Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(4): 666-668

Received: 19-05-2020
Accepted: 21-06-2020

K Ashok
Research Scholar, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

K Aravinthraju
Research Scholar, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Madurai, Tamil Nadu, India

S Abirami
Research Scholar, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Tikamgarh, Madhya Pradesh, India

Corresponding Author:
K Ashok
Research Scholar, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Evaluation of certain botanicals against pulse beetle, *Callosobruchus chinensis* (L.) on chickpea

K Ashok, K Aravinthraju and S Abirami

Abstract
Pulses, a poor man's meat in which many insect pests causes losses in both field and storage condition. In storage condition, the pulse beetle, *Callosobruchus spp.* causes major losses among other Pests. The present study involves the evaluation of certain botanicals like Neem leaf powder 5g/ 100 seeds, Nimbicidin 5ml/ 100 seeds, Karanji oil 5ml/ 100 seeds, Custard apple leaf powder 5g/ 100 seeds, Castor oil 5ml/ 100 seeds and Eucalyptus oil 5ml/ 100 seeds against *C. chinensis* in chick pea for percent seed infestation and percent seed weight loss, where Deltamethrin (2.8 EC) 0.04ml/ 100 seeds and untreated treatments used as standard check and untreated check respectively. The results revealed that all the treatments was significantly superior then the untreated control that have maximum insect damage (9.0%) at 30 days of storage period. Insect infestation percent was increased in all the treatments with period increased in storage and nature of protectants. Minimum percent infestation and percent weight loss were noted in Deltamethrin (2.8 EC) 0.04ml/ 100 seeds followed by Nimbicidin 5ml/ 100 seeds and highest were in untreated control.

Keywords: *C. chinensis*, chickpea, botanicals, seed infestation, weight loss

Introduction
Pulses have been considered as the poor man's meat which play an important role in food categories that have been extensively used as staple foods to cover basic protein and energy needs throughout the history of humanity. The global pulse market is estimated at 60 million tonnes. In the world, pulses are grown by 171 countries. India is the world's largest producer and the largest consumer of pulses. At triennium ending 2010, the total area under pulses was 723 lakh ha with production of 644.08 lakh tonnes and a productivity of 890 kg/ha. Among the pulse growing countries highest area was contributed by India (32.24%) followed by Niger (7%), Myanmar (5.33%), Brazil (5.29%) and Nigeria (4.44%). During 2010, the production of pulses in India, was estimated at 17.29 million tonnes, an all-time record [6].

A large amount (15-20 percent) of agricultural production in the world is lost every year due to insect infestation. Out of this, 8 percent production is lost every year due to insect infestation alone in storage. In storage losses occurred due to insect infestation is the most serious problem, particularly in the villages and towns of tropical and subtropical countries, because of humid conditions, poor sanitation and inappropriate storage facilities. More than 200 major species of insects and mites infest important crops and store products in storage [8]. In warehouse, 12 percent loss was recorded by the infestation of these pulse beetles [7].

In India, two species of *Callosobruchus* namely, *C. maculatus* F. and *C. chinensis* L. are commonly known as pulse beetles. These insects are not only common in the India but also widely spread throughout the tropical and sub-tropical regions. Among them *C. chinensis* L. causes enormous losses to almost all kinds of pulses like chickpea (*Cicer arientum* L.), lentil (*Lens culinaris* M.), blackgram (*Vigna mungo* L.), cowpea (*Vigna unguiculata* L.), pigeonpea (*Cajanus cajan* L.), mungbean (*Vigna radiate* L.), grasspea (*Lathyrus sativas* L.), garden pea (*Pisum sativum* L.), etc. in storage condition. This *Callosobruchus* spp. caused 33 percent damage in stored leguminous seeds and 3 percent damage in cucurbitaceous, solanaceous and oilseed crops [5]. The infestation caused by *C. chinensis* L. renders chickpea unsuitable for human consumption. Infested chickpea seeds become non- viable and sometimes unusual sprouting compels re-sowing. The adult beetles do not cause damage to the pulse grains. They do not feed on the seed but they mate and oviposit on grains. The larva is solely responsible for the damage [6].

Several methods are available for controlling pulse beetle in the storage. These are mechanical, cultural, physical, biological, chemical and use of botanical pesticides. Among these control of storage pests by using synthetic chemicals has become a common practice among the farmers and stockholders. It is now widely known that the chemical method has several problems, which include health hazards to the users and grain consumers. It causes residual toxicity, environmental pollution and development of pesticide resistance against bruchids. By realizing the importance of these botanicals, it is imperative that there is a need to examine and evaluate some botanicals in stored commodities. In that direction the present investigation was carried out to evaluate some eco-friendly approaches for management of *C. chinensis* in different pulses.

