Indian Journal of Applied Entomology **27**(2) : 98–101 (2013)

EFFECTIVENESS OF PACKAGING MATERIALS AND STORAGE CONTAINERS AGAINST PULSE BEETLE, *CALLOSOBRUCHUS CHINENSIS* (LINN.)

YOGENDRA PAREEK, PUNAM SHARMA AND K.C. KUMAWAT

Department of Entomology, S.K.N. College of Agriculture (SK Rajasthan Agricultural University), Jobner (Rajasthan) – 303329, India

ABSTRACT

Different packaging materials and storage structures were evaluated against infestation of *Callosobruchus chinensis* (Linn.). The minimum adult emergence was recorded in the metal bin (3.00 to 7.67) in which the cowpea seeds were free from adult beetle infestation upto 90 days of storage. This was followed by plastic fibre bag (2.66–18.00), wherein the seeds were free from the adults infestation upto 60 days of storage. The maximum adult emergence was recorded in kuthla (2.00–45.67) that closely followed matka bin (2.33–43.67). Seed damage was minimum in the metal bin (4.00–11.67) as it could protect the seeds upto 90 days of storage. This was followed by plastic fibre bag in which the seed damage ranged from 4.00 to 21.33 per cent, and it was able to protect the seeds upto 60 days of storage. The maximum seed damage was recorded in the kuthla (3.02–47.33%) followed by matka bin (4.00–47.00%). The quantitative loss caused by *C. chinensis* was minimum in the metal bin (1.67–4.33%) followed by plastic fibre bag (1.67–10.67%). The maximum quantitative loss was recorded in the kuthla (0.67 to 20.67%), followed by matka bin (0.67 to 21.33%).

Keywords: *Callosobruchus chinensis,* adult emergence, cowpea, packaging materials, strorage structure

INTRODUCTION

According to the FAO Report (1977), pulses suffer 8.5 per cent post harvest losses in India and insect pests alone are responsible for 5.0 per cent. Gurjar and Yadav (1978) recorded 30.2–55.7 per cent loss in seed weight and 17.0–53.5 per cent loss in protein content. In case of severe infestation, cent per cent damage is caused by the pest (Pruthi and Singh, 1950). Apart from the quantity, the quality, nutritional and aesthetic values of pulses are deteriorated by pulse beetles during the storage. The different genera associated with storage are *Bruchus, Callosobrochus, Caryedon* and *Zabrotes.* among these *Callosobruchus chinensis* is the most important insect pest infesting stored cowpea.

A wide range of management practices including use of fumigants and other toxic chemicals against the bruchids have been suggested (Dutt, 1988 and Hill, 1990) but indiscriminate use of these causes chronic and acute toxicity, insect resistance to insecticides, environmental pollution and other problems. Therefore, exploration of alternative non–chemical techniques, free from environmental and human health hazards may be included in the IPM strategy against a given insect pest.

MATERIALS AND METHODS

Packaging materials and storage containers used. Different packing materials and storage containers evaluated were cloth bag, gunny bag, polythene bag, urea bag, *Matka* bin, metalbin and *Kuthla*. 200g cowpea seeds of variety, RC–101 (sterilised and conditioned) were kept in bags of 12 × 18 cm^2 size and small representative storage containers, each replicated four times. These storage bags and containers were infested with *C. chinensis* to have the natural infestation. The storage bags and containers were inspected periodically (monthly interval) for the infestation.

Method of recording the observations. The adult emergence was recorded at monthly interval. After counting the adults, they were discarded from the samples so that the same was not counted while taking the observation next time. The seed damage was recorded by visual observations. 100 seeds were observed in each sample for recording seed damage. The healthy seeds (uninfested) were sorted out and remaining (infested or damaged) were counted. The per cent seed damage was calculated as follows:

$$\text{Seed damage (\%)} = \frac{\text{Number of damaged seeds}}{\text{Total number of seeds counted}} \times 100$$

The weight loss due to seed damage was recorded by excluding the frass from the seeds. Total five observations on weight loss were recorded. These observations were recorded at monthly intervals.

$$\text{Weight loss (\%)} = \frac{I - F}{I} \times 100$$

Where,

I = Initial weight of seeds

F = Final weight of seeds

Statistical analysis. The per cent data on grain damage and weight loss were transformed into angular values (arc sine percentage) and number of insects into log X + 1 values for analysis of variance.

