



LARVICIDAL EFFECTS OF *PARTHENIUM HYSTEROPHORUS* AGAINST POLYPHAGUS PESTS *SPODOPTERA LITURA* AND *SPODOPTERA LITTORALIS*

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ABSTRACT Though numbers of plants are screened for insecticidal properties, *P. hysterothorus* is not much explored. It is a nuisance plant weed which has adverse effects on growth and development of major cash crop and also hazardous to human well being and its eradication is mandatory. Thus in the present investigation, *P. hysterothorus* will be scientifically checked for its insecticidal potential to control *Spodoptera litura* and *Spodoptera littoralis* which are major pests for oil seed plants like soybean, a major cash crop in Nandurbar district with tribal population. The use of *P. hysterothorus* as an insecticide will automatically help in its eradication. Present investigation has been undertaken to screen the crude extract of *P. hysterothorus* with different solvent systems against larvae of *S. litura* and *S. littoralis*.

KEYWORDS : *Parthenium*; *Spodoptera litura*; *Spodoptera littoralis*; LC50.

INTRODUCTION:

Over the centuries people have struggled to protect crops against invasion by pests and microbial pathogens. To overcome this problem of insect pests, numerous synthetic insecticides and pesticides are used in regular practice but pesticide resistance develops in insect and negative effects are reported on target and non-target organisms including human being and environment^[1]. One possible way to reduce all these death-defying effects of synthetic insecticides and pesticides is to use plant derived insecticides which are more eco-friendly and medically safe^[2]. Botanical products are one of the most prominent alternatives for pest control in current and future requirements^[3]. Several plant extracts have been evaluated for their activity against important agricultural pests for a few decades in different countries^[4] but only few have been reached up-to field trials and commercialization.

Now a day researchers turned toward the botanicals as the chemical pesticides resulted in evolution of the pesticide resistance for several pests. More than 2000 species of plants are known to possess some insecticidal activity. Due to these reasons number of researchers are orienting towards the evaluation of toxicity of secondary metabolite of plants; like phenols, alkaloids, glucosinolates, cyanogenic glycosides and saponins^[5]. Various studies of different plant species extracts were performed on different insect pests, still their applications are not known to the farmers^[6].

In Present study has been undertaken to screen the crude extract of *P. hysterothorus* with different solvent systems against larvae of *S. litura* and *S. littoralis* to obtain a sustainable alternative to the synthetic insecticide.

MATERIALS AND METHODS:

1. Plant material: *Parthenium hysterothorus* plants were collected from local area. It was identified and authenticated by Dept. of

Botany of our institute.

- Insects: For collection of *Spodoptera litura* and *Spodoptera littoralis* eggs and larvae were collected from crop fields of Dhadgaon and Shahada Tehsil and sterilized with 0.02% sodium hypochloride solution, dried and allowed to hatch and third generation larvae were used. The culture was continuously maintained on castor bean leaves at room temperature ($27 \pm 2^\circ \text{C}$), $65 \pm 5\%$ RH and 12:12 L:D photo period in the laboratory for further experimentation.
- Extraction of crude extracts using different solvent systems: Fresh leaves of identified *Parthenium hysterothorus* were collected, washed, shade dried and coarsely powdered. Known quantity of powdered leaves extracted with known quantity of Chloroform, ethyl acetate, methanol and water in soxhlet apparatus.
- Toxicity assay for crude extracts: Different concentrations of crude extract of *P. hysterothorus* were screened for larvicidal activity against 4th instar larvae of *S. litura* and *S. littoralis* using leaf deep method and LC 50 & LC 90 values were determined using Probit Analysis method of Finney^[7]. For each experiment, 4th instar larvae were used for 48 hours of exposure with 5 replicates.

RESULTS:

Present investigation showed that LC 50 values & LC 90 values for different solvent extracts of *P. hysterothorus* for both species of *Spodoptera*. It is observed that aqueous extracts of *P. hysterothorus* LC 50 values i.e 7.96 and 8.18 for 72 hours of exposure were least as compared to Chloroform, Ethyl Acetate and Methanol for *S. litura* and *S. littoralis* respectively. Similarly LC 90 values i.e 11.28 and 12.05 were also found least for 72 hours of exposure to aqueous extract as compared to other solvents used for preparation of crude extracts. It was also observed aqueous extracts of *P. hysterothorus* would be helpful to control these polyphagous pests.

LC 50 & LC 90 values for 72 hours of exposure of *P. hysterothorus* crude extracts using different solvents against *S. litura* and *S. littoralis*

Sr. No.	Insect	Solvent of Extraction	LC 50 Value (% conc)	95% confidence limit		LC 90 Value (% conc)	95% confidence limit	
				Lower	Upper		Lower	Upper
1	<i>Spodoptera litura</i>	D. Water	7.96	4.92	9.20	11.28	9.59	13.60
2		Chloroform	8.18	6.17	10.11	14.92	12.98	16.34
3		Ethyl Acetate	9.26	8.20	11.05	16.14	15.20	17.10
4		Methanol	10.40	9.10	12.20	17.96	16.90	19.40
5	<i>Spodoptera littoralis</i>	D. Water	8.14	5.40	9.29	12.05	10.05	14.25
6		Chloroform	9.34	7.46	11.25	15.94	15.05	17.65
7		Ethyl Acetate	10.20	9.15	11.95	17.59	16.50	19.60
8		Methanol	12.05	10.14	13.55	19.24	18.55	22.50

