



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 6, June 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

[ijirset@gmail.com](mailto:ijirset@gmail.com)

[www.ijirset.com](http://www.ijirset.com)

# Efficacy of Blended Extracts of *Nyctanthes Arbor-Tristis* and *Tagetes Erecta* Against *Callosobruchus Chinensis*

P. C. Bhati

Associate Professor, Department of Zoology, SRKP Government PG College, Kishangarh, Rajasthan, India

**ABSTRACT:** The seed extract of *Nyctanthes arbor-tristis* and floral head extract of *Tagetes erecta*, prepared in acetone, have been tested against the infestation of cowpea seeds by the pulse beetle, *Callosobruchus chinensis*. The blended extracts in the ratio of 1:1, completely protected the cowpea seed at the hundred percent concentration level. The combination of the extracts also showed toxicity against the hatchability of the pulse beetle eggs, as it was recorded to exhibit 60.86 percent egg mortality at the 100% concentration level as compared to 3.84 % mortality of eggs in the control group.

**KEY WORDS:** *Nyctanthes arbor-tristis*, *Tagetes erecta*, *Callosobruchus chinensis*

## I. INTRODUCTION

Over the last few decades, pesticides have become indispensable component of the agriculture the world over. These are the chemical substances of natural or synthetic origin that are used to eradicate pests and insects. The use of these substances aims to promote crop yield and protect the crops from diseases and damage [1]. The large scale production and use of these synthetic chemical substances is driven primarily by the increasing global demand of food grains. This demand is due to the population growth in the developing countries, which translates into the growing demand of the agricultural produce. Although, these chemicals are claimed to boost the agriculture produce in order to meet the growing demand, their harmful impact on the environment is drawing attention of the scientists and environmentalists throughout the world. Most of the synthetic chemical pesticides are broad spectrum pesticides hence the impact of these toxic chemicals is not restricted to the target plant or animal species. They affect the whole ecosystem in many ways by contaminating soil, water and air.

Serious threat to human health is also attributed to the toxic properties of the synthetic chemical pesticides. Most studies revealed a significant relationship between pesticide exposure and an increased cancer incidence rate. Among the most studied groups of pesticides are organochlorine (OC) pesticides. These pesticides and their residues could significantly increase cancer in children and adults [2]. Moreover, the pesticides banned or restricted for use within many developed countries owing to their hazardous effects are exported to developing countries with lesser strict regulation for their use. Keeping in mind the harmful impact of synthetic chemical pesticides, scientist in different parts of the world have been exploring the safer alternative to control the problem of pests. Present study also aims to explore the toxicological properties of *Nyctanthes arbor-tristis* seed extract blended with *Tagetes erecta* floral head extract against the damage caused by the pulse beetle, *Callosobruchus chinensis*.

## II. MATERIAL AND METHODS

### Rearing of experimental insect

In laboratory, the culture of *Callosobruchus chinensis* was developed and maintained in pre-sterilized jars containing disinfested cowpea seeds. The optimum condition of  $27\pm 2^{\circ}\text{C}$  temperature and  $60\pm 10$  percent relative humidity was maintained. Freshly emerged adults (0-24 hrs) were taken for experimentation.

### Collection and extraction of plant materials

*Nyctanthes arbor-tristis* is small woody shrub with white flowers. This plant species can be cultivated in tropical and subtropical regions all over the world from sea-level up to 1500 m [3]. It has brown compressed, flat

round or heart shaped capsule. The capsule has two sections and the each section contains a single seed. Exalbuminous sees are with thick testa and heavily vascularized outer layer of transparent cells. Cotyledons are flat with inferior radical [4]. *Tagetes erecta* (Marigold) is a hardy annual herb native to Southern Europe and is also cultivated extensively in Asia, India, China and other countries with a tropical climate. Marigold flowers have different fragrances and colors, in which the yellow color is most common. The flowers are useful in fevers, epileptic, stomachic, astringent, scabies, carminative, liver and eyes diseases [5].

