"Screening the Efficacy of Some Plant Extracts for their Ovicidal Activity Against the Pulse Pest Callosobruchus Chinensis"

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Abstract

In the present investigation petroleum ether extracts of selected medicinal plants viz. *Argemone Mexicana, Withania somnifera, Datura metel,Lawsonia inermis, Parthenium hysterophorous* and *Lantana camara* were screened for their ovicidal properties against the Pulse pest *Callosobruchus chinensis.* It was observed that the extracts at all concentrations enhance the egg mortality in treatment groups.

Keywords: Ovicidal, *Callosobruchus chinensis*, *Argemone Mexicana, Withania somnifera, Datura metel, Lawsonia inermis, Parthenium hysterophorous* and *Lantana camara*.

Introduction:

Pulses are important crops being the richest source of proteins and can be stored for future consumption as these have various uses in our daily meal. The stored pulses are invariably attacked by different species of pulse beetle. Amongst these, *Callosobruchus* sp. is one of the most destructive pest of pulses. *Callosobruchus* sp. is a major insect pest of pulses in stores in tropical and subtropical regions of the world.

It belongs to the family Bruchidae which includes important pests of pulses. The members of the family Bruchidae have long been reported to destroy the seeds of the leguminous plants, but a number of them are now also known to attack the pods, flowers and leaves belonging to the families Asteraceae, Malvaceae, Rosaceae, Umbelliferae, Convolvulaceae, Anacardiaceae, Papaveraceae and Palmae. They are not only serious pests of edible pulses, beans, lentils and peas but also infest the pods and seeds of the wild medicinal and ornamental plants.

Bruchids thus play the role of crucial limiting factors by downizing the availability of pulses to the human population to a substantial level. *Callosobruchus* sp. causes substantial damage in various stored pulses. The damage is done to a great extent during storage by *C. chinensis* (L) not only in

terms of quantity, but also in quality of food grains (Gupta et.al., 1981: Gurjar and Yadav, 1978). The feeding of grubs of pulse beetles on seeds result in germination of abnormal seedlings (Jotwani and Sircar, 1967).

The infestation of pulse beetle is indicated by the presence of eggs which are laid on grain surfaces and by the circular emergence holes of about 1/20 inch diameter. The damage is caused by the grubs which bore in to the seeds and complete their development inside it. The grub feed on inner content of seeds turning them into hollow seeds which are unfit for human consumption as well as for seed purposes.

Indian Soil is very rich in floratic species, still work on botanicals has centered only around Neem.

Inspired by this parochial attitudes 10 plants species were selected after a preliminary screening. Extracts of leaves of these plants were prepared by soxhlet method by using acetone and pet ether as solvents.

The present investigation has been targeted to identify certain other aboriginal floratic species for their insecticidal properties. It is not surprising that a horde of promising floral species have been successfully evaluated against menace of stored grain pulse beetle *Callasobruchus chinennis*, which has been selected as the animal model for the present study. Hence a detailed study of the control measures have been undertaken with the anticipation that the finding will make it possible to open new avenues to devise proper and more effective control measures to suppress the pest population to safer limits with this aim following studies were included in this investigation.

Materials and Method

The pulse beetles were reared in the laboratory in pre-sterilized jars which contained cowpea seeds (*Vigna sinensis* (Savi) (Chawla). 50 pairs of freshly emerged pulse beetles were taken from parent pure culture, and released on disinfested cowpea grains. After the culture bloomed to its youth, subsequent subcultures were also established. A few pairs of freshly emerged beetles were released on cowpea grains in smaller jars. After a period of 10 days of oviposition the adult beetles were removed and grains with eggs were provided optimum conditions of constant temperature (27+2°c) and relative humidity (60-75%). Thus a continuous supply of freshly emerged beetles, required for experiments was maintained by repeating the process every week. Stale grain were frequently replaced by the fresh ones to maintain healthy conditions of stock cultures. Cowpea was used for stock as well as subcultures to prevent food effects, as all the experiments were carried out on cowpea grains only. Sex identification was done according to Southgate (1958) and Arora (1977).

Survey, Screening and Extraction of Botanical pesticides

A preliminary field survey was conducted to select the plant products for extraction. The screening was based on their palatability or non-palatability to phytophagous insects as well as their availability. The preference was given to the commonly occuring aboriginal plant products,

particularly weeds. The plants were collected from nearby agroclimatic zones.

After initial screening of many plant species, following plants which gave promising results were selected for detailed study. The plants were tested against the insect.

Experimental Protocol:

A general plan was followed to evaluate the effects of various plant extracts on the life cycle of *C. chinensis* under controlled and experimental conditions. Cowpea grains were first disinfested by adopting methods as recommended and followed by Smith (1966) and Singh and Sharma (1981) respectively. After disinfestation, the grains were conditioned at room temperature for 24 hours before use. 10 grams of cowpea grains were taken in plastic vials (Height 4.5 cm. and 3 cm. diameter) and 3 pairs of adult beetles were released in each of them. All experiments were replicated thrice. A control was also run for each experiment. The beetles were allowed to mate and oviposit for 10 days and were removed thereafter. The number of grains having eggs laid on them and the total number of eggs were counted in each to prevent the entry of the powdered material into the arm of the extractor and the flask replication. The vials were then kept to observe the emergence of offspring. To determine the exact developmental period the observation were made daily till the last emergence. The adults were removed after every observation to prevent further oviposition.

