying the physical surplus in the shape of the food and raw materials and by providing economy-surplus, which constitutes the material basis for economic development. Unfortunately, a major part of our agricultural production is eaten away and destroyed mercilessly by various pests and plant diseases.

Pests destroy more than one third of the world's crop production and this heavy crop at both the International and National level can be successfully dealt with only through the intensive use of pesticides. If pesticides are not used, the graph of the crop losses may rise to 50% and even more in the developing countries. The world today uses over 2.3 million tonnes of pesticides annually. Out of this, around 34% is used in North America, 40% in Europe and the rest in other parts of the world, particularly in the developing countries.

Study Area

The caterpillar and other states of *Achaea janata* collected from the *Castor*, *Ricinus communis* Linn. fields of Fattepur Gohi, Kanpur for conducting the experiments during the period of the study, the feeding habits of caterpillar have been noted. Generally, the caterpillars feed in the early and later parts of the day.

Material and Methods

The Castor Semiloper *Achaea janata* Linn. is the serius pest of various crops like Castor, Guava and Citrus etc. Caterpillar of Caster Semiloper, *Achaea janata* Linn. feeds the leaves of Castor, *Ricinus communis* Linn. and in severely attacked plants, their growth is arrested and consequently the yield is considerably reduced. The details of methodology employed in the experiments are given in the following headings.

Experimental Site

Experiments were conducted in the Department of Zoology, D.B.S. Post Graduate College, Kanpur. Geographically, the district Kanpur is located in between latitudes 25.26° and 26.58° and longitudes 19.31° and 84.34° East and at an elevation of about 127.117° metres above the mean sea level and has a semi-arid subtropical climatic conditions.

Test Insect

For the proposed study, the following insects have been used for their biological efficacy. The castor Semiloper *Achaea janata* Linn. (Lepidoptera : Noctuidae)

Caterpillar and other stages of *Achaea janata* collected from the Castor, *Ricinus communis* Linn. fields of Fattepur Gohi, Kanpur for conducting the experiments. During the period of study, the feeding habits of caterpillars have been noted. Generally, the caterpillars feed in the early and later parts of the day. In remaining period, due to hot sunshine, they move towards the under side of the leaves and in soil to hide themselves. In cloudy weather, the caterpillars continue to feed on the upper surface of leaves throughout the day.

a) Antifeedant Test

The five square cm. of castor *Ricinus communis* Linn. leaves was cut and dipped in different concentrations of the extracts. The castor leaf pieces fastened under clip and left under electric fan for about thirty minutes, to complete dry up the extract. In each set of extract, one control was kept in which the leaf pieces were dipped in Benzene + Emulsified water only. The treated pieces were kept in petridishes on moist filter papers and third instar starved caterpillars of castor semiloper *Achaea janata* Linn. were released in each petridish to feed for 24 hours. The area consumed by the larvae in each replication was measured with the help of Plainimeter. All the comparisions were made with control. Three replications of each treatment were done.

b) Repellent Test

For testing the repellent effect of the castor, *Ricinus communis* leaves were used as food against the caterpillars of castor semiloper *Achaea janata* Linn. and Castor leaves were used as food against *Achaea janata* treated with different concentrations like that of antifeeding test. The treated food was kept in jar (23cm×10cm) on moist filter paper. Then third instar 24 hours starved larvae were released in each jar. In each set of extract and one control was introduced, where the leaves pieces were dipped in Benzene + Emulsified water only. After four hours of the release of grubs, the data was collected on the number of larvae reached at each treated food. Three replications of treatment were made.

c) Insecticidal Test

After conducting the preliminary trials, the regular experiments were carried out under laboratory conditions. The third instar caterpillars of Castor semiloper, *Achaea janata* Linn. were used for the purpose. The insecticides of the plants origin were tested by dry-film technique. The spraying of the insecticides was done in glass petridishes (10cm diameter) by potter's spray tower, using 1.0 ml of solution (Insecticidal preparation) per petridish. Three or five concentrations were tested in three replications, along with over control (Benzene + emulsified water). To record the mortality, the spray petridishes were gently shaken under an electric fan until the liquid phase evaporated leaving behind a uniform dry film of insecticide on the glass surface. The spray tower was thoroughly rinsed with the insecticide solution. Inside each pair of petridishes. Known aged ten caterpillars were released and allow remaining there up to two hours; after which, they were transferred to the fresh petridishes containing fresh food for feeding.