Seeds of *Nyctanthes arbor-tristis* and floral heads of *Tagetes erecta* were thoroughly washed with water to remove the dust and dirt particles. Further, the plant materials were dried in shade and powdered with the help of an electric grinder. The extracts were prepared separately by Soxhlet extraction method [6] using acetone as solvent. 30 gm of powdered plant material was extracted separately with 300 ml of acetone keeping the ratio 1:10. The duration of extraction process was kept eight hours. After filtration, the extracts were kept in refrigerator as stock solution.

### Experimental Design

After completion of the extraction process, the extracts of *Nyctanthes arbor-tristis* and *Tagetes erecta* were blended in the ratio of 1:1 (by volume). For experiments, 5 grams 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 the solvent. Three replicas of each dose level and a control containing seeds treated with the solvent (acetone) only were run parallel. Three pairs of newly emerged adults (0-24 hrs. old) were introduced in each vial for egg laying on grains. The vials were covered with muslin cloth. Phagodeterrent action of the blended extracts was assessed on the basis of average oviposition, average adult emergence, average loss in seed weight and percent seed protection. 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. The number of unhatched eggs in each vial was calculated by direct observation and percent corrected egg mortality was calculated by following formula [7].

$$\% \text{ corrected mortality} = \frac{\% \text{ kill in treated} - \% \text{ kill in control}}{100 - \% \text{ kill in control}} \times 100$$

### III. RESULTS AND DISCUSSION

Table 1 shows that the combination of two extracts remarkably decreased fecundity in the treatment group since the blended extracts reflected 79, 29.33, 23.33 and 15.33 eggs at 25%, 50%, 75% and 100% dose levels, respectively as compared to 169 eggs noted in the control group. Viability of eggs was adversely affected in treatment groups and was found to be dependent on concentration level since 25%, 50%, 75% and 100% dose levels featured 28.68, 40.91, 44.27 and 60.86 percent egg mortality, respectively as compared to 3.84 percent eggs found unhatched in the control group. Percent corrected egg mortality at 25%, 50%, 75% and 100% dose level was 25.83, 38.55, 42.04 and 59.29, respectively. At the highest dose level, the joint action of two extracts completely inhibited the adult emergence. However, at remaining dose levels, i.e., 25%, 50%, and 75% the emergence was dose dependent being 20.66, 4.33 and 3, respectively as compared to 67 adults counted in the control group.

A perusal of the table 1 also shows that no damage to treated cowpea seeds occurred at the highest dose level while at 25%, 50% and 75% concentration levels, it was noticeably brought down to 36.08, 10.1 and 7.9 percent, respectively as compared to 79.14 percent loss observed in the control group. Consequently, the treated cowpea seeds remained intact at the highest dose level showing 100 percent protection, while at lower dose levels, the blended extracts provided considerable protection expressing 63.92, 89.9 and 92.1 percent seed protection at 25%, 50% and 75% dose levels, respectively as compared to 20.86 percent in the control group. Percent seed protection over control enumerated was 54.409, 87.237, 90.017 and 100 at 25%, 50%, 75% and 100% dose levels, respectively. Crude extracts and its fractions of the flower of *Tagetes erecta* Linn. were also tested by other workers for insecticidal activity against a stored product insect pest, *Tribolium castaneum* (Herbst). In the experiment the chloroform fraction showed highest toxicity against both the larvae and adults of *Tribolium castaneum* [8]. In another study, the repellent properties of *Nyctanthes arbor-tristis* against the adult pulse beetles

was recorded to be 56.77 percent repellency [9]. Toxicity of other plant species has also been assessed by other researchers [10], [11], [12] which also support the phagodeterrent activities of the studied plant extracts.

