



Effect of hermetic storage of groundnut pods on the adult emergence and pod damage caused by the bruchid, *Caryedon serratus* (Olivier)

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Abstract

An experiment on the effectiveness of hermetic storage of groundnut to prevent or reduce the damage caused by C. serratus was conducted by using hermetic bags like Magik bags and Super grain bags. These were compared with conventional storage bags like Nylon bags, Cloth bags, Polythene lined cloth bags, Polythene lined thin netted jute bags, thick netted and thin netted double layered, Thick netted and thin netted single layered jute bags. The adult emergence and pod damage was estimated to measure the effectiveness. Groundnut pods stored in Magik bags were completely free from infestation by C. serratus by recording zero adult emergence and zero pod damage up to six months storage period. The kernels from the pods stored in Magik bags recorded cent per cent germination up to six months of storage.

Keywords: *Caryedon serratus, Adult emergence, Pod damage, Magik bags,*

I. INTRODUCTION

Groundnut is susceptible to the attack of many insect pests during storage. Out of 100 species of insect pests attacking the stored groundnut, pod bruchid, *Caryedon serratus* (Olivier) is a major cosmopolitan pest of economic importance [1]. It is the only pest which infests both pods and kernels of groundnut. *C. serratus* causes heavy loss in quality and quantity of stored groundnut. This pest caused 20% loss on a period of five months of storage of groundnut pods in Andhra Pradesh [2]. The extent of damage was recorded as 77.1% in pods and 67.8% in kernels by [3] and 50-70 % in pods and 80-85% in kernels [4].

The continuous usage of chemicals as prophylactic and curative treatment not only contaminates the produce but also leads to serious health hazards and environmental problems. Hence development of alternative, low risk methods for stored grain protection are important which are eco-friendly methods of storage pest management. Storage under air tight conditions is currently gaining importance and a study was conducted on hermetic storage.

II. MATERIALS AND METHODS

The experiment was conducted in the laboratory of the Department of Entomology, Agricultural College, Bapatla, Guntur district, Andhra Pradesh.

A. Collection and rearing of the test insect

The population of the test insect, *C. serratus* was collected from the laboratory of Post Harvest Technology Centre, Agricultural College, Bapatla, Guntur district and transferred into the disinfested groundnut kernels. About 250 g of groundnut kernels were taken in a plastic jar measuring 45 x 15 cm and about 20 pairs of *C. serratus* adults were released into it for oviposition. Adults were removed after ten days and released into another jar containing groundnut kernels, thus

a succession of the insects were maintained for utilizing the eggs laid staggeredly to ensure constant supply of test insects of known age. The newly emerged adults were changed into fresh kernels and used for the multiplication of culture and also for conducting the experiments.

B. Sexing of Test Insects

Sexing of the adult beetles was done by observing the last visible segments of the abdomen. In male, the pygidium or fifth visible tergite projects downward and was hidden by the elytra. The fifth visible sternite was deeply incurved and seventh tergite projects between fifth sternite and the pygidium. In female, the pygidium can be seen in dorsal view projecting beyond the elytra. The fifth sternite was fully extended and the ventral surface was more or less flat. The seventh tergite was not seen in the female.

C. Storage bags

The storage bags used in the present study are hermetic bags like Magik bags (M/S Coromandel fertilizers) and Super grain bags (M/S Grainpro, Inc., Philippines) and conventional bags like Nylon bags, Cloth bags, Polythene lined cloth bags, Polythene lined thin netted jute bags, Thick netted and thin netted double layered, Thick netted and thin netted single layered jute bags.

All types of bags (22 × 15 cm) of 500 g capacity were taken and filled with 500g of disinfested groundnut pods and freshly emerged adult beetles (one day old) were released into the bags @ 10 pairs per bag. Then the bags were closed air tight. Six sets of the treatments were made in three replications to know the effect of hermetic storage at monthly interval up to six months storage period. The first set was opened after one month likewise second set after two months, third set after three months, fourth set after four months, fifth set after five months and sixth set after six months, respectively to record the data.

