

Control Measure of Pulse Beetle, *Callosobruchus* spp. Using Some Botanicals

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Received June 09, 2021; Revised July 11, 2021; Accepted July 30, 2021

Abstract The effectiveness of some botanicals collected from various localities of Jodhpur were used against adult emergence of stored grain insect pest, *Callosobruchus* spp. The experiment was conducted at Department of Zoology, Jai Narain Vyas University, Jodhpur. All the botanicals were used in the form of leaf powder and applied at three doses, 0.5, 1 and 2 gm, separately mixed with 20 gm of mung beans. *Azadirachta indica* was found most effective with minimum number of adult emergence at all three doses while maximum adults were emerged in grains treated with *Salvadora persica* at 0.5 gm/20gm of mung beans in comparison to the other botanicals. *Eucalyptus globulus*, *Fagonia cretica*, *Balanites aegyptiaca*, *Ocimum sanctum*, *Commiphora weightii*, *Barleria acanthoides* and *Maytenus emarginata* also showed effective result in comparison to the control.

Keywords: *Callosobruchus*, botanicals, plant powder

Cite This Article: Lekhu Gehlot, Dushyent Gehlot, Anand Kumar Prajapat, Sonal Sankhala, and Kheev Raj, "Control Measure of Pulse Beetle, *Callosobruchus* spp. Using Some Botanicals." *Applied Ecology and Environmental Sciences*, vol. 9, no. 7 (2021): 704-706. doi: 10.12691/aees-9-7-9.

1. Introduction

Pulse beetles, *Callosobruchus* spp. are important stored grain insect pests, are small insects of about 2-3 mm in length. Pulse beetle infest several pulses such as mung bean, moth bean, cowpea, chickpea, pigeon pea etc. The infestation starts from field when the grains becomes green, with the harvested grains they make their way into store where they continue infest the stored grains thus *Callosobruchus* is field to store pest [1]. During storage of pulses they cause qualitative and quantitative losses to grains and in developing countries about ten to fifteen percent of seeds are damaged during postharvest [2,3]. To overcome from this problem during storage these insects pests are controlling with the use of chemicals which are often create problem such as resistant strains, toxic residues etc. [4], non-selective insecticides also kill the beneficial insects [5,6]. Problem created by pesticides residue increased the requirement of biodegradable pesticides [7]. From last few years, these insects pests have been controlling with the use of plant derived product which have many advantages in comparison to synthetic insecticides. Botanicals are target specific, have no adverse effect against beneficial insects, have no environmental hazards [8]. In the present research work efficacy of some botanicals were evaluated against the adult emergence of pulse beetle, *Callosobruchus* spp. infesting stored mung beans.

2. Material and Method

2.1. Preparation of Plant Powder

Leaves of selected plants were collected from different areas of Jodhpur and dried naturally under shade at room temperature for ten days by which time the leaves were crisp dry, the powder prepared by grinding the leaves through grinder and then filter through a mesh size 0.25mm. The prepared powder applied at the rate of 0.5, 1.0 and 2.0 gram per 20 gm seeds (w/w) of mung beans.

2.2. Method used for Adult Emergence of Test Insect

Twenty grams of un-infested and clean mung beans were placed into culture tube. Plant powder were added and mixed thoroughly. For the control set no plant powder was added in grains. Five pairs of newly emerged adults of *Callosobruchus* spp. were introduced into each tube. Muslin cloths were tied with rubber bands to cover the mouth of tubes. All culture tubes containing mung beans treated with plant powder along with control tube maintained at 28±2°C and 70±5 % relative humidity in incubator. Three replicates were set up for each experiment. After 15 days dead beetles were removed from tubes to avoid mixing with newly emerged adults. Emergence of adult insects counted regularly till emergence was stopped.