RESULTS AND DISCUSSION

Different packaging materials and storage structures being used by the farmers in villages were evaluated against the infestation of *C. chinensis*. The various packaging materials and structures included for evaluation were gunny bag, cloth bag, plastic fibre bag, polythene bag, *Kuthla*, metal bin and *Matka* bin. The parameters recorded were adult emergence, seed damage and quantitative loss at monthly intervals. The minimum adult emergence was recorded in the metal bin (3.00–7.67), the seeds were free from adult infestation upto 90 days of storage (Table 1). This was followed by plastic fibre bag (2.66–18.00), the seeds were free from adults upto 60 days of storage. The maximum adult emergence was recorded in *Kuthla* (2.00–45.67), closely followed by *Matka* bin (2.33–43.67).

Seed damage was minimum in the metal bin (4.00–11.67%), it could protect the seeds upto 90 days of storage (Table 2). This was followed by plastic fibre bag in which the seed damage ranged from 4.00–21.33 per cent, it could protect the seeds upto 90 days of storage. The maximum seed damage was recorded in the *Matka* bin (4.00–47.00%) followed by gunny bag (3.33–41.67%). The quantitative loss caused by *C. chinensis* was minimum in the metal bin (1.67–4.33%) and could protect the seeds upto 90 days (Table 3). Maximum quantitative loss was recorded in *Kuthla* (0.67–20.67%) followed by *Matka* bin (0.67–21.33%). Earlier the packaging materials and storage structures were evaluated by Awaknavar *et al.* (1989), Sinha (1990), Dwivedi *et al.* (1991) and Gupta *et al.* (1998). The present findings corroborate with the findings of Awaknavar *et al.* (1989) who recorded 3.2 per cent weight loss in the metal bin and maximum weight loss (5.0%) in the earthen pot storage. Dwivedi *et al.* (1991) reported that the tin containers were the most effective with mud *Kothi* and earthen pots intermediate in the effectiveness. The descending order of effectiveness to protect the seeds from *C. chinensis* infestation was a metal bin, plastic fibre bag, cloth bag, polythene bag, gunny bag, *Matka* bin and *Kuthla*.

ACKNOWLEDGEMENTS

The authors are highly grateful to ghe Dean, S.K.N. College of Agriculture, Jobner and Vice–Chancellor, SKRAU for providing necessary facilities to conduct the studies.

Table 1. Effect of different packaging materials and storage structure on the adult emergence of *C. chinensis* at certain period of storage

S. No.	Containers	30 Days	60 Days	90 Days	120 Days	150 Days	Mean
1.	Gunny bag	0.00 (0.00)	2.33 (0.52)	7.67 (0.94)	19.33 (1.31)	37.00 (1.58)	13.26
2.	Cloth bag	0.00 (0.00)	1.67 (0.43)	5.67 (0.82)	13.00 (1.15)	26.67 (1.44)	9.40
3.	Plastic fibre bag	0.00 (0.00)	0.00 (0.00)	2.66 (0.56)	7.33 (0.92)	18.00 (1.28)	5.60
4.	Polythene bag	0.00 (0.00)	2.67 (0.56)	6.00 (0.85)	17.67 (1.27)	34.01 (1.54)	12.07
5.	*Kuthla*	2.00 (0.48)	5.67 (0.82)	13.67 (1.17)	26.66 (1.44)	45.67 (1.67)	18.73
6.	Metal bin	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	3.00 (0.60)	7.67 (0.94)	2.13
7.	*Matka* bin	2.33 (0.52)	4.00 (0.70)	11.33 (1.09)	22.00 (1.36)	43.67 (1.65)	16.67
	S.Em. ±	–	0.01	0.02	0.02	0.03	–
	CD (P = 0.05)	–	0.03	0.06	0.06	0.08	–

Figures in the parentheses are log (X + 1) values

Table 2. Effect of different packaging materials and structure on the infestation (seed damage %) of *C. chinensis* in cowpea at certain period of storage

