



TOXICITY OF *GOSSYPIUM ARBOREUM* ON OVIPOSITION AND ADULT EMERGENCE AGAINST *CALLOSBRUCHUS CHINENSIS* (L.)

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ABSTRACT

Plant products are being explored for pest management in different parts of the world. Present study was also deals with evaluation of acetone extract of *Gossypium arboreum* for its toxicity on fecundity and adult emergence against pulse beetle, *Callosobruchus chinensis* (L.) infesting cowpea seeds. At 25%, 50%, 75% and 100% dose levels the extract depicted considerable toxicity against fecundity and adult emergence. However, the potency of the extract was found to be dose dependent.

Key words: *Callosobruchus chinensis* (L.), fecundity, *Gossypium arboretum*

1. Introduction

Injudicious and large scale use of synthetic chemical pesticides as a pest management method has led to several potential side effects across the globe. Some of the potential harmful effects of these pesticides include development of a high degree of resistance towards chemical pesticides by target pests, destruction of non-target forms of life including natural enemies of insect pests, contamination of food and high degree of residual toxicity in the environment. Further, the risk to human health posed by exposure to the synthetic pesticides in drinking water, food and fodder have become the primary argument in the debate about the use of synthetic pesticides. Besides, several plant species possess toxicity towards many insect pests which has drawn attention of scientist community for checking population of insect pests. Traditional plant product based pest control practices if refined on eco-friendly lines may prove better alternative to the synthetic chemical pesticides.

Keeping in view the darker side of the synthetic pesticides, the pesticidal properties of many plant products are being explored by researchers as biodegradable and biorational alternative for synthetic pesticides. Present study also deals with the evaluation of acetone extract of *Gossypium arboreum* for its toxicity fecundity and adult emergence against pulse beetle, *Callosobruchus chinensis* (L.) infesting cowpea seeds.

2. Material and Method

2.1 Extraction of plant materials

After collection from botanical garden of University of Rajasthan and nearby areas, seeds of *Gossypium arboretum* were thoroughly washed to remove all the dust and dirt. Later, these were dried in shade and fine powder was prepared separately with the help of an electric grinder. The extract of the plant material was



prepared by Soxhlet Extraction method using acetone as solvent [1]. The ratio of plant material with solvent was kept 1:10 by extracting 30 gms of plant material in 300 ml of acetone. The duration of extraction process was kept eight hours. After filtration and vacuum evaporation thick extract was kept in refrigerator as stock solutions. The desired dose levels for experiments were prepared by further dilution of extracts with the solvent.

2.2 Rearing of experimental insect

Initial culture of experimental insect (*Callosobruchus chinensis*) was obtained from Durgapura Agriculture Research Station, Jaipur. In laboratory, the insects were reared in pre-sterilized jars containing disinfested cowpea seeds. The optimum condition of $27\pm 2^{\circ}\text{C}$ temperature and 60 ± 10 percent relative humidity was maintained. Freshly emerged adults were taken for experimentation.

2.3 Experimental design

5 gms. of cowpea seeds were taken in plastic vials and treated with 1 ml. of each desired dose level i.e. 25%, 50%, 75% and 100%. The doses were prepared by mixing the extracts with respective volume of solvent. Three replica of each dose level and a control containing seeds treated with solvent (acetone) were run parallel. Three pairs of newly emerged adult (0-24 hrs. old) were introduced in each vial for egg laying on grains. The vials were covered with muslin cloth. The number of eggs laid on seeds and the number of adults emerged were recorded. The loss in seed weight was calculated by weighing the damaged seeds separately.

3. Results and Discussion

Results of effects of *Gossypium arboreum* acetone extract on fecundity and adult emergence against the pulse beetle are exhibited in Fig 1 and 2. The results are clearly indicative that the seed extract of *Gossypium arboreum* is effective against fecundity and adult emergence. Average oviposition on the cowpea seeds was found to be reduced with the increasing concentration levels of the extract. The female beetles were unable to lay eggs at highest dose level, i.e., 100%, while the average oviposition recorded at 25%, 50% and 75% concentration of the extract was 118, 43 and 11, respectively as compared to 190 eggs registered in controls. These results show that the extract possess potential properties of oviposition deterrence. The extract adversely affected the adult emergence also as no adult was noticed at 50% dose level onwards while at lowest dose level (25%) average adult emergence recorded was 16.66 compared to 55.5 adults for the untreated control.

Decreased adult emergence is result of ovicidal properties of botanicals which may be attributed to the active ingredients present in them. The active biomolecules present in the extract arrest the embryonic development in the eggs of the *Callosobruchus chinensis*. The work of Chander and Ahmed [2] also provides support to this assumption by observations on the eggs of *Callosobruchus chinensis*. However, the study needs further investigations to find out active principle ingredients responsible for ovicidal properties of plant extracts.

Dwivedi and Garg [3] have also recorded larvicidal properties of *Tagetes indica* and *Ricinus communis* against *Corcyra cephalonica*. Kunbhar *et.al* [4] also conducted studies to evaluate the impact of neem



Azadirachta indica, tobacco Nicotina tabbaciun, trooh Citrullus colocynthus, Movanto (Spirotetramat) against sucking insect pests of brinjal and their predators. Their results also corroborate role of plant products in pest management. Toxic properties of different plant species were observed by Kumari and Kumar [5], Saxena *et al.* [6], Obembe and Kayode [7] respectively, which also support the results of present study.

4. Conclusion

At 25%, 50%, 75% and 100% dose levels the extract of *Gossypium arboretum* depicted considerable toxicity against fecundity and adult emergence. The potency of the extract was found to be dose dependent. Further studies regarding principal active ingredients in plant extract will help identification of the biomolecules with pesticidal properties for pest management.