Assessment of the Efficacy of Botanical Pesticides: Ovicidal action

Mode of treatment	By contact
Insecticides	Various plant extracts
Number of eggs	20
Dose applied	S/25, S/50, S/75 and S/100 of plant extract
Temperature and Relative Humidity	27+2°c and 60-70%
Period of treatment	Upto incubation
Container used	Petridishes

For ovicidal action cowpea grains with freshly laid 20 eggs were taken in petridishes and treated with I ml. of various dose level of respective plant extracts in pet ether. A control was also run simultaneously treating the substrate with solvent only. The solvent was allowed to evaporate and after that the grains were transferred in plastic vials. Results were taken by counting the hatched and unhatched eggs in treated as well as control vials.

Argemone Mexicana

It was observed that hatching percent and percent corrected mortality at S/25, S/50, S/75, S/100 dose levels was 56.67, 46.67, 36.67, 28.33 and 40.34, 50.87, 61.40, 70.17 respectively, whereas

control had 5 percent egg mortality (Table-1).

Withania somnifera :

It was observed that hatching percent and percent corrected mortality at S/25, S/50, S/75, S/100 dose levels was 66.65, 46.65, 40.00, 36.65 and 29.84, 50.89, 57.89, 61.42 respectively, wherea control had 5 percent egg mortality (Table - 2).

Datura metel:

It has been observed that hatching percent and percent corrected mortality at S/25, S/50, S/75, S/100 dose levels was 73.35, 67.35, 46.65, 43.75 and 24.76, 30.92, 52.15, 55.12 respectively, whereas control had 2.5 percent egg mortality (Table - 3).

Lawsonia inermis :

It was observed that hatching percent and percent corrected motality at S/25, S/50, S/75, S/100 dose levels was 75.00, 58.33, 55.00, 45.00 and 23.07, 40.17, 43.58, 53.84 respectively whereas control had 2.5 percent egg mortality. (Table-4).

Parthenium hysterophorus:

It was observed that hatching percent and percent corrected mortality at S/25, S/50, S/75, S/100 dose levels was 61.67, 40.00, 28.33, 21.67 and 29.52, 54.28, 67.61, 75.23 respectively whereas control had 12.5 percent egg mortality (Table - 5).

Lantana camara

It was observed that hatching percent and percent corrected mortality at S/25, S/50, S/75, S/100 dose levels was 61.67, 45.00, 30.00 23.33 and 36.74, 53.84, 69.23, 76.07 respectively whereas control had 2.5 percent egg mortality (Table-6).

Table-1: *C.chinensis*: Ovicidal action of *Argemone Mexicana* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	11.33	56.67	8.67	43.33	40.34
2.	S/50	9.33	46.67	10.67	53.33	50.87
3.	S/75	7.33	36.67	12.67	63.33	61.40
4.	S/100	4.67	28.33	15.33	71.67	71.17
5.	Control	18.19	95	1	5	-

No. of replication- 3

No. of treated insects- 3 pairs

Table-2: *C.chinensis*: Ovicidal action of *Withania somnifera* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	13.33	66.65	6.67	33.35	29.84
2.	S/50	9.33	46.65	10.68	53.35	50.89
3.	S/75	8.00	40.00	12.00	60.00	57.89
4.	S/100	7.33	36.65	12.67	63.35	61.42
5.	Control	19.0	95.0	1.0	5.0	-

No. of replication- 3

No. of treated insects- 3 pairs

Table-3: *C.chinensis* : Ovicidal action of *Datura metel* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	14.67	76.35	5.33	26.65	24.76
2.	S/50	13.47	67.35	6.53	32.65	30.92
3.	S/75	9.33	46.65	10.67	53.35	52.15
4.	S/100	8.75	43.75	11.25	56.25	55.12
5.	Control	19.5	97.5	0.5	2.5	-

No. of replication- 3

No. of treated insects- 3 pairs

Table-4: *C.chinensis*: Ovicidal action of *Lawsonia inermis* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	15.00	75.00	5.00	25.00	23.07
2.	S/50	11.67	58.33	8.33	41.67	40.17
3.	S/75	11.00	55.00	9.00	45.00	43.58
4.	S/100	9.00	45.00	11.00	55.00	53.84
5.	Control	19.5	97.5	0.5	2.5	-

No. of replication- 3

No. of treated insects- 3 pairs

Table-5: *C.chinensis*: Ovicidal action of *Parthenium hysterophorous* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	12.33	61.67	7.67	38.33	29.52
2.	S/50	8.00	40.00	12.00	60.00	54.28
3.	S/75	5.67	28.33	14.33	71.67	67.61
4.	S/100	4.33	21.67	15.67	78.33	75.23
5.	Control	17.50	87.5	2.5	12.5	-

