Int.J.Curr.Res.Aca.Rev.2018; 6(1): 11-16

International Journal of Current Research and Academic Review

ISSN: 2347-3215 (Online) Volume 6 Number 1 (January-2018)

Journal homepage: http://www.ijcrar.com

doi: https://doi.org/10.20546/ijcrar.2018.601.xxx

Pesticidal Activity of *Hyptis suaveolens* L. Seed Extract for the Control of the Rice Moth, *Corcyra cephalonica stainton*

S. Peer Mohamed[1*], H. M. Mahilini[2], S. Sankaralingam[3] and D. Kathiresan[3]

[1]Department of Zoology, Sadakathullah Appa College, Tirunelveli, Tamil Nadu, India
[2]Department of Zoology, St. John's College, Tirunelveli, Tamil Nadu, India
[3]Department of Botany, Saraswathi Narayanan College, Madurai, Tamil Nadu, India

**Corresponding author*

Abstract

The pesticidal properties of different plants are used worldwide for the control of insect pests of crop plants, and pests of domestic animals and human beings. The seed extract of *Hyptis suaveolens* contains potential pesticidal components compared to other parts. The potential of *Hyptis suaveolens* a common weed available in scrub jungles against the larvae of rice moth is tried in this study. Both petrolem ether and ethanolic extracts of *H. suaveolens* seeds were administered against the larva of the rice moth *C. cephalonica stainton* either in the form of spray through oral route. The results revealed that administration through oral route was more toxic. LD_{50} 48h at of 3rd instar of *C. cephalonica* was 92.70 µg/g for pet ether and 49.79 µg/g for ethanol. The LC_{50} values pertaining to spray administration were 48.21 µg /dl and 39.12 µg/dl respectively. The study indicated that the presence of phyto chemicals like cynogenic glycosides, phenolics, flavonoids, terpenoids and saponin in *H. suaveolens* seeds could have contributed to the toxicity against for *C. cephalonica* larvae.

Article Info

Accepted: 31 December 2017
Available Online:20 January 2018

Keywords

Hyptis suaveolens,
C. cephalonica stainton,
Seed extract,
Larval toxicity

Introduction

Plant products are increasingly used in the management of insect pest. They are superior to chemical pesticides because of their bio degradable nature and lesser environmental toxicity. Various types of plants and their parts are used in preparation of plant based insecticide. Plant products are store houses of insecticidal, ovicidal and insect deterrent bio active compounds (Al Qahtani *et al.*, 2012; Mostafa *et al.*, 2012). Bioactive compounds from plants form a key component of Integrated Pest Management. Plants are repositories of noval bioactive compounds with significant biocidal properties. *Hyptis suaveolens* L. posseses bioactive compounds with prominent ovicidal, larvicidal and adulticidal properties against insect pests (Conti *et al.*, 2012). These bioactive compounds have been field tested on crop plants to assess their efficacy as raw extracts on common lepidopteron larvae. Isolation of specific compounds and elucidation of their structure are prerequisites for producing synthetic molecules that mimic the plant bioactive compounds.

The protection of stored agricultural products using plant materials is an age-old practice in many parts of the world (Jacobson; Poswal and Akpa, 1991). Insecticial properties of *Ocimum viride* Wild, *Piper mullesua* Buch. Ham, *Azadirachta indica* A. Juss. and *Nicotiana tabacum* L. are helpful in the management of insect pests

(Jacobson; Ohigashi *et al.,* 1991; Owusu, 2000; Srivastava *et al.,* 2001; Nathan *et al.,* 2005). These insecticides of plant origin are commonly used in the form of aqueous solvent extracts, powders, volatiles and oils (Keita *et al.,* 2001, Srivastava *et al.,* 2001; Tapondjou *et al.,* 2002).

Hyptis suaveolens L. is used as an effective pesticide capable of controlling serious pests like *Sesamia calamistis* Hampson, *Helicoverpa armigera* and *Spodoptera litura* (Fab). (Moreira *et al.,* 2010) analysed the essential oil obtained from *H.suaveolens* leaves using GC-MS and identified a number of bio active compounds with different retention timings. (Shaikat *et al.,* 2012) carried out phyto chemical screening of *H. suaveolens* to identify the presence of alkaloids, glycosides, saponins, tannin and flavonoids in the ethanolic extracts of the leaves. In this study extracts of *H. suaveolens* seeds in petroleum ether and ethanol were administered to *C.cephalonica* larvae through spray and feed to find out their pesticidal activity.

Materials and Methods

Extraction of seed powder

Two hydrophobic polar solvents, petroleum ether and ethanol were used for the extraction. The extracts were prepared in 1 and 5 percent concentration.

H. suaveolens seed powder was prepared by grinding dried seeds in an electric blender. Aliquots of 1 and 5g of *H. suaveolens* seed powder were thoroughly mixed with 100 ml of each solvent and kept in stoppered glass bottles for 120 hours.