These petridishes were kept as such under control conditions (27±2°C temp, 75±5% relative humidity) and mortality count was taken after 6, 12 and 24 hours of exposure.

The mortality of the hairy caterpillars castor semilooper *Achaea janata* Linn. was counted after 24, 48, 72 hours of released.

In the field experiments, the different plant origin insecticides at different concentrations selected plant origin insecticides (0.5, 1.0 and 2.0) and conventional insecticides (0.001, 0.003 and 0.005) were sprayed on castor plots against the 3^{rd} instar, 24 hours starved larvae of *Achaea janata*.

The control plots were sprayed with Benzene + emulsified water. The laboratory reared 24 hours. starved larvae of *Achaea janata* were released. Observations on mortality were recorded after 24, 48, and 72 hours of spraying. Thus, the percentage reduction in larvae of *Achaea janata* populations considered for assessing the efficacy of the treatments. It was obvious from the results that the reduction of larvae of *Achaea janata* was promising when treated with the 0.05% *Endosulfan*, followed by 2.00% *P. Heyneanus*.

The *C. Amboinicus* and *Phosphomidon* proved the least effective, when compared to the selected plant origin insecticide and conventional insecticides. On the basis of percentage mortality of grubs the following descending order was observed as *Endosulfan* (77.56) > *P. Heyneanus* (54.06 percent) > *M. Longifolia* (53.86 percent) > *M.Piperita* (53.55 percent) > *S. Officinalis* (52.23 percent) > *M. Spicata* (51.66 percent) > *C. Amboinicus* (51.30 percent)> *Phosphomidon* (46.81 percent) > *O. Canum* (36.40 percent) respectively.

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Overall in the analysis of variance of all the experiments under the lab and field conditions, 0.005% *Endosulfan* was proved to be the highest effective than the *Phosphamidon*. The 2.00% *P. Heyneanus, M. Longifolia* and *M. Piperita* also gave promising results.

On the basis of the above mentioned anti-feeding and insecticidal results, it is concluded that all the plant origin insecticides and conventional insecticides were the most effective for protecting the castor and vegetables in the laboratory as well as in the field conditions when compared with that of control.

Table - Mean Mortality percentage of *Achaea janata* in different exposure period irrespective of concentration under invitro.

Treatment (Plant extracts)	Conc. %	Mean Mortality Percentage after-		
		6 hours (T_1)	12 hours (T_2)	24 hours (T_3)
Mentha Longifolia	0.5	35.22	39.15	46.92
Mentha Longifolia	1.0	43.08	48.85	52.78
Mentha Longifolia	2.0	62.44	71.56	83.85
Mentha Piperita	0.5	43.08	45.00	46.92
Mentha Piperita	1.0	46.92	48.85	52.78
Mentha Piperita	2.0	63.44	66.15	68.85
Mentha Spicata	0.5	41.15	45.00	46.92
Mentha Spicata	1.0	46.92	52.78	54.78
Mentha Spicata	2.0	50.77	52.78	61.22
Ocimum Basilicum	0.5	35.22	37.22	39.23
Ocimum Basilicum	1.0	41.15	43.08	45.00
Ocimum Basilicum	2.0	56.76	59.01	61.22
Ocimum Canum	0.5	23.85	26.56	28.78
Ocimum Canum	1.0	30.99	35.22	37.22
Ocimum Canum	2.0	00.00	41.15	43.08
Pogostemon Heyneanus	0.5	41.15	43.08	45.00
Pogostemon Heyneanus	1.0	52.78	54.78	59.01
Pogostemon Heyneanus	2.0	61.22	63.44	66.15
Salvia officinalis	0.5	43.08	46.92	50.77
Salvia officinalis	1.0	45.00	46.92	48.85