D. Adult Emergence

The total number of adults emerged from different bags were counted. The live beetles were collected and anesthetized with the help of ethyl acetate for easy counting. The total number of adult beetles from each treatment was counted.

E. Pod damage

A representative sample of 20g of groundnut pods was taken and bored pods were separated. These bored pods were counted for calculating per cent pod damage by count [5]

$$\text{Per cent pod damage (by count)} = \frac{\text{Number of bored pods}}{\text{Total number of pods}} \times 100$$

F. Per cent germination

Fifty seeds from each treatment tested for germination by rolled paper towel method. Germinated seeds were counted after 5 days and converted to percentage.

III. RESULTS AND DISCUSSIONS

A. Adult Emergence

Groundnut pods stored in Magik bag recorded zero adult during one to six months after storage which was significantly different from storage in all other types of bags. Groundnut pods stored in all different types of bags recorded zero beetle emergence at 30 days after storage and were not

significant. The reason behind this is due to the duration of life cycle of *C. serratus* which about 45 days for adult emergence.

Super bags recorded minimum number of emerged beetles of *C. serratus* at 60, 90, 120, 150 and 180 Days after storage (DAS) with average number of adult beetles of 15.33, 23.33, 59.67, 115 and 136.33 respectively. Maximum number of beetles were recorded in cloth bags and single layered thin netted jute bags at 60 to 180 DAS.

Table 1. Adult emergence of *C. serratus* in different storage bags.

Sl. No.	Storage bags	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
1	Magik bag	0 (0.00)	0 (0.71) ^a	0 (0.71) ^a	0 (0.71) ^a	0 (0.71) ^a	0 (0.71) ^a
2	Super bag	0 (0.71)	15.33 (3.97) ^b	26.33 (4.99) ^b	59.67 (7.65) ^b	115 (10.72) ^b	136.33 (11.69) ^b
3	Nylon bag	0 (0.71)	17.67 (4.25) ^b	23.33 (4.84) ^b	79.0 (8.88) ^b	127 (11.26) ^b	195.33 (13.98) ^{bc}
4	Cloth bag	0 (0.71)	82.67 (9.11) ^f	187.5 (13.60) ^d	249.33 (15.71) ^d	322.67 (17.91) ^d	350 (18.71) ^d
5	Polythene lined cloth bag	0 (0.71)	37 (6.11) ^{bcd}	53.67 (7.29) ^{bc}	107.0 (10.34) ^{bc}	210.67 (14.43) ^c	229.33 (15.10) ^c
6	Polythene lined thin netted jute bag	0 (0.71)	31 (5.38) ^{bc}	68.67 (8.29) ^c	118.33 (10.83) ^{bc}	217.67 (14.71) ^{cd}	237 (15.36) ^c
7	Thick netted double layered jute bag	0 (0.71)	50.33 (6.77) ^{cde}	82.33 (9.09) ^c	212.33 (14.57) ^d	242 (15.46) ^{cd}	278.33 (16.62) ^{cd}
8	Thick netted single layered jute bag	0 (0.71)	68.33 (8.28) ^{ef}	82.67 (9.10) ^c	169.67 (12.87) ^{cd}	241.67 (15.41) ^{cd}	283.67 (16.73) ^{cd}
9	Thin netted double layered jute bag	0 (0.71)	63 (7.96) ^{def}	87.33 (9.35) ^c	169.67 (12.89) ^{cd}	239.67 (15.34) ^{cd}	283.33 (16.70) ^{cd}
10	Thin netted single layered jute bag	0 (0.71)	78 (8.80) ^{ef}	161.67 (12.43) ^d	206.33 (14.19) ^d	299 (17.30) ^{cd}	366 (19.23) ^d
	S.E.m±		0.68	0.87	1.03	1.04	0.91
	CD	NS	2.01	2.56	3.03	3.06	2.68

DAS- Days after storage

Values in parentheses are square root transformed values

In each column values with similar alphabet do not vary significantly at P=0.05

B. Pod damage

Pod damage was found to be increasing in all types of bags with the increase in storage period except in Magik bag which gave complete protection against the pod damage due to the attack of *C. serratus* upto 180 days of storage and was significantly superior and different from all other types of storage bags.

