European Journal of Applied Sciences 7 (1): 21-24, 2015
ISSN 2079-2077

DOI: 10.5829/idosi.ejas.2015.7.1.1127

Efficacy of Some Plant Material on Green Gram (*Vigna radiata* L. Wilczek) Seed Against *Callasobruchus maculatus* (Fab.)

[1]Sangeeta Gupta, [1]S.D. Apte and [2]Nageshwar Wast

[1]Department of Zoology, Govt. Post Graduate College, Khargone (M.P) India
[2]Department of Zoology, Govt. Holkar Science College, Indore (M.P) India

Abstract: In present investigation, the efficacy of six plant materials namely bhilawa (*Semecarpus anacardium* L.), black gram flour (*Vigna mungo* L.), custard apple seed powder (*Anona squamosa* L.), neem leaf powder (*Azadirachta indica* A. Juss.), neem seed kernel powder and tobacco leaf powder (*Nicotiana tobaccum*) at two doses 0.5 mg and 0.25 mg per 100 g seeds (w/w) were evaluated against stored grain pest, *Callosobruchus maculatus* (Fab.) in the laboratory. The result revealed that the effectiveness of grain damage by *C. maculatus* was in the order of custard apple > neem seed kernel > tobacco leaf > neem leaf > black gram flour > bhilawa. All the plant materials were found to be move effective at higher dose in comparison to the lower one. Further, all the plant material causes more than 17% egg mortality. The adult mortality ranged from 30.8% (tobacco leaf, 0.25 mg) to 50% (neem seed kernel, 0.5 mg). However, more than 30% reduction in seed weight has been observed in all the treatments.

Key words: Plant materials · Green Gram seed · *Callasobruchus maculates* and egg mortality

INTRODUCTION

Pulses form the most important group of food crops in India. Pulses are important source of protein vegetarian diet. They also contribute in maintaining soil fertility due to nitrogen fixing ability. *Callasobruchus maculatus* is one of the most important insect pest species infesting stored pulses. It lays their eggs on the host grains and adult emerge out from damaged hollow seed-grains. Synthetic insecticides can be used to protect stored grain from insect infections but their indiscriminate use has created a serious problems to human health and non target organisms. The safe and alternative to synthetic insecticides to protect stored grains and their products from insect pests are highly desirable [1].

The effort has been made to use of plant products or plant derived compounds as an alternative to synthetic insecticides in controlling insect pests of stored grains by many workers [2]. In view of this, the attempts have been made to investigate the efficacy of some plant material on Green Gram (*Vigna radiate* L. Wilczek) seed against *Callasobruchus maculatus* (Fab.)

MATERIALS AND METHODS

Insect Culture: The culture of *C. maculatus* was raised on the green gram in the laboratory and the removal and transfer of the culture was carried out by aspirator. Beetles emerged from these cultures were used in the experiment with in 24 hours. Saxes were distinguished on the basis of antennae & abdomen [3]. For this, an experiment was set up at 30°C in completely randomized block design (CRD) with four replications. There are 200 gm of green gram (local cultivar Khargone – 1) seeds were taken for each storage containers in which 10 pairs of freshly emerged beetles were released.

The experimental plant material was taken as Bhilawa, Black gram flour, Custard apple powder, Tobacco leaf powder for treatment. The doses were taken in rang from 0.05% w/w and 0.025% w/w/gr/100 seeds. The experiments were carried out for 10 days, 60 days, 120 days, 180 days and 1 year.

Corresponding Author: Nageshwar Wast, Department of Zoology, Govt. Holkar Science College, Indore, India.
E-mail: nagesh_mku@yahoo.co.in.

RESULTS AND DISCUSSION

In present investigation, the studied plant materials *viz,* custard apple powder, tobacco leaf powder, neem leaf powder, black gram flour, neem seed Kernel powder and bhilawa (mixed with seeds in different doses) were found to be more effective than control in reducing the survival, oviposition of *C. maculatus* (Linn.), seed damage and Seed weight loosed by the pest. The the extent of oviposition of *C. maculatus* upto 10 days, 60 days, 120 days, 180 days and 1 year are summarized in Table 1.

Studies on extent of oviposition were carried out by counting the total number of eggs laid on the seeds after 10 days 60 days, 120 days, 180 days and 1 year of release on the insects. It was noticed that all the treatment were found to be more effective than control up to 60 days, however higher doses (0.05%) of almost all the treatments were found to be most effective than the lower doses (0.025%). Higher doses of neem leaf powder was found to be most effective as it exhibited lowest oviposition followed by tobacco leaf powder, neem seed kernel powder, lower dose of neem leaf powder, higher doses of black group flour, lower doses of tobacco leaf powder, black gram flour, need seed kernel powder, higher doses of bhilawa and custard apple seed powder. Higher doses of need leaf powder (0.05) and tobacco leaf powder (0.005%) followed by neem seed kernel powder (0.05%) were found to be most effective, as all of them recorded lowest number of eggs in comparison with other treatment and control.