Treatment (Plant extracts)	Conc. %	Mean Mortality Percentage after-		
		6 hours (T_1)	12 hours (T_2)	24 hours (T_3)
Salvia officinalis	2.0	63.44	59.01	66.15
Coleus amboinicus	0.5	46.92	48.85	50.77
Coleus amboinicus	1.0	56.79	61.22	63.44
Coleus amboinicus	2.0	63.44	66.15	83.85
Endosulfan	0.01	59.01	63.44	83.85
Endosulfan	0.03	71.56	90.00	90.00
Endosulfan	0.05	90.00	90.00	90.00
Phosphamidon	0.01	37.22	43.08	48.85
Phosphamidon	0.03	45.00	48.85	52.78
Phosphamidon	0.05	54.78	61.22	63.44

Figures within Parenthesis represent mean percentage transformed back values.

C.D. for the treatment combination means = 0.2728

REFERENCE

1. Aalbersberg, W.G.I. and Singh Y. (1991). Essential Oil of Fijan Ageratim Conyzoides Flavour and Fragrance, J. 6: 117-120.
2. Abbas, J.A., El. Oqlah, A.A. and Mahasneh A.M. (1992). Herbal Plants in the Traditional Medicine of Bahrain, Econ. Bot. 46(2): 158-163.
3. Abott, W.S. (1925). A Method of Computing the Effectiveness of An Insecticide. Jour. ECon. Ent. 18: 265-267.
4. Abe, M. and K. Matsuda (2000). "Feeding Deterrent from Momordica Charantia Leaves to Cucurbitaceous Feeding Beettle Species." Applied Entomology and Zoology 35(1): 143-149.
5. Kareem, A.A., Sadakanthulla S., Venugopal M.S. and Subramaniam T.S. (1974). Efficacy of Two Organotim Compounds and Neem Extract against the Sorghum Shootly. Phytoparasite 2(2): 127-130.
6. Afifi, F.A. Salem M. and Hekal, A.M. (1989). Insecticidal Property of the Extracts of Lupin seed the Caraway fruits against some stored product insects Annals Agric. Sci. 34(1): 401-414.
7. Agarwal, I.L. (1993). Ovecidal Activity of Four Plant Extracts on Dysdercus Krenigii Fabr. Indian J. Ent. 55 (4): 440-443.
8. Agarwal, K.K., Tripathi A.K., Ahmed A., Prajapati V., Verma N. and Kumar S. (2001). Toxicity of 1-Menthol and Its Derivatives Against Four Storage Insects. Insect Sci. Applic. 21(2): 117-122.
9. Ahmed, A.P.Y. and Ahmed S. (1991). Potential of Some Rhizomes of Zingiberaceae Family as Grain Protectants Against Storage Insect Pests. J. Food Science and Technology 28(6): 375-377.
10. Ahuja, D.B. and Sehgal V.K. (1982). Effect of Seed Extracts Containing Mustard Oil Glucosides on Feeding Responses of Mustard Sawfly, Athalia Proxima Klug. Indian Ent. 44(1) : 34-40.
11. Ali, S.I., Singh, O.P. and Misra U.S. (1983). Effectiveness of Plant Oils Against Pulse Beetle Collosobruchus Chinensis Linn. Indian J. Ent. 45(1): 6-9.
12. Alford, A.R., Cullen, A.J., Storch, H.R. and Bentley M.D. (1987). Anti-feedant activity of Limonin Against the Colorado Potato Beetle (Coleoptera: Chrysomedae). Jour. ECon. Ent. 80 (3): 575-578.
13. Ambika Devi D. and Mohandas N. (1982). Relative Efficacy of Some Antifeedants and Deterrants Against Insects Pest of Stored Paddy. Entomon. 7(3): 261-264.