5. Acknowledgement

The author is thankful for financial assistance from Council of Scientific and Industrial Research is gratefully acknowledged.

References

- [1] S.D. Deshmukhand and M.N. Borle, Studies on insecticidal properties of indigenous plant products, *Ind. J. Ent.*, 35(1), 1975, 111-118.
- [2] H. Chander and , S.M. Ahmed , Efficacy of oils from medicinal plants as protectants of green gram against the pulse beetle, *Callosobruchus chinensis*, *Entomon*, 11(1), 1986, 21-28.
- [3] S.C. Dwivedi, and S.Garg, Comparative efficacy of various botanical extracts as larvicides against rice moth, *Corcyra cephalonica* (Lepidoptera : Pyralidae), *Indian J. Environ. and Ecoplan.* 5(1), 2001, 185-188.
- [4] S. Kumbhar, L.B. Rajput, A.A Gilal, G.A. Channa, and J.G.M. Sahito, Impact of botanical pesticides against sucking insect pests and their insect predators in brinjal crop. *Journal of Entomology and Zoology Studies*, 6(2), 2018, 83-87.
- [5] P. Kumari, and D. Kumar, Effect of mixture of tobacco leaf and neem seed powder on *Callosobruchus chinensis* (L.) infesting pulse grains, *Journal of Ecotoxicology and Environmental Monitoring*, 8 (3/4), 1998, 229-232.
- [6] R.C. Saxena, O.P. Dixit and V. Harshan, Insecticidal action of *Lantana camara* against *Callosobruchus chinensis* (Coleoptera : Bruchidae). *Journal of Stored Product Research*, 28(4), 1992, 279-281.
- [7] O. M. Obembe and J. Kayode, Evaluation of Toxic Properties of Cotyledon Powders and Oils of Sandbox, *Hura crepitans L.* against *Sitophilus zeamais* Motschulsky (coleoptera: curculionidae). *Bio-Science Research Bulletin*, 34(2), 2018,40-47.

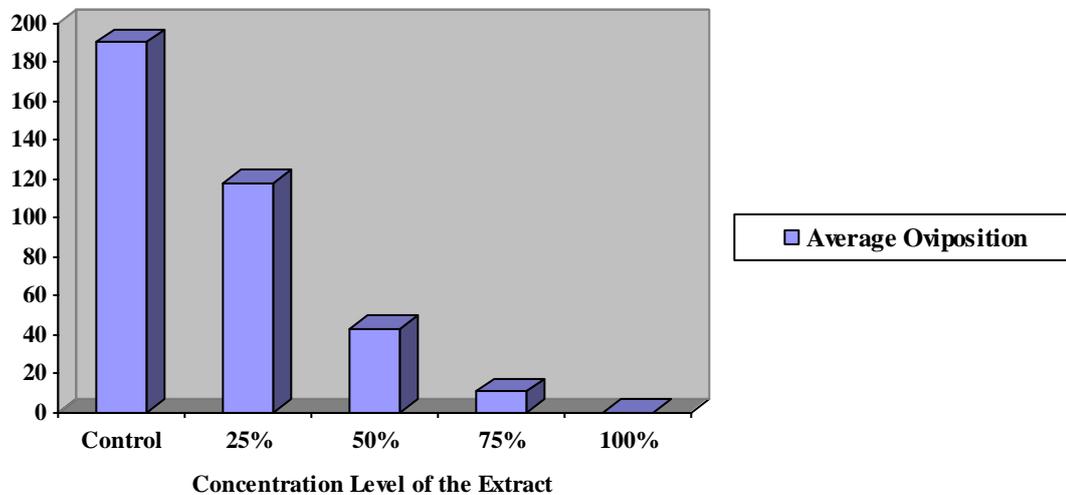


Figure 1: Effect of *Gossypium arboreum* extract on fecundity of pulse beetle, *Callosobruchus chinensis* (L.)

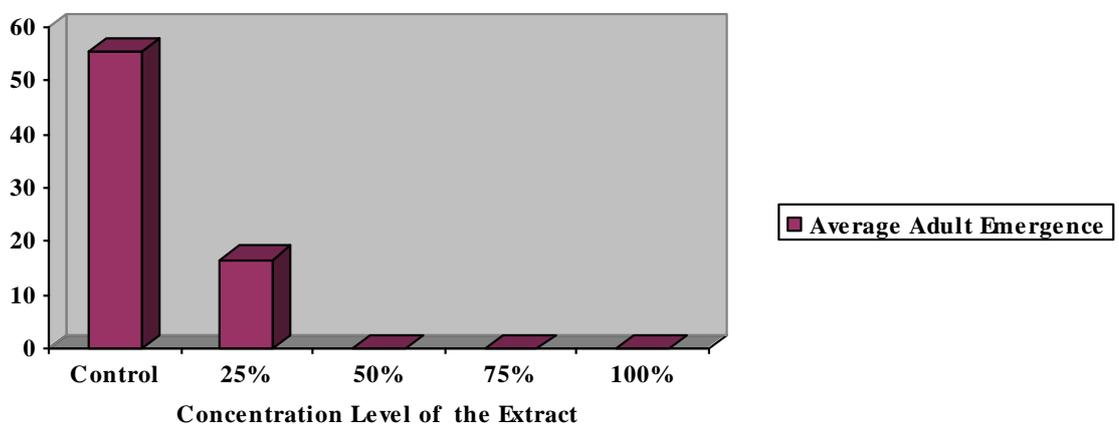


Figure 2: Effect of *Gossypium arboreum* extract on adult emergence of pulse beetle, *Callosobruchus chinensis* (L.)