A significant difference was observed in the development period of the *C. maculatus* in all the six treatment with proposed doses. Development period was found to be least in the neem leaf powder (0.05%), whereas an ascending trend was recorded in the following manner tobacco leaf powder 0.05% > neem seed kernel powder 0.05% > neem leaf powder (0.025%) > black gram flour 0.05% > tobacco leaf powder (0.025%) > black gram flour (0.025%) > neem leaf powder (0.025%) > Bhilawa (0.05%) > Custard apple seed powder (0.05%) > Custard apple seed powder (0.025%) > bhilward (0.025%).

The Seed damage (in %) and Reduction of seed weight (in %) by *Callasobruchus maculatus* on Green Gram (*Vigna radiata* L. Wilczek) were summarized in Table-2. The Seed damage (in %) and Reduction of seed weight (in %) by *Callasobruchus maculatus* on Green Gram (*Vigna radiata* L. Wilczek) were recorded minimum as 12.09 and 45.77 % respectively by Neem leaf powder at higher dose (0.05%), however these values were recorded maximum for Bhilawa as 41.58 and 57.94 % respectively at lower dose (0.025%).

The result of the present investigation indicates that the studied plant materials were were found to be more effective than control in reducing the survival and oviposition of *C. maculatus* (Linn), seed damage & seed weight loosed by the pest. It was reported that neem leaves acts as a botanical insecticides against lesser grain borer [4]. However, Kardinan *et al*. [5] have reported that custard apple seed powder 1% (w/w) adversely affects the oviposition behaviour of *C. analis* on stored food. Tobacco leaf powder contains an alkaloid which act as antifeedant activities against *Tripolium castaneum* and has insecticidal and hormonal effect against their larva [6]. Accordind to Kotkar *et al*. [7], the flavonoids (from aqueous extracts) exhibit antimicrobial activity against all the common microbes of pulses and 80% insecticidal activity against *C. chinensis* at a concentration of 0.07 mg/ml. The effect of different formulations viz., aqueous

Table 1: Efficacy of seed protectants for management of *Callasobruchus maculatus* oviposition on Green Gram (*Vigna radiata* L. Wilczek) seed.

		Extent of Oviposition				
Plant material	Dose	10 days	60 days	120 days	180 days	1 year
Custard apple powder	0.05%	21.33	28.27	73.86	100	100
Custard apple powder	0.025%	25.34	31.37	75.98	100	100
Tobacco leaf powder	0.05%	10.77	13.19	52.76	100	100
Tobacco leaf powder	0.025%	18.57	22.80	64.22	100	100
Neem leaf powder	0.05%	7.09	9.83	49.63	100	100
Neem leaf powder	0.025%	16.75	20.26	62.11	100	100
Black gram flour	0.05%	17.50	21.41	63.15	100	100
Black gram flour	0.025%	18.82	23.44	64.65	100	100
Neem seed kernel powder	0.05%	13.88	17.00	56.12	100	100
Neem seed kernel powder	0.025%	20.54	23.69	69.67	100	100
Bhilawa	0.05%	20.88	26.88	70.69	100	100
Bhilawa	0.025%	26.49	36.19	79.34	100	100
Control	-	41.39	66.43	79.62	100	100

Table 2: Efficacy of seed protectants on Seed damage (in %) and Reduction of seed weight (in %) by *Callasobruchus maculatus* on Green Gram (*Vigna radiata* L. Wilczek)

Plant material	Dose	Seed damage (in %)	Reduction of seed weight (in %)
Custard apple powder	0.05%	28.64	56.44
Custard apple powder	0.025%	36.38	57.21
Tobacco leaf powder	0.05%	13.25	46.89
Tobacco leaf powder	0.025%	22.26	54.09
Neem leaf powder	0.05%	12.09	45.77
Neem leaf powder	0.025%	16.37	51.68
Black gram flour	0.05%	19.56	53.55
Black gram flour	0.025%	23.52	54.56
Neem seed kernel powder	0.05%	15.64	51.67
Neem seed kernel powder	0.025%	24.90	55.81
Bhilawa	0.05%	27.72	56.36
Bhilawa	0.025%	41.58	57.94
Control	-	43.47	70.66

suspension, aqueous extract and ether extracts of 10, 5, 2.5 and 1% concentrations of various parts (root, stem, leaf, fruit) of plant *Solanum surratense* were applied on egg laying activities of the pulse beetle *C. chinensis* Linn [8]. A significant reduction in the oviposition (eggs laid per pair) of insects were noticed by these authors [8]. The grains were treated with seed powder of custard apple, black pepper, leaves of mint, a complete prevention of egg laying by *C. analis* have been observed until 60 days [9].