The bottles were placed in a rotary shaker at 80 rpm for the entire period. After 120 hours, the contents of each bottle were decanted into fresh dry stoppered bottles with appropriate labels. The extracts were used to assay the toxic response of *C. cephalonica* larvae.

Toxicity of *H. suaveolens* seed extracts to fourth instar *C. cephalonica* larve was analysed using two types of basic assays depending upon the type of administration of the extracts.

Third Instar Larvae: Spray administration

The seed extracts were evaporated in a rotary vaccum evaporator. The evaporated solvents were separately collected and the concentrated extracts were removed and dried in a dessicator.

The raw extracts were mixed in water to prepare a series of concentrations of liquid preparations to be sprayed on the larvae. The larvae to be sprayed were placed in glass petriplates on paper padding. Spraying was done using a glass chromatographic sprayer.

The sprayed larvae were allowed to remain drenched with the toxicant for a maximum period of 20 seconds and were removed to another petriplate and fed with flour after 30 minutes. The mortality of the larvae was recorded at 12 h intervals for a maximum period of 72 h.

The third Instar *C. cephalonica* larvae were sprayed with pet ether extract of *H.suaveolens* at concentrations ranging from 20-75 µg dl with 5 µg intervals and ethanol extract with 12 different concentrations ranging from 10-65 µg/dl (5 µg intervals).

During each observation, the larvae were separated using a fine brush and the dead larvae were removed and recorded the count recorded.

Feed administration

The raw extracts of *H.suaveolens* seed were mixed with the flour to be fed to fourth *C.cephalonica* larvae. The extracts and the flour were thoroughly mixed by shifting the mixture a number of times.

Aliquots containing the required quantity of the extracts were mixed with the flour thoroughly, subsequently dried and shifted to ensure thorough mixing. The mortality of the larvae was through consumption of flour mixed with the toxicant and thus LD_{50} values were calculated.

Third Instar Larvae: Feed administration

The third instar *C.cephalonica* larvae were fed with pet ether seed extract of *H.suaveolens* mixed with flour at 12 different concentration ranging from 40 to 150 µg/g with 10 µg increase at each level. The third instar larvae were also fed with *H. suaveloens* ethanol extract mixed flour of concentrations ranging from 35 to 68 µg/g with an increase of 3µg.

Probit analysis

Probit analysis of the toxicity response of the fourth instar *C.cephalonica* against pet ether and ethanol extracts of *H.suaveolens* administered through spray or feed was made using method by (Finney, 1971).

Results and Discussion

The LC_{50} of *H. suaveolens* pet ether seed extract at 24h to *C. cephalonica* third instar larvae was 59.85 µg/dl. The corresponding value for ethanol extract was 52.65 µg/dl. In feed administration, the LD_{50} of pet ether seed extract at 24h was 113.18 µg/g and the corresponding value for ethanol extract was 56.20 µg/g.

The LC_{50} of *H. suaveolens* pet ether seed extract at 48 h to *C. cephalonica* third instar larvae was 48.21 µg/dl. The corresponding value for ethanol extract was 39.12 µg/dl. In feed administration, the LD_{50} of pet ether seed extract at 48 h was 92.70 µg/g and the corresponding value for ethanol extract was 49.79 µg/g. The LC_{50} of *H. suaveolens* pet ether seed extract 72 h to *C. cephalonica* third instar larvae was 40.53 µg/dl. The corresponding value for ethanol extract was 27.15 µg/dl. In feed administration, the LD_{50} of pet ether seed extract at 72 h was 74.90µg/g and the corresponding value for ethanol extract was 46.30 µg/g. (Table 1 - 4).

The insecticidal property of different plant parts is exploited in the management of field, domestic and stored grain pests. Stored grain pests like *C.cephalonica* and *Callosobruchus maculatus* fabric us are effectively managed using plant derivatives. Resistance and toxicity problems associated with synthetic insecticides are not encountereded in the case of plant based pesticides.

The most commonly used plant part for extract preparation against insect pest is the leaf. Trees in cities are more prone to heavy metal pollution due to pervasive pressure of auto vehicular emission (Li *et al.*, 2007) and leaf is the most sensitive part affected by air pollutants as major physiological processes are concentrated in the leaf (Rejini and Janardhanan, 1989; Naveed *et al.*, 2010). (Iwalokun *et al.*, 2012) studied the anti-microbial activity of a new chemo type of *H. suaveolens* from Nigeria. About 28 volatile compounds were identified in the dried leaves of the plant subjected to hydro distillation. (Jayakumar and Ganesh, 2012) studied the effects of crude extracts of *H. suaveolens* leaves prepared by using solvents like hexane, petroleum ether, ethyl acetate, chloroform, methanol, acetone and water. The leaf extracts were found to have anti feedant, ovi position deterrant, ovicidial and insecticidal activity against *Helicoverpa armigera* Hubner and *Spodoptera litura*. Root extracts of plants are also extensively used as insecticidal compounds.

