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# Screening of some plant extracts against polyphagous pest *Spodoptera litura* (Lepidoptera: Noctuidae)

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**Abstract**
*Spodoptera litura* is an economically important polyphagous pest. It feed on a wide range of horticultural crops and caused severe damage to the fruit. Several chemical pesticides are used to control its infestation but these chemicals produce many adverse effects on environment, animals and non-target pest. So, there is a need of ecologically safe crop protectants. Botanical pesticides are an important group of naturally occurring and slow-acting crop protectants. They are generally safe to the animals and environment than the conventional pesticides with minimum residual effect. These contains mixture of biologically active substances thus no resistance developed in the pest. In the present study, *Lantana camara* (leaves), *Pedalium murex* (root), *Taxodum disticum* (leaves), *Ageratum vulgaris* (Whole plant), *Gymnema sylestre* (Leaves) were tested against tobacco caterpillar. The maximum antifeedant activity was observed in *Pedalium murex* (87.49%) followed by *Lantana camara* (83.17%), *Gymnema sylestre* (63.08%), *Taxodum disticum* (56.24%) and *Ageratum vulgaris* (51.27%). Highest larval mortality (72%), lowest pupation (28.61%), lowest adult emergence (11) were also observed during *Pedalium murex* treatment. Percentage of deformed pupae was highest in *Lanatana camara* treatment (23.01%). Adult moth showed poorly developed wings and reduction of body size in this treatment. *Taxodum disticum, Ageraturm vulgaris* and *Gymnema sylestre* were also showed significant morphogenetic effect against *Spodoptera litura*.

**Keywords:** biopestcides, *Spodoptera litura, Pedalium murex, Gymnema sylvestre, Lantana camara*

## 1. Introduction
Noctuid moth *Spodoptera litura* causing economic damage to several agricultural crops to southeast Asia, India, China and Japan (A. Hadapad *et al.*, 2001) [3]. The pest feed on approximate 112 plant species worldwide (A.K. Sharma *et al*., 2005) [7]. In India it causes damage to 40 economically important plant species. It is considered as one of the major threats to the present day intensive agriculture and changing cropping patterns worldwide, next only to *Heliothis armigera.* Indiscriminate use of broad spectrum pesticide to control *S. litura* has resulted in development of resistance to many pesticides. Simultaneously these chemical pesticides are harmful to the non-target organism and to human health (M.B. Isman, 2006) [4]. Because of these adverse effects of chemical pesticides, there is a need of ecologically safe pesticide. In this scenario, new type of insecticides originating from plant products, targeting *S. litura* could be useful alternative for integrated pest management. Botanical pesticides are an important group of naturally occurring and often slow-acting plant protectants. Generally, these plant products are safer to non-target organism, human health and effective against polyphagous pest. These contain mixture of biologically active substances thus no resistance is developed in the pest.

## 2. Material and Method
### 2.1 Rearing of test organism
Freshly laid batches of eggs of *S. litura* were collected from the vegetable farm of C.S.A. University, Kanpur. Eggs were allowed to hatch under laboratory conditions. Larvae were reared in the laboratory in the sterilized earthen pots. Mouth of pots covered with muslin cloth. Larvae were fed on fresh castor leaves and maintained temperature of 26 ℃, relative humidity of 65%. The laboratory reared pre-starved fourth instar larvae were used as test insect.

### 2.2 Collection and extraction of plant material
*Lantana camara* (leaves), *Pedalium murex* (root), *Taxodum disticum* (leaves), *Ageratum vulgaris* (Whole plant), *Gymnema sylestre* (Leaves) were collected from the different farms of Kanpur district. Plant materials were thoroughly washed with water and dried in shade at room temperature at zoology department of A.N.D. College, Kanpur. The dried plant materials were powdered using electrical grinder and sieved through strainer to obtain powder. Powder from each plant species was extracted by soaking in ethyl acetate for 48 hours (*Matharu K S, et al.2016*) [5]. Then it filtered by Whattman filter paper no.-1. All solvents the evaporated to air dryness at room temperature to give crude extract. All extracts were collected in clean borosil vials and stored at 4ºC in a refrigerator until use. The crude extracts of different plant parts obtained above were further diluted with solvent to make the desire concentrations and emulsifier was added to it. (*Matharu K S, et al*, 2016) [5].

### 2.3 Treatments
T1 - *Lantana camara*
T2 - *Pedalium murex*
T3 - *Taxodum disticum*

*T4 - Ageratum vulgaris*
T5 - *Gymnema sylvestre*
T6- Control

### 2.4 Procedure of treatment application
Leaf disc of castor were dipped in different plant extracts for 5 minutes with 500 ppm concentration of each plant extract. Treated leaf discs were placed inside separate petridish. The pre-starved larvae were allowed to feed on treated leaf discs for 24 hours.