Whereas, Bhalla *et al*. [10] have studied that on exposure of low temperatures (20±1°C, 9±1°C and –14±1°C) on green gram seeds infested with different stages of *Callosobruchus maculatus viz.,* egg, early larva, late larva and pupa for 24h and found that all the stages were highly sensitive to a temperature of –14±1°C and adult mortality at this temperature occurred within 12 min. They also found that on exposure of 50°C temperature on cowpea seeds infested with different stages of *C. maculatus* for 2h, 4h and 6h revealed that all stages are sensitive to an exposure period of 6 h however, complete mortality of adults is occurs within 12 min.) The damaged percentage of grains of *Vigna radiata* affected with *Callosobruchus chinensis* are directly related with concentration [11]. According to these authors [11], the dose concentration of 10% was most effective and lowest damage to the grains. However, Jain *et al*. [12] have selected plant *Tephrosia purpurea* (Fabaceae) to screen its efficacy against the pulse beetle *Callosobruchus chinensis* (Coleoptera: Bruchidae) by taking use of certain formulations and recording egg laying by the pest species. These author observed a significant decrease in egg laying in different experimental sets. The results of the present investigation also in conformities with the findings of previous authors.

The present investigation are important from agricultural point of view, as they provide the idea about to manage, store and protect the green gram from insecticidal activities of studied pest and are also beneficial for sustaining and maintenance of the environment and human health better.

REFERENCES

1. Das, D.R., S. Parween and F.I. Faruki, 2006. Efficacy of commercial neem based insecticides, nimbicidine against eggs of the red flour beetle *Tribalium Castaneum* (Herpst). Univ: J. Zool. Rajshahi Univ., 25: 51-35.
2. Umoetok, S.B.A. and M.B. Gernard, 2003. Comparative efficacy of *Acarus calomus* powder and two synthetic insecticides for control of three major insects pests of stored cereal grains. Global J. Agric, Sci., 2(2): 94-97.
3. Zakladnoi, G.A. and V.F., Ratanova, 1987. Stored grain pests and their control. Oxonian Press Pvt. Ltd., New Delhi, pp: 1-268.
4. Amin, M.R. and M. Shahjahan, 2000. Use of Akanda, Biskatali & neem leaves as botanical insticides against lesser bares. Bangladesh. J. Entomol., 10: 1-13.
5. Kardinan, A., E.A. Wikardi, M. Sidik, B.M. Rejesus, R.P. Garcia, B.R. Champ, M. Bengston, O.S. Dharmaputa and H. Halid, 1997. The prospect of botanical insecticides on stored food insects management. Proceedings of the Symposium on “Pest management for stored food and feed, held at Bogor, Indonesia 5-7 September. BIOTROP – Special – Publication, (59): 199-208.

6. Tiwari, A., M.L. Kumar, R.C Saxena, A. Tiwari and M. Lakshmana Kumar, 1995. Effect of *Nicotiana tobaccum* on *Tribolium castaneum*. International J. of Pharmacognosy, 33(4): 348-350.
7. Kotkar, H.M., P.S. Mendki, S.V. G.S. Sadan, S.R. Jha, S.M. Upasani and V.L. Maheshwari, 2002. Antimicrobial and pesticidal activity of partially purified flavonoids of *Annona squamosa*. Pest Manag. Sci., 58: 33-37.
8. Srivastava, M. and L. Gupta, 2007. Effect of formulations of *Solanum surratense* (Family:Solanaceae) an Indian desert plant on oviposition by the pulse beetle *Callosobruchus chinensis* Linn. African Journal of Agricultural Research, 2(10): 552-554.
9. Juneja, R.P. and J.R. Patel, 1994. Botanical materials as protectants of green gram, Vigna radiata (L.) Wilczek against pulse beetle *Callosobruchus analis* (Fab.) Gujrat Agric. Univ. Res., J., 20(1): 84-87.
10. Bhalla, S., K. Gupta, B. Lal, M.L. Kapur and R.K. Khetarpal, 2008. Efficacy of various non-chemical methods against pulse beetle, *Callosobruchus maculatus* Fab. ENDURE International Conference 2008 Diversifying crop protection, 12-15 October 2008 La Grande-Motte, France - Oral presentations, pp: 1-4.
11. Mann, A.K. and M. Srivastava, 2013. Efficacy of plant *Peganum harmala* on the percentage of damaged grains infested by pulse beetle *Callosobruchus chinensis Linn.* International Journal of Scientific Research, 2(8): 512-513.
12. Jain, P., H. Kosar, R. Bareth and M. Srivastava, 2014. *Tephrosia Pupurea* Formulations as Ovipositional Deterrents against Pulse Beetle *Callosobruchus Chinensis* Linn. (Coleoptera: Bruchidae). Biomirror, 5(10): 89-96.