Materials and Methods

Mass culturing of *C. chinensis*

Lab culture of *C. chinensis* L. was carried out on chick pea seed to obtain inoculum cultures in Department of Entomology, Faculty of Agriculture, Annamalai University, Chidambaram. The infested seed kept in plastic container and covered with muslin cloth till the emergence of adults. Healthy adults emerging from the container were shifted to another plastic container, provided with clean chickpea seeds for oviposition and maintained at 27±2 °C temperature and 70 percent relative humidity in BOD incubator. The container was not disturbed till the emergence of the adults. Freshly emerging subsequent generations were used for bio assay experiments. Treatment details were provided in Table 1.

Table 1: Treatment details

S. No.	Treatment	Doses
T1	Neem leaf powder	5 g
T2	Nimbicidin	5 ml
T3	Karanji oil	5ml
T4	Custard apple leaf powder	5g
T5	Castor oil	5ml
T6	Eucalyptus oil	5ml
T7	Deltamethrin (2.8 EC)	0.04ml
T8	Untreated	-

Effect of botanicals on chickpea seed infestation (damage) by *C. chinensis*

From each sample of each replication hundred seed will be randomly selected carefully to short out healthy and unhealthy seed with the help of magnifying lens (10x). The observation will be recorded at 90 and 180 days after treatment. The data thus obtained will be used for computing percent damage seed by using above formula.

$$\text{Percent seed damage (bored seed)} = \frac{\text{No. of bored seed in sample}}{\text{Total number of seed in sample}} \times 100$$

Determination of percentage weight loss of seed

To calculate the percent weight loss of seed, 100 seed will be taken. From each replication of different treatment and carefully examined with the help of magnifying lens (10x) to separated out the bored seed. The observations were recorded at the end of experiment (180 days). The data thus obtained will be used for computing weight loss percent by using above formula [11].

$$\text{Percent weight loss in seed} = \frac{\text{Weight of damaged seed sample}}{\text{Total weight of seed sample}} \times 100$$

Results and Discussion

The results showed variation in seed infestation and seed weight loss in chickpea up to experimental storage periods. The insect damaged was ranged from 0.33 to 3.33 percent at 15 Days and 1.67 to 6.00 percent at 30 days of ambient storage. At 15 days of storage period the minimum seed infestation 0.33% was observed in Deltamethrin 2.8 EC @ 0.04 ml kg ' followed by Nimbicidin @ 5 ml kg" with 0.67 percent and Karanji oil @ 5 ml kg with 1.0 percent damage. At 30 days of storage period the minimum seed infestation 1.67 percent was observed in Deltamethrin 2.8 EC @ 0.04 ml kg, followed by Nimbicidin @ 5 ml kg with 2.33 percent and Karanji oil @ 5 ml kg with 3.33 percent damage (Table 2).

All treatment was significantly superior then the untreated control that have maximum insect damage (9.0%) at 30 days of storage period. Insect infestation percent was increased in all the treatments with period increased in storage and nature of protectants. These results were also supported by [1] in cowpea and [3] in pigeon pea.

The result showed that all the seed protectants showed better performance in respect to percent weight loss with significant level over control at different storage periods. At 15 days of storage, the weight loss due to feeding of seed was ranged 9.33-2.67 percent. The minimum weight loss observed in Deltamethrin 2.8 EC @ 0.04 ml kg 2.67 percent followed by Nimbicidin @ 5 ml kg: with 4.333 percent, Neem leaf powder @ 5g kg" with 4.76 percent, Karanji oil @ 5 ml kg' with 6.33 percent and Custard apple leaf powder @ 5g kg with 7.76 percent. The weight in control was higher in compare to treatment and was 10.75 percent (Table 3).

At 30 days of storage, the weight loss was ranged 14.8-6.33 percent. The minimum weight loss was in Deltamethrin 2.8 EC @ 0.04 ml kg" 6.33 percent followed by Nimbicidin @ 5 ml kg' with 9.51 percent, Neem leaf powder @ 5g kg with 9.76 percent, and Karanji oil @ 5 ml kg' with 10.15 percent. The weight in control was 18.8 percent significantly higher than all control. Similar findings have been reported by several workers, [10] and [4] in pigeon pea, [2] in cowpea, [9] in chickpea.