The seeds of a number of plants are found to possess insecticidal activity. (Chatterjee *et al.*, 1980) analysed the insecticidal properties of the seeds of *Jatropha gossypifolia* L. The toxicity *Azadirachta indica* seed A. *Juss* on *Sitophilus oryzae* L. in stored and reported (Ivbijaro, 1983).

Table.1 Toxicity nh LC_{50} values and their confidence intervals of 3rd instar *C. cephalonica* larvae sprayed with pet ether extract of *H. suaveolens* seeds

S.No.	Period of Exposure (h)	LCL	LC_{50}	UCL
1.	24	54.94	59.85	65.117
2.	48	44.13	48.21	52.58
3.	72	36.39	40.53	45.10

Table.2 Toxicity nh LC_{50} values and their confidence intervals of 3rd instar *C. cephalonica* larvae sprayed with ethanolic extract of *H. suaveolens* seeds

S.No.	Period of Exposure (h)	LCL	LC_{50}	UCL
1.	24	47.96	52.651	57.716
2.	48	34.745	39.121	43.994
3.	72	23.971	27.150	30.711

Table.3 Toxicity nh LD_{50} values and their confidence intervals of 3rd instar *C. cephalonica* larvae fed with pet ether extract of *H. suaveolens* seeds

S.No.	Period of Exposure (h)	LDL	LD_{50}	UDL
1.	24	104.809	113.183	122.03
2.	48	84.197	92.701	101.882
3.	72	67.266	74.900	83.253

Table.4 Toxicity nh LD_{50} values and their confidence intervals of 3rd instar *C. cephalonica* larvae fed with ethanolic extract of *H. suaveolens* seeds

S.No.	Period of Exposure (h)	LDL	LD_{50}	UDL
1.	24	53.186	56.201	59.306
2.	48	47.238	49.791	52.408
3.	72	44.045	46.304	48.607

Seed extracts are seldom used as insecticidal compounds. (Pathak and Tiwari, 2012) studied the insecticidal action of acetone extracts of neem seed against *C.cephalonica*. A dose level of 0.01 mg / 100 mg of flour resulted in 6±2.11% larval death. At 0.1 mg / 100 mg flour, the mortality of larvae was 54± 2.19%. Thus seeds of neem contain bioactive compounds highly effective against insect life stages even at low concentrations.

H. suaveolens seed contained cynogenicglycosides, phenolic compounds, flavonoids, terpenoids and saponins. Presence of heavy metals like Arsenic, Cadmium, Copper, Chromium, Lead and Zinc were recorded in the leaf, flower, roots, stem and seeds *H. suaveolens*. AAS analysis showed that the seeds carried a heavy level of copper and zinc. Heavy metal ions found in different plant parts potentiate them as insecticides.

Plants absorb heavy metals through the roots as well as the parts in contact with heavy metal rich medium.

Seeds of *H. suaveolens* store significant amounts of copper and zinc and very little quantities of Arsenic, Cadmium, Lead and Chromium. *H. suaveolens* is toxic to the third, fourth and fifth instar larvae of *C. cephalonica* and the role played by the constituent heavy metals is not clearly known.

H. suaveolens was found to be toxic to the larvae of *C. cephalonica* in spray and feed administrations.

The ethanolic extracts is presumed to contain hydrophilic alkaloids with a high level of insecticidal activity than pet ether extract. When the extracts are sprayed, the active components in the extracts acted on the external body surface of the larvae. There are limited possibilities for the components to enter into the body except for those components with ability to penetrate the larval skill. But in feed administration, the active principals are consumed along with feed and they affect the insects more than spray.

References

Al Qahtani AM, Al-Dhafar ZM, Rady, MH. Insecticidal and Biochemical effect of Some dried plants against *Oryzaephilus surinamensis* (Coleoptera – Silvanidae). The Journal of Basic and Applied zoology. 2012; 65(1): 88-93.

Chatterjee AB, Das N, Aditychaudhury, Debkirtaniya S. Note on insecticidal properties of the seeds of *Jatropha gossypifolia* Linn. Indian J. Agric. Sci., 1980. 50(8): 637-638.

Conti B, Benelli G, Flamini G, Cioni PL, Profeti R, Ceccarini L, Macchia M. Canale ALarvicidal and repellent activity of *Hyptis suaveolens* (Lamiaceae) essential oil against the mosquito *Aedes albopictus* Skuse (Diptera: Culicidae). Parasitology Research. 2012. 110(5): 2013-2021.

Finney PJ. Probit analysis - 3rd edition. Cambridge University Press, Cambridge, London. 1971.