### 2.5 Data collection
At the end of the experiment, the uneaten area of the leaf discs was measured with leaf area meter. Larval mortality and pupal deformities were also recorded. The percent antifeedent activity was calculated based on the formula of Singh and Pant.

$$\% \text{ Antifeedent activity} = \frac{\text{Leaf disc consumed by the larvae in control} - \text{Leaf disc consumed by the larvae in treated}}{\text{Leaf disc consumed by larvae in control} + \text{Leaf disc consumed by larvae in treated}} \times 100$$

$$\% \text{ larval mortality} = \frac{\text{Number of dead larvae}}{\text{Number of treated larvae}} \times 100$$

### 2.6 Statistical analysis
Mean and standard deviation were calculated from the replication data. Data was subjected to analysis of variance.

## 3. Result and Discussion
Four botanical extracts, *Lantana camara, Pedalium murex, Taxodum disticum, Ageratum vulgaris* and *Gymnema sylvestre* were tested for their efficacy against *S. litura*. Efficacy was assayed by measuring antifeedent activities, mortality % of larvae, number of dead larvae, pupation %, number of deformed pupa and number of adult emergence.

### 3.1 Antifeedant activity
Antifeedent activity of each plant extract was assessed by comparing the averages of the leaf area consumed in the treated leaves that of control. Efficacy of botanical extract was assayed against the third instar larvae of *S. litura* for their antifeedent activity. The average food consumption in control was between 1350 to 998 sq.mm. Reduced food intake was observed in all plant extract treated leaves in comparison to control. Major antifeedent activity shown by *Pedalium murex* (87.49%) followed by *Lantana camara* (83.17%), *Gymnema syvestre* (63.28%), *Taxodum disticum* (56.24%) and *Ageratum vulgaris* (51.27%).

**Table 1:** Antifeedent activity of plant extracts against *Spodoptera litura* larvae

| Treatments | Antifeedant activity |
|---|---|
| *Lantana camara* | ++++ |
| *Pedamium murex* | ++++ |
| *Taxodum disticum* | ++ |
| *Ageratum vulgaris* | ++ |
| *Gymnema sylvestre* | +++ |
| Control | + |

total leaf area at the starting of experiment=1400 sq.mm.
*++++ below 200 sq.mm
*+++ 200-400 sq.mm
*++ 400-600 sq.mm
*+ 600-800 sq.mm
* - above 800 sq.mm

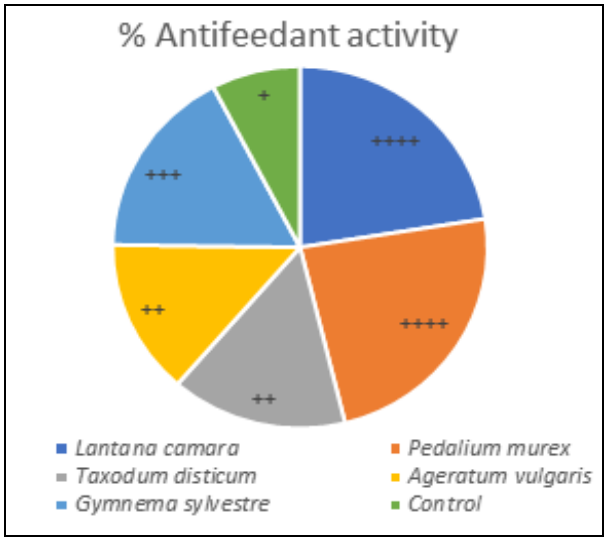


**Fig 1**

### 3.2 Morphogenetic effect

Morphogenetic effect of all the botanical extracts were also tested against the *Spodoptera litura*. Mortality %, pupation%, number of deformed pupa and adult emergence was used to assayed morphogenetic effect. Highest mortality % (72) and lowest adult emergence (11) were found in *Pedalium murex* treatment. Adult moth with treatment showed poorly developed wings and reduction of body size.

**Table 2**

| Treatments | No of larvae treated | No. of dead larvae | Mortality (%) | Pupation (%) | Pupal deformity (%) | Number of adult emergence | % antifeedant activity |
|---|---|---|---|---|---|---|---|
| *Lantana camara* | 50 | 35 | 70% | 31.25 | 23.01 | 12 | 83.17 |
| *Pedalium murex* | 50 | 36 | 72% | 28.61 | 16.38 | 11 | 87.49 |
| *Taxodum disticum* | 50 | 18 | 36% | 64.00 | 12.96 | 28 | 56.24 |
| *Ageratum vulgaris* | 50 | 15 | 30% | 70.00 | 10.84 | 31 | 51.27 |
| *Gymnema sylvestre* | 50 | 23 | 46% | 54.00 | 13.00 | 23 | 63.28 |
| Control | 50 | 05 | 10% | 90.00 | 4.00 | 48 | 28.36 |