Even though all types of storage bags recorded zero adult emergence at 30 DAS, varying levels of pod damage were recorded in different bags due to the attack of *C. serratus* larva which will bore the pods immediately after hatching.

Minimum pod damage was observed in Super bags at 30, 60, 90, 120, 150 and 180 DAS by recording 0.85, 9.92, 42.92, 55.33, 68.67 and 82.67 per cent respectively and was on par with the pod

damage recorded in nylon bags at 30, 60 and 90 DAS with an average of 0.81, 12.64 and 55.76 per cent damage respectively.

Maximum pod damage was recorded in cloth and single layered thin netted jute bags. At 180 DAS all types of storage bags recorded cent per cent damage except Super bags which recorded 82.67 per cent damage and significantly different from other types of storage bags.

Table 2. Per cent pod damage caused by C. serratus in different storage bags.

Sl. No.	Storage bags	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
1	Magik bag	0 (0.00) ^a	0 (0.00) ^a	0 (0.00) ^a	0 (0.00) ^a	0 (0.00) ^a	0 (0.00) ^a
2	Super bag	0.85 (0.49) ^a	9.92 (5.69) ^{ab}	42.92 (16.16) ^{ab}	55.33 (33.64) ^b	68.67 (43.42) ^b	82.67 (55.84) ^b
3	Nylon bag	0.81 (0.46) ^a	12.64 (7.26) ^b	55.76 (34.69) ^{bc}	90 (65.77) ^c	95.33 (73.06) ^c	100 (90.0) ^c
4	Cloth bag	11.52 (6.62) ^b	31.19 (18.22) ^c	75.47 (49.75) ^c	100 (90.0) ^d	100 (90.0) ^d	100 (90.0) ^c
5	Polythene lined cloth bag	5.78 (3.31) ^{ab}	16.11 (9.28) ^{bcd}	58.33 (40.96) ^{bc}	98.67 (84.58) ^d	100 (90.0) ^d	100 (90.0) ^c
6	Polythene lined thin netted jute bag	5.55 (3.19) ^{ab}	15.35 (8.84) ^{bc}	57.27 (36.95) ^{bc}	92.67 (72.08) ^c	100 (90.0) ^d	100 (90.0) ^c
7	Thick netted double layered jute bag	5.46 (3.13) ^{ab}	26.04 (15.17) ^{cde}	68.16 (45.21) ^{bc}	100 (90.0) ^d	100 (90.0) ^d	100 (90.0) ^c
8	Thick netted single layered jute bag	11.23 (6.45) ^b	27.42 (15.92) ^{de}	73.07 (47.60) ^{bc}	100 (90.0) ^d	100 (90.0) ^d	100 (90.0) ^c
9	Thin netted double layered jute bag	4.53 (2.59) ^{ab}	26.67 (15.49) ^{cde}	70.15 (44.57) ^{bc}	100 (90.0) ^d	100 (90.0) ^d	100 (90.0) ^c
10	Thin netted single layered jute bag	13.41 (7.74) ^b	34.97 (20.48) ^c	84.09 (58.78) ^c	100 (90.0) ^d	100 (90.0) ^d	100 (90.0) ^c
	S.E.m±	1.70	3.16	9.61	4.01	1.22	0.58
	CD	5.03	9.32	28.34	11.83	3.59	1.73

DAS - Days After storage

Values in parentheses are angular transformed values

In each column values with similar alphabet do not vary significantly at P=0.05

Bibliography [6] also reported that polythene bags, gunny bags and polythene coated gunny bags were less effective by recording more amount of per cent weight loss in pods.