**Table 01: Effect of *Nyctanthes arbor-tristis* extract blended with *Tagetes erecta* against *Callosobruchus chinensis***

S. No.	Dose level	Fecundity	% egg mortality	% corrected egg mortality	Average adult emergence	% grain damage	% seed protection	% seed protection over control
1.	25%	79	28.68	25.83	20.66	36.08	63.92	54.409
2.	50%	29.33	40.91	38.55	4.33	10.10	89.90	87.237
3.	75%	23.33	44.27	42.04	3	79	92.10	90.017
4.	100%	15.33	60.86	59.29	0	0	100	100
5.	Control	169	3.84	-	67	79.14	20.86	-

Weight of treated cowpea seeds – 5 grams

Number of replications – 3

Number of adults in each replication – 6 (3 males + 3 females)

#### IV. CONCLUSION

The blended extracts of *Nyctanthes arbor-tristis* seeds and *Tagetes erecta* floral heads showed toxicity against the pulse beetle, *Callosobruchus chinensis*. When the extracts were blended in the ratio of 1:1 they showed complete protection against the pulse beetles at the highest concentration level. At the remaining dose levels, i.e., 25%, 50% and 75% the combination of the extract however showed moderate seed protection properties as compared to the untreated control group.

#### ACKNOWLEDGEMENT

The author is thankful to Council of Scientific and Industrial for the financial assistance.

#### REFERENCES

- [1] Kaur, R.; Choudhary, D.; Bali, S.; Bandral, S. S.; Singh, V.; Ahmad, M. A.; Rani, N.; Thakur, G. S. and Chandrasekaran, B. (2024). Pesticides: An alarming detrimental to health and environment. *Science of the Total Environment*, 10:915:170113.
- [2] Mahshid, Ataei and Mohammad, Abdollahi (2022). A systematic review of mechanistic studies on the relationship between pesticide exposure and cancer induction. *Toxicology and Applied Pharmacology*, 1;456:116280.
- [3] Hiremath, V., Hiremath, B.S., Mohapatra, S, Das, A.K. (2016). Literary review of Parijata (*Nyctanthus arbor-tristis* Linn.) An herbal medicament with special reference to Ayurveda and Botanical literature. *Biomed Pharmacol J*, 9(3): 1019-1025.
- [4] Rani, C., Chawla, S., Mangal, M., Mangal, A., Kajla, S., Dhawan, A. (2012). *Nyctanthes arbor-tristis* Linn. (Night Jasmine): A sacred ornamental plant with immense medicinal potentials. *Indian Journal of Traditional Knowledge*, 11: 427-435.
- [5] Kar, Sukhendu and Patra, Soumen (2022). A Review on Marigold (*Tagetes erecta* Linn): the Phytochemicals Present and its Biological activities. *Prayogik Rasayan*, 6: 10.53023/p.rasayan-20221220.
- [6] Deshmukh, S.D. and Borle, M.N. (1975). Studies on insecticidal properties of indigenous plant products. *Ind. J. Ent.*, 35(1): 111-118.
- [7] Abbot, W.S. (1925). A method of computing the effectiveness of insecticides. *J. Econ. Ent.*, 18(2): 265-267.
- [8] Nikkon, Farjana; Habib, Md; Karim, Rezaul; Ferdousi, Zennat; Rahman, Motiur and Haque, M.. (2009). Insecticidal activity of flower of *Tagetes erecta* L. against *Tribolium castaneum* (Herbst). *Research Journal of Agriculture and Biological Sciences*, 5: 748-753.
- [9] Bhati, P.C. (2022). Repellent properties of *Nyctanthes arbor-tristis* seed extract against the adult pulse beetles. *International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)*, 11(6): 8801-8803.

- [10] Obembe, O. M. and Kayode, J. (2018). 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): 40-47.
- [11] Alim, M.A.; Song, J.; Lim, U.T.; Choi, J.J. and Hossain, M.A. (2017). Bioassay of plant extracts against *Aleurodicus disperses* (Hemiptera: Aleyrodidae). *Florida Entomologist*, 100(2): 350-357.
- [12] Lu, Jianhua and Wu, Shuhui (2010). Bioactivity of essential oil from *Ailanthus altissima* bark against 4 major stored-grain insects. *Afr. J. Microbiol. Res.*, 4(3):154-157.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details