DISCUSSION:

Finding of the study reveals that LC 50 & LC 90 values for 72 hours of exposure were least for aqueous extract of *P. hysterophorus* exposed to both species of *Spodoptera*. Hence aqueous extract of *P. hysterophorus* could be helpful to control these polyphagous pests. These findings are similar to our previous^[8, 9] findings where Fall Army worms were exposed to aqueous extract of Parthenium. Similarly Datta and Saxena^[10] found Parthenium hysterophorus is helpful to control insect pest. Their study revealed that lactone was found to be about 2.25 times more active than parthenin against sixth-instar larvae of *Spodoptera litura* and pyrazoline adduct was found to be the most effective as an insecticide against the adults of store grain pest *Callosobruchus maculatus*.

Many studies^[11,12,13] suggest *P. hysterophorus* can be used for their insecticidal properties hence need to encourage the research on the utilization potential of this weed and to evaluate its efficacy as insecticide in near future.

CONCLUSION & SUMMARY:

In present investigation, *P. hysterophorus* was scientifically checked for its insecticidal potential and showed values of LC 50 & LC 90 for aqueous extract on 72 hours of exposure to *Spodoptera litura* and *Spodoptera littoralis* were least. Both *Spodoptera* species are major pests for oil seed plants like soybean, a main cash crop in Nandurbar district with tribal population of Maharashtra. Thus use of *P. hysterophorus* as an insecticide will automatically help in eradication of this invasive weed from crop land.

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REFERENCES:

1. K. M. Remia, S. Lowgaswamy, "Larvicidal efficacy of leaf extract of two botanicals against mosquito vector *Aedes aegypti* (Diptera: Culicidae)". *Indian J Nat products & Resources* Vol. 1(2), pp. 208-10, 2010.
2. F. E. Dayan, C. L. Cantrell, and S. O. Duke, "Natural products in crop protection", *Bioorgan Med Chem*, Vol. 17, pp. 4022-34, 2009.
3. National Research Council. 2000. The future role of pesticides in US agriculture. Committee on the future role of pesticides in US Agriculture, BANRBEST, Commission on life sciences. National academy of sciences, Washington, DC. pp. 301.
4. B. Vasakorn, W. Eric, A. Pascaline, and F. Ren'e, "Antifeedant activity of *Jatropha gossypifolia* and *Melia azedarach* senescent leaf extracts on *Spodoptera frugiperda* (Lepidoptera: Noctuidae) and their potential use as synergists", *Pest Manag Sci* Vol. 68, 1255-64, 2012.
5. M. S. Tagliari, N. Knaak, and L. M. Fiuzu, "Plantas inseticidas: interações e compostos", *Pesquisa. Agropecuária Gaúcha*, Vol. 10, pp. 101-11, 2004.
6. C. Ulrichs, I. Mewis, S. Adhikary, A. Bhattacharyya, and A. Goswami, "Antifeedant activity and toxicity of leaf extracts from *Porteresia coarctata* Takeoka and their Vectors on the physiology of *Spodoptera litura* (F)", *J. Pest Sciences*, Vol. 81, pp. 79-84, 2008.
7. D. J. Finney, "The estimation from individual records of the relationship between dose and quantal response", *Biometrika*, Vol. 34, pp. 320-34, 1947.
8. D. M. Gawande, Y. H. Wasu, and I. A. Raja, "Plant derived toxicants to control castor semilooper, *Achaea janata* (Noctuidae: Lepidoptera)". *Asian J. Biol. & Biotechnol*, Vol. 2(2) pp. e-214.
9. Y. H. Wasu, D. M. Gawande, and S. P. Patil, "Plant Weeds *Parthenium hysterophorus* and *Ageratina adenophora* for Fall Armyworm Control", *Int. J. of Life Sciences*, Vol. 1 (1), pp. 71-75, 2013.
10. S. Datta, and D. B. Saxena, "Pesticidal properties of parthenin (from *Parthenium hysterophorus*) and related compounds", *Pest Management Science*, Vol. 57, pp. 95-101, 2001.
11. L. Morin, A. M. Reid, N. M. Sims-Chilton, Y. M. Buckley, K. Dhileepan, G. T. Hastwell, T. L. Nordblom, and S. Raghu, "Review of approaches to evaluate the effectiveness of weed biological control agents", *Biol. Control* Vol. 5 pp. 1-15, 2009.
12. A. I. Maishi, P. K. S. Ali, S. A. Chaghtai, and G. Khan, "A proving of *Parthenium hysterophorus*, L.", *Brit Homoeopath J* Vol. 87, pp. 17-21, 1998.
13. A. Bagchi, A. Raha, and P. Mukherjee, "A complete review on *Parthenium hysterophorus* linn.", *Int. J Recent Adv Pharmaceutical Res.*, Vol. 6(1), pp. 42-49, 2016.