C. Per cent germination

Pods stored in different types of bags showed 100 per cent germination and viability at one month after storage and decreased with the increase in storage period except for Magik bags which maintained 100 per cent viability and germination which may be due to complete protection from *C.serratus* throughout the storage period up to six months. Germination of kernels reduced with increase in pod damage due to *C. serratus* in Super bags and conventional storage bags.

Table 3. Germination per cent of groundnut kernels stored in different storage bags

Sl. No.	Storage bags	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS
1	Magik bag	100	100 ^a	100 ^a	100 ^a	100 ^a	100 ^a
2	Super bag	100	97.67 ^a	92.33 ^b	82.33 ^b	74 ^b	71.67 ^b
3	Nylon bag	100	94 ^b	88.67 ^{bc}	77.67 ^c	72.67 ^b	69.33 ^b
4	Cloth bag	100	92.33 ^{bc}	82.67 ^d	72.67 ^d	62.33 ^c	52.33 ^c
5	Polythene lined cloth bag	100	93 ^b	84 ^d	71.33 ^d	63 ^c	51.33 ^c
6	Polythene lined jute bag	100	92.33 ^{bc}	86 ^{cd}	73 ^d	63.33 ^c	52 ^c
7	Thick netted double layered jute bag	100	93 ^b	84 ^d	75 ^{cd}	64.33 ^c	51.67 ^c
8	Thick netted single layered jute bag	100	91.33 ^{cd}	82.33 ^d	75 ^{cd}	61.33 ^c	53.67 ^c
9	Thin netted double layered jute bag	100	89.33 ^{bcd}	82.33 ^d	74.67 ^{cd}	64.67 ^c	52.33 ^c
10	Thin netted single layered jute bag	100	88.67 ^d	81.33 ^d	70.67 ^d	61.33 ^c	50.67 ^c
	S.E.m±		1.03	1.40	1.34	1.46	1.44
	CD	NS	3.05	4.14	4.79	4.32	4.26

DAS - Days After storage

Values in parentheses are angular transformed values

In each column values with similar alphabet do not vary significantly at P=0.05

Bibliography [7] reported maintenance of highest germination in hermetic bags with an average germination of 96 per cent. Bibliography [8] also reported inhibition of germination in cloth bags in accordance of level of infestation.

BIBLIOGRAPHY

- [1] Singh, V and Ansari, S. U. 1991. Farmers level survey on insects and mites on stored groundnut in Andhra Pradesh. Bulletin of Grain Technology. 29(1): 14-21.
- [2] Dick, K. M. 1987. Pest management in stored groundnuts. Information Bulletin No. 22. International Crop Research Institute for Semi-Arid Tropics, Patancheru. A.P.
- [3] Kumari, D. A., Vijay Singh, Sudhir Reddy, V and Tejkumar, S. 2002. Quantitative and qualitative losses caused by pod bruchid, *Caryedonserratus* Olivier (Bruchidae : Coleoptera) in stored groundnut. Indian Journal of Plant Protection.30 (2): 213-214.
- [4] Devi, D. R and Rao, N. V. 2000. A note on reaction of groundnut varieties to the bruchid *Caryedonserratus* (Olivier). Journal of Research ANGRAU. 28(3): 41-43.
- [5] Lal, S. R. 1990. Studies on qualitative and quantitative losses in wheat due to insects at farm level storage. Bulletin of Grain Technology. 28: 210-220.
- [6] Diep, C. B., Phan, V. L., Nguyen, T. D., Gummert, M and Rickman, J. F. 2006. Effect of hermetic storage in the super bag on seed quality and milled rice quality of different varieties in Bac Lieu, Vietnam. International Rice Research Notes 31: 55 – 56.
- [7] Jolli, R. B., Karabhantanal, S. S and Jayaprakash, T. C. 2005. Influence of pesticides and storage methods in the management of pulse beetle (*Callosobruchus* spp.) and their effects on seed viability in moth bean. Journal of Entomological Research. 29(2): 159 – 162.