Table 2: Effect of treatments (seed protectants) on insect infestation by *C. chinensis* in chickpea at different storage period

S. No.	Treatments	Doses	Mean percent infestation	
			Storage days after treatment	
			15 days	30 days
T1	Neem leaf powder	5 g	1.33 (6.53)	3.33 (10.49)
T2	Nimbicidin	5 ml	0.67 (3.82)	2.33 (8.74)
T3	Karanji oil	5ml	1.00 (5.73)	3.33 (10.49)
T4	Custard apple leaf powder	5g	1.67 (7.33)	3.66 (11.01)
T5	Castor oil	5ml	2.67 (9.53)	5.33 (13.33)
T6	Eucalyptus oil	5ml	3.33 (10.94)	6.00 (14.14)

T7	Deltamethrin (2.8 EC)	0.04ml	0.33 (1.92)	1.67 (7.33)
T8	Untreated	-	5.00 (12.87)	9.00 (17.43)
SE (d)			1.044	0.615
CD (5%)			3.17	1.84

Note: The figures in parenthesis are Angular Transformed values

Table 3. Effect of treatments (seed protectants) on seed weight loss (%) in chickpea at different storage period

S. No.	Treatments	Doses	Mean percent infestation	
			Storage days after treatment	
			15 days	30 days
T1	Neem leaf powder	5 g	4.76 (12.59)	9.76 (18.17)
T2	Nimbicidin	5 ml	4.33 (11.99)	9.51 (17.96)
T3	Karanji oil	5ml	6.33 (14.57)	10.15 (18.57)
T4	Custard apple leaf powder	5g	7.76 (16.17)	13.0 (21.10)
T5	Castor oil	5ml	8.33 (16.75)	13.8 (21.80)
T6	Eucalyptus oil	5ml	9.33 (17.78)	14.8 (22.64)
T7	Deltamethrin (2.8 EC)	0.04ml	2.67 (9.37)	6.33 (14.57)
T8	Untreated	-	10.75 (18.93)	18.8 (25.71)
SE (d)			0.341	0.314
CD (5%)			1.021	0.94

Note: The figures in parenthesis are Angular Transformed values

Conclusion

The present investigation revealed that all the seed protectants at 15 and 30 days were given significantly superior results over control in respect to both seed infestation and seed weight loss. Hence, with the utilization of different plant product, it is concluded that these botanicals has a potential scope for stored grain pest control.

Acknowledgement

The authors sincerely thank Dr. S. Arivudainambi and Dr. V. Selvanarayanan from Department of Entomology, Faculty of Agriculture, Annamalai University, Chidambaram for their valuable support and love towards us all the time.

References

1. Chander S, Singal SK, Bhanot JP. Role of grain protectants in integrated pest management of pulse beetle, *Callosobruchus chinensis* (L.) infesting greengram, *Vigna radiata* (L.) Wilczek. Research on Crops. 2007; 8(2):458.
2. Gawade AA, Chavan BP, Chandele AG. Relative efficiency of some botanicals and synthetic seed production against the pulse beetle *Callosobruchus maculatus* F. on cowpea. Pest Management and Economic Zoology. 2009; 17(2):159-162.
3. Lal D, Raj DV. Efficacy of application of four vegetable oils as grain protectant against the growth and development of *Callosobruchus maculatus* and on its damage. Advances in Bioresearch. 2012; 3(2):55-59
4. Pandey AK, Singh P, Palni UT, Tripathi NN. Bioefficacy of plant essential oils against pulse beetles *Callosobruchus spp*. (Coleoptera: Bruchidae) in pigeon pea seeds with particular reference to Clause Napentaphylla (Roxb.) Journal of Phytopathology and Plant Protection, 2013; 46(12):1408.
5. Rathore YS, Sharma V. Management of bruchid infestation in pulses. In Proceedings of the National Symposium on Pulses for Sustainable and Nutritional Security. Mansoor Ali, SK Chaturvedi and SN Gurha (eds.). Indian Institute for Pulses Research, New Delhi. 2001, 17-19.
6. Sharma SS. Review of literature on the losses caused by *Callosobruchus* species (Bruchidae: Coleoptera) during storage of pulses. Bulletin of Grain Technology. 1984; 22(1):62-71.
7. Singh KM, Sureja AK, Sarma AK. Bio-efficacy of some botanicals against *Callosobruchus chinensis* L. (Coleoptera: Bruchidae) on pea. Indian Journal of Entomology. 2006; 68(4):404.
8. Singh S, Sharma G. Efficacy of some plant products against pulse beetle (*Callosobruchus chinensis*) in green gram (*Vigna radiata*) and their effect of on germination. Indian Journal of Applied Entomology. 2002; 16(1):48-52.
9. Tabu D, Selvaraj T, Singh SK, Mulugeta N. Management of Adzuki bean beetle (*Callosobruchus chinensis* L.) using some botanicals, inert materials and edible oils in stored chickpea. Journal of Agricultural Technology. 2012; 8(3):881-902
10. Tripathi S, Awasthi S, Chandralekha. Efficacy of different seed protectants against (*Callosobruchus chinensis* L.) on pigeon pea. Indian journal of Pulses Research. 2006; 19(2):272.
11. Yadav MK, Kumar R, Sahu R, Singh RB. Standardization of seed protectants for improving the seed quality of pigeonpea (*Cajanus cajan* L.) seed under the ambient storage. International Journal of Chemical Studies. 2018; 6(4):1985-1990.