3. Observation and Result

The effectiveness of various botanicals in the form of powder against the adult emergence of *Callosobruchus* spp. is presented in Table 1. Results revealed that @ 2gm/20g seeds minimum number of adult emerged in the case of *Azadirachta* (6.67%) followed by *Eucalyptus* (10.00%), *Fagonia* (16.67%), *Balanites* (20.00%), *Ocimum* (23.33%), *Commiphora* (30.00%), *Barleria* (33.33%), *Maytenus* (43.33%) and *Salvadora* (50.00%) while maximum number of adult emerged in control (93.33). In other two doses (1gm and 0.5gm) again minimum and maximum number of adults emerged in grains treated with *Azadirachta* and *Salvadora* respectively in comparison to the control (Table 1). Analysis of variance (ANOVA) revealed that all the treatment caused significant reduction in adult emergence (99% probability), the variance due to different concentration of same plant species are also significant (Table 2).

Botanicals have been used by various researchers in controlling stored grain insect pests. Miah et al. [9] used *Vitex negundo* leaf powder against *Callosobruchus chinensis* and they observed reduction in number of adult emergence. Panday and Singh [10] used powder of neem leaves to

protect black gram from infestation by *Callosobruchus chinensis*. Sharvale and Borikar [11] reported that neem leaves and castor oil were found effective for the reduction in the adult emergence of *Callosobruchus chinensis* infesting stored chickpea. Banjo and Mabogunje [12] applied powder of *Azadirachta indica*, *Jatropha curcas* and *Pepper* in controlling the adult emergence of the *Callosobruchus maculatus* and they found satisfactory result. Gupta and Singh [13], Rahman and Talukdar [14] and Lakshmi and Venugopal [15] also tested effectiveness of plant powder against various stored grain insects and found satisfactory results. Sundria et al. [16] evaluated six botanicals against *Callosobruchus chinensis* infesting green gram and found reduction in number of adult emerged. Ali et al. [17] evaluated insecticidal properties of turmeric and garlic extract against *Tribolium castaneum* and reported that both plant cause significant reduction in larva, pupa and adult emergence in comparison to control. Asawalam et al. [18] used powder of four indigenous plants; *Dennettia tripetala*, *Curcuma longa*, *Piper guineense* and *Zingiber officinale* against *Sitophilus oryzae*, highest mean number of adult emerged in case of control while *Curcuma longa* found most effective among the all botanicals with minimum mean number of adult emerged.

Table 1. Botanicals against adult emergence of pulse beetle, *Callosobruchus* spp.

Plant Species	Doses (gm./100g seeds)	No. of Insects Repelled (%)	Plant Species	Doses (gm./100g seeds)	No. of Insects Repelled (%)
<i>Azadirachta indica</i>	0.50	16.67	<i>Fagonia cretica</i>	0.50	30.00
	1.00	10.00		1.00	23.33
	2.00	6.67		2.00	16.67
<i>Balanites aegyptiaca</i>	0.50	33.33	<i>Maytenus emarginata</i>	0.50	63.33
	1.00	26.67		1.00	50.00
	2.00	20.00		2.00	43.33
<i>Barleria acanthoides</i>	0.50	56.67	<i>Ocimum sanctum</i>	0.50	46.67
	1.00	43.33		1.00	33.33
	2.00	33.33		2.00	23.33
<i>Commiphora weightii</i>	0.50	53.33	<i>Salvadora persica</i>	0.50	76.67
	1.00	40.00		1.00	56.67
	2.00	30.00		2.00	50.00
<i>Eucalyptus globulus</i>	0.50	20.00	Control	93.33	
	1.00	13.33			
	2.00	10.00			

Table 2. Analysis of variance for botanicals against adult emergence of *Callosobruchus* spp.

Summary

Groups	Count	SUM	Average	Variance
Doses	27	31.5	1.1666	0.4038
Plant species	27	926.6667	34.3209	330.611
ANOVA (Single Factor)				

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Source of Variance	Sum Of Square (SS)	Degree Of Freedom (Df)	Mean Of Square (MS)	F-Value	P-Value	F crit
Between Group	14839.32	1	14839.32	89.6595	6.61E-13	4.0266
Within Group	8606.385	52	165.5704			
Total	23445.71	53				

Acknowledgements

Author is grateful to Department of Science and Technology, New Delhi, for their financial support under the WOS-B scheme to carry out this research work.

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