Ivbijaro MF. Toxicity of neem seed, *Azadirachta indica* A. Juss, to *Sitophilus oryzae* (L.) in stored maize. Protection Ecology. 1983. 5(4): 353-357.

Iwalokun BA, Oluwadun A, Otunba A, Oyenuga OA. Chemical composition and Antimicrobial activity of a New Chemotype of *Hyptis suaveolens* (Poit) from Nigeria. Current Research Journal of Biological Sciences. 2012. 4(3): 265-272.

Jacobson M. Botanical pesticides, past present and future. In: *Insecticides of plant origin*, 1-10 (Eds J T Arnsaon, B J R Philogene and P Morand). Proceedings of the American Chemical Society, ACS series, Washington DC.

Jayakumar and Ganesh. New enolic type bioactive constituents from *Hyptis suaveolens* (L.) Poit. Asian Journal of Plant Sciences and Research. 2012. 2(4):403-408.

Keita SM, Vincent C, Schmidt JP, Arnason JT, Belanger A. Efficacy of essential oil of *Ocimum basilicum* L. and O. *gratissimum* L. applied as an insecticidal fumigant and powder to control *Callosobruchus maculatus* (Fab) (Coleoptera: Bruchidae). Journal of Stored Products Research. 2001. 37: 339-349.

Li FR., Ling F, Gao XQ. Traffic-related heavy metal accumulation in soils and plants in Northwest. China. Soil Sedim. Contam., 2007. 16:473-484.

Moreira ACP, Lima EO, Wanderley PA, Egberto Santos Carmo, Evandro Leite de Souza. Chemical composition and antifungal activity of *Hyptis suaveolens (*L). poit leaves essential oil against *Aspergillus speices.* Brazilian Journal of Micro Biology. 2010. 41:28-33.

Mostafa M, Hossain H, Hossain MA, Biswas PK, Haque MZ. Insecticidal activity of plant extracts against *Tribolium Castaneum* Herbst. Journal of Advanced scientific research, 2012; 3(3): 82-84.

Nathan S, Kalaivani K, Mururgan K, Chung PG. Efficacy of neem limonoids on *Cnaphalocrocis medinalis* (Guenee) (Lepidoptera: Pyralidae), the rice leafroller. Crop Protection. 2005. 24: 760-763.

Naveed NH, Batool AI, Rehman FU, Hameed U. Leaves of roadsides plants as bioindicator of traffic related lead pollution during different seasons in Sargodha, Pakistan. Afr. J.Environ. Sci. Technol. 2010. 4:770-774.

Ohigashi H, Takagaki T, Koshimizu K, Watanabe K, Kaji M, Hishino J. Biological activities of plant extract from tropical Africa. Africa Study Monograph. 1991. 12:201-210.

Owusu OO. Effect of some Ghanaian plant components on the control of two stored product insect pests of cereals. Journal of stored Products Research. 2000. 37:85-91.

Pathak CS, and Tiwari SK. Insecticidal Action of Neem Seed (Azadirachta indica A. Juss) Acetone Extract against the Life-Cycle Stages of Rice-Moth, Corcyra cephalonica Staint. (Lepidoptera: Pyralidae). World Journal of Agricultural Sciences. 2012. 8 (5): 529-536.

Poswal MAT, and Akpa AD. Current trends in the use of traditional and organic methods for the control of crop pests and diseases in Nigeria. Trop. Pest Manag., 1991. 37: 329-333.

Rejini MBJ, and Janardhanan K. Effect of heavy metal on seed germination and early seedling growth of groundnut, sunflower and ginger. Geobios. 1989. 16:164-170.

Shaikat H, Zeshan Md, Md.Taleb Hossain, Md. Golam Azam. Phytochemical screening and Antidiarrhoeal Activity of *Hyptis suaveolens.* Int.Jn. of Applied research in Natural Products. 2012. 5(2):1-4.

Srivastava S, Gupta MM, Prajapati V, Tripathi AK, Kumar S. Insecticidal activity of myristicin from *Piper mullesua.* Pharamaceutical Biology. 2001. 39: 226-229.

Tapondjou LA, Adler C, Bouda H, Fontem DA. Efficacy of powder and essential oil from *Chenopodium ambrosoides* leaves as post-harvest grain protectant against six stored-product beetles. Journal of stored Products Research. 2002. 38: 395-402.

How to cite this article:

Peer Mohamed S., H. M. Mahilini, S. Sankaralingam and Kathiresan D. 2018. Pesticidal Activity of *Hyptis suaveolens* L. Seed Extract for the Control of the Rice Moth, *Corcyra cephalonica stainton*. *Int.J.Curr.Res.Aca.Rev*. 6(1), 11-16. **doi:** https://doi.org/10.20546/ijcrar.2018.601.002