No. of replication- 3

No. of treated insects- 3 pairs

Table-6: *C.chinensis*: Ovicidal action of *Lantana camara* leaf extract (Pet ether)

S. No.	Dose level	No. of egg hatched	% of egg hatched	Egg mortality	% egg mortality	% corrected mortality
1.	S/25	12.33	61.67	7.67	38.33	36.74
2.	S/50	9.00	45.00	11.00	55.00	53.84
3.	S/75	6.00	30.00	14.00	70.00	69.23
4.	S/100	4.67	23.33	15.33	76.67	76.07
5.	Control	19.5	97.5	0.5	2.50	-

No. of replication- 3

No. of treated insects- 3 pairs

Discussion:

Pet-ether extracts of the leaves of *Argemone, Withania* and *Datura, Lawsonia, Parthenium* and *Lantana* causes considerable reduction in hatching of eggs of the pulse beetle. The extracts also cause mortality in the newly hatched larvae thus exhibit effective ovicidal property against *Callosobruchus chinensis*. A prolongation of incubation period is suggestive of the fact that the extracts interfere with the normal development of eggs, although do not produce lethal effects. It is quite probable that the extracts may inferfere in the normal metabolic process in eggs of *C. chinensis*, which in turn results in disturbances during the moulting process, probably by suppressing hormone and biochemical process and chitin deposition. Results of ovicidal activity recorded in present investigation fail to explain the marked variation in the ovicidal properties of extracts which is dependant on the type of solvent used.

Results of ovicidal efficacy explain that egg mortality was dose dependent. Each extract expressed

more egg mortality than control because extracts formed a sticky and oily layer on the seeds along with glued I which probably blocked oxygen supply. This leads to the inhibition of embryo development inside the egg. Little egg mortality occurred in control groups because solvents get evaporated in few seconds.

The pet-ether extracts of *Argemone, Withania* and *Datura* exhibited strong ovicidal action and also significantly mitigated growth and emergence of pulse beetles hence the pet ether extracts of *Argemone, Withania and Datura* leaves are recommended as an effective ovicide.

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References:

1. Ahmed, S.M. and Ahmed, A (1992). Efficacy of some indigenous plants as pulse protections against *C. chinensis* (L.) infestation. International pest control, 34 (2): 54-56.
2. Ali, S.L.; Rawat, R.R.; and Singh, O.P. (1981). Effectiveness of various forms of custard apple seed powder as seed protectants against the pulse beetle, *C. chinensis* (L.) Bull. Grain Technol,19 (1): 53-56.
3. Ali, S.L.; Singh, O.P. and Mishra, U.S. (1983). Effectiveness of plant oils against some beetle, *Callosobruchus chinensis* (L.) Indian J. Ent., 45 (1): 6-9.
4. Credland, P. (1992). The structure of bruchid eggs may explain the ovicidal effect of oils. Journal of stored products protection, 28(1):1-9.
5. Don-Pedro, K.N. (1990). Effects of fixed vegetable oils on oviposition and adult mortality of *Callosobruchus* (F.) on cowpea. International Pest Control, 31 (2):
6. Dwivedi, S.C. and Mathur, M. (2000). Quisqualis indica, A strong ovicide and larvicide against the Diamond back moth, *Plutella xylostella* (L.) Indian J. Environ and Ecoplan 3 (2): pp. 2000.
7. Garcia, J.R. Jr. (1990). Bioassay of five botanical materials against the bean weevil, *Callosobruchus chinensis* (L.) on mungbean [*Vigna radiata* (L.) Wilczek]. College, Laguna (Philippines). 67 leaves.
8. Ofuya, I.T.; Okoye, B.C. and Olota, A.S. (1991). Efficacy of crude extract from seeds of Monodora myristica Dunal as surface protectant against *Callosobruchus maculatus* (F.)

attacking legume seeds in storage. Zeitschrift fur Pflanzenkrankheiten and Pflanzenschut, 99 (5): 528-532.

9. Ofuya, T.I. (1990). Oviposition deterrence and ovicidal properties of some plant powders against *Callosobruchus maculatus* in stored cowpea (*Vigna unguiculata*) seeds. J. of Agricultural Science, 115: 343-345.
10. Naik, R.L. and Dumbre, R.B. (1987). Surface coating of cowpea seed with certain vegetable oils for protection from pulse beetle. Jour. of Maharashtra Agric. Univ. 12 (1): 76-78.
11. Yadav, T.D. (1985). Anti ovipositional and ovicidal toxicity of neem (*Azadirachta indica*) oil against 3 species of Callosobruchus. Neem news letter, 2 (1): 5-6.
12. Mathur, K (2020).Screening of some plant extracts for their larvicidal properties against the Pulse pest *Callosobruchus chinensis*. Our Heritage(UGC Care Journal),Vol-68-issue-66-January-2020.