S. No.	Containers	30 Days	60 Days	90 Days	120 Days	150 Days	Mean
1.	Gunny bag	0.00 (0.00)	0.33 (10.51)	9.00 (17.46)	20.33 (26.30)	41.67 (40.20)	14.87
2.	Cloth bag	0.00 (0.00)	2.33 (8.78)	7.33 (15.71)	16.66 (24.09)	34.00 (35.69)	12.06
3.	Plastic fibre bag	0.00 (0.00)	0.00 (0.00)	4.00 (11.54)	9.67 (17.12)	21.33 (27.51)	7.00
4.	Polythene bag	0.00 (0.00)	3.00 (9.97)	6.67 (14.96)	19.17 (25.97)	37.33 (37.66)	13.23
5.	*Kuthla*	3.00 (9.97)	7.67 (16.08)	16.67 (24.10)	29.33 (32.79)	47.33 (43.47)	20.80
6.	Metal bin	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.00 (10.54)	11.67 (19.98)	3.13
7.	*Matka* bin	4.00 (11.54)	6.33 (14.57)	14.00 (21.97)	27.00 (31.31)	47.00 (43.28)	19.67
	S.Em. ±	–	0.16	0.29	0.48	0.76	–
	CD (P = 0.05)	–	0.48	0.89	1.47	2.30	–

Figures in the parentheses are arc sine $\sqrt{\text{percentage values}}$

Table 3. Effect of different packaging materials and structures on the quantitative loss (%) caused by *C. chinensis* in cowpea at certain period of storage

S. No.	Containers	30 Days	60 Days	90 Days	120 Days	150 Days	Mean
1.	Gunny bag	0.00 (0.00)	1.33 (6.62)	3.67 (11.04)	10.17 (18.60)	17.00 (24.35)	6.53
2.	Cloth bag	0.00 (0.00)	0.33 (3.29)	2.67 (9.40)	5.00 (12.92)	13.67 (21.70)	4.33
3.	Plastic fibre bag	0.00 (0.00)	0.00 (0.00)	1.67 (7.43)	4.00 (11.54)	10.67 (19.07)	3.27
4.	Polythene bag	0.00 (0.00)	0.67 (4.69)	2.33 (8.78)	9.67 (18.12)	17.00 (24.35)	5.93
5.	*Kuthla*	0.67 (4.69)	3.00 (9.97)	6.67 (14.97)	11.33 (19.67)	20.67 (27.04)	8.47
6.	Metal bin	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.67 (7.43)	4.33 (12.01)	1.20
7.	*Matka* bin	0.67 (4.69)	2.00 (8.13)	5.67 (13.78)	11.33 (19.67)	21.33 (27.51)	8.20
	S.Em. ±	–	0.13	0.22	0.34	0.51	–
	CD (P = 0.05)	–	0.39	0.67	1.03	1.55	–

Figures in the parentheses are arc sine $\sqrt{\text{percentage values}}$

REFERENCES

FAO Report. 1977. Analysis of an FAO survey of post harvest crop losses in developing countries (AGPP: Misc./27). Food and Agriculture Organization of the United Nations, Rome.

Awaknavar, J.S., Krishnamurthy, K.C., Babu, C.K. and Ramakumar, M.V. 1989. Different storage structures for safe storage of pulses. *Mysore Journal Agricultural Sciences*. **23**(4): 526–532.

Dutt, N. 1988. Biological studies on F_1 immature form obtained from crosses of *Callosobruchus chinensis* (L.) exposed to sub lethal concentration of oragnophosphorus insecticides. *Indian Journal of Entomology*. **50**: 307–314.

Dwivedi, P.K., Bansode, P.C. and Agrawal, R.K. 1991. Assessment of losses in blackgram, *Vigna mungo* and green gram, *Vigna radiata* stored at farm level in different types of structures in Madhya Pradesh (India). *Journal of Entomological Research.* **15**: 203–207.

Gupta, H.C., Sharma, S.K., Gupta, I.J., Goyal, K.C. and Sharma, S.N. 1998. Effect of pesticides and packaging materials on bruchid control and viability of mungbean (*Vigna aureus* Roxb.) seeds. *Seed Research.* **26**: 168–173.

Gurjar, G.T. and Yadav, T.D. 1978. Feeding of *Callosobruchus maculatus* (Fab.) and *C. chinensis* (Linn.) in green gram. *Indian Journal of Entomology.* **40**: 108–112.

Hill, D.S. 1990. *Pests of stored products and their control*. C.B.S., London.

Sinha, S.P. 1990. Effect of quality of storage structures on multiplication behaviour of *Callosobruchus chinensis* in *Cajanus indicus* (arhar). *Comparative Physiology and Ecology.* **15**: 125–128.