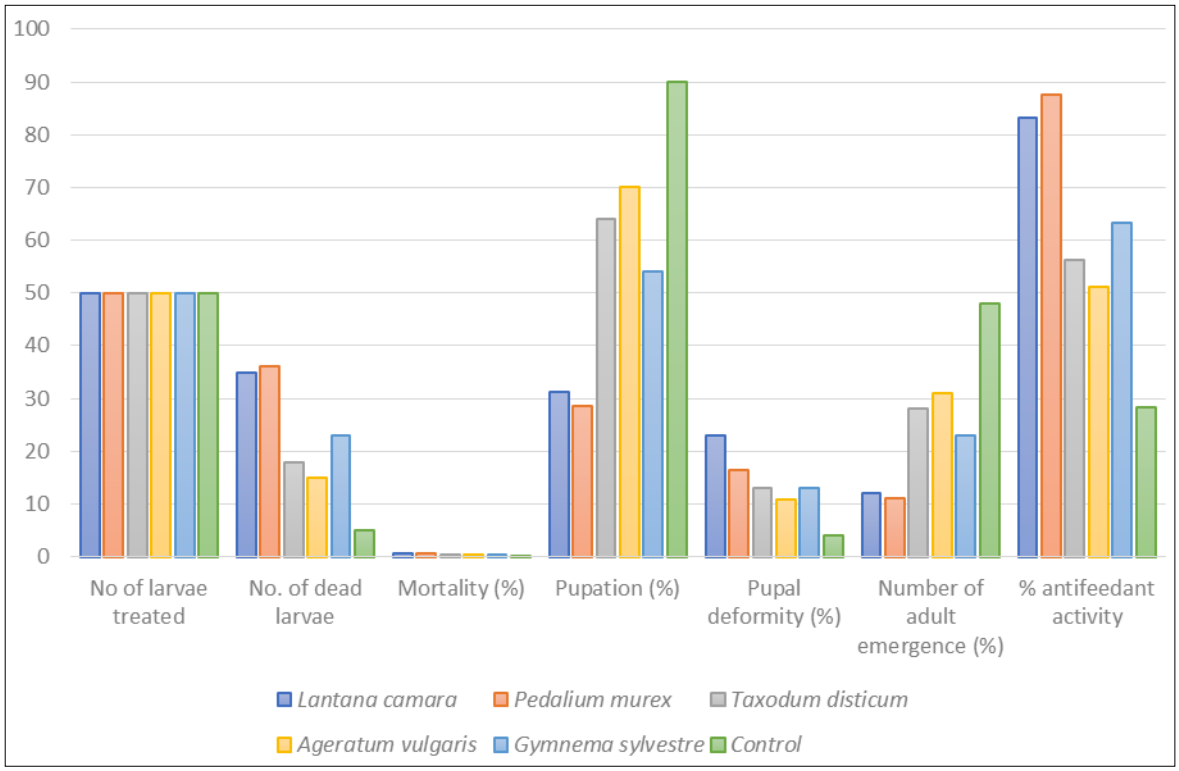


**Fig 2:** Efficacy of different plant protectants against *Spodoptera litura*

### 4. Conclusion

Metabolites produced by plants as their defensive mechanism, are act as natural biopesticides. They worked against growth, development, feeding and oviposition of pest. It is concluded from the present study that *Spodoptera litura* was better controlled by *Pedalium murex* root extract. It showed maximum antifeedant activity, maximum larval mortality and least pupation. It also reduced adult emergence. Emerging adults were small in size with deformed wings.

### 5. Declaration

Funding: None
Conflict of interest: Not declared

### 6. References

1. Choudhary JS, Srivastava C, Walia S. Screening for antifeedant activity of *Gymnema sylvestre* leaf extracts against *Spodoptera litura* F. (Lepidoptera: Noctuidae). The Bioscan. 2014; 9(2):633-638.
2. Deshmukhe PV, Hooli AA, Holihosur SN. Effect of *Lantana camara* (L.) on growth, development and survival of tobacco caterpillar (*Spodoptera litura* Fabricius). Karnataka J Agric, Sci. 2011; 24(2):137-139.
3. Hadapad A, Chaudhari CS, Kulye M, Chaudele AG, Salunkhe GN. Studies on chitin synthesis inhibitors against gram pod borer, *Heliothis armigera* (Hub.). Journal of Nacton. 2001; 13(2):137-140.

4. Isman MB. Botanical insecticides, deterrents repellents in modern agriculture and an increasingly regulated world. Annual review of entomology. 2006; 51:45-66.
5. Matharu KS, Mehta PK. Field efficacy of plant extracts against tomato fruit borer *Helicoverpa armigera*. The Bioscan. 2016; 11(1):155-158.
6. Renuga FB, Sahayaraj K. Influence of botanicals in total head protein of *Spodoptera litura* (Fab.). Journal of biopesticides. 2009; 2(1):52-55.
7. Sharma AK, Seth RK. Combined effect of gamma radiation and azadirachtin on the growth and development of *Spodoptera litura*. Current Science. 2005; 89:1027-1031.
8. Sujatha S, Joesph B, Sumi PS. Medicinal plants and its impact of ecology, nutritional effluents and incentive of digestive enzymes on *Spodoptera litura* (Fabricious). Asian journal of agricultural research. 2010; 4(4):204-211.