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ESTIMATION OF LOSSES DUE TO PULSE BEETLE IN CHICKPEA

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ABSTRACT
The losses caused by pulse beetle were estimated by releasing 1, 2, 4, 8 and 16 pairs of adults in jars each containing 500g chickpea grains. The lowest mean grain damage, weight loss and germination loss were recorded in case of 1 pair of adult pulse beetle *i.e.,* 7.79, 1.81 and 4.55 per cent. While, highest losses were recorded in case of release of 16 pair *i.e.,* 60.93, 13.99 and 44.57 per cent after 30 days of storage, respectively. The losses followed the same trend after 90 days of storage and reached to highest *i.e.,* 41.44, 19.26 and 29.27 per cent in case of release of 1 pair of adult, While, 100, 46.13 and 100 per cent, respectively, in case of release of 16 pair of adult pulse beetle. The losses were increased with increase in storage period.

INTRODUCTION

Pulses the "wonderful gift of nature" play an important role both in Indian economy and diet. Pulses are traditionally recognized as an indispensable constituent of Indian diet. In India where the population is predominantly vegetarian, pulses are important as they are rich source of protein and several amino acids. They are also rich source of energy, minerals and certain vitamins. India has the largest producer of pulses in world it has 23.63 million ha area and 14.76 metric ton production (anonymous, 2007-2008). However, among the Indian states, Rajasthan stands at third position in pulse production. In Rajasthan, the total area under pulses was 3.87 million ha with the annual production of 1.55 metric tones (2007-2008).

In India 17 species of bruchids belonging to 11 genera have been recorded infesting different pulses (Arora, 1977). The genus *Callosobruchus* attacks grain legumes during both pre and post harvest stages all over the world; but in India, *C. maculatus, C. analis* and C. *chinensis* are the predominant pest species of the genera (Dias, 1988). The insects spends its entire immature stage in individual legume seeds, where they cause weight loss, decrease in germination potential and diminish the market as well as nutritional value of the commodity. In India Gujar and Yadav (1978) recorded 32.2 to 55.7 per cent loss in seed weight and 17.0 to 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). It is well known fact that food constituents play a vital role in the survival and reproduction potential of the insects. The grain characters, which also interfere the normal physiology or feeding of the insect, affects the biology of the pest adversely and these make a variety resistant to insect attack.

MATERIALS AND METHODS

A Laboratory experiment was conducted on estimation of losses due to pulse beetle in chickpea in the Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during Aug.- Dec., 2010.

Rearing and Maintenance of Culture

The culture of pulse beetle was maintained on chickpea at room temperature in the Bioagent laboratory. Chickpea procured from local market at Udaipur, it was cleaned, washed, dried and then sterilized at temperature of 50ºC overnight to eliminate the hidden infestation, if any.
The nucleus culture of *C. chinensis* was started from a single pair and was multiplied in rearing jars (25cm x 15 cm x 10 cm) by releasing 10 pairs of one day old adults in each glass jar containing 500g seeds for oviposition. After 48h adults were remove from the jars and discarded. The jars were covered with muslin cloth and tied up with rubber bands. These jars were kept at ambient condition in the laboratory. In order to get a continuous fresh supply of adults of *C. chinensis* for experimentation dated culture was maintained at regular time intervals using the above rearing technique. During experimentation a pair of forceps, Camel hair brush and aspirator was invariably used for transferring insects in seeds.

Estimation of losses

The losses caused by the pulse beetle in stored green gram were determined. The details are given as under.

Experimentation

To estimate the losses at different population levels of the pulse beetle 1 pair, 2 pairs, 4 pairs, 8 pairs and 16 pairs of adults (both male and female) was released in separate jars

Table 1: Effect of pulse beetle on grain damage at different population density levels

No. of Pair released	Grain damage (%) days after release		
	30	60	90
1	7.79(16.18)	20.81(27.12)	41.44(40.07)
2	17.41(24.63)	36.59(37.22)	54.21(47.42)
4	26.69(31.08)	49.66(44.80)	74.67(59.81)
8	43.09(41.03)	68.37(55.79)	96.33(79.14)
16	60.93(51.32)	94.21(76.17)	100.00(90.00)
SEm ±	1.033	0.983	1.076
CD 5%	3.184	3.030	3.316

* Figures in parenthesis are angular transformed values of percentage

Table 2: Effect of pulse beetle on mean weight loss at different population density levels

No. of Pair released	Mean weight loss (%) days after release		
	30	60	90
1	1.81(7.73)	7.05(15.39)	19.26(26.02)
2	4.08(11.64)	12.61(20.79)	24.76(29.83)
4	6.00(14.17)	16.50(23.96)	33.59(35.41)
8	9.45(17.89)	22.33(28.20)	42.63(40.76)
16	13.99(21.96)	32.79(34.93)	46.13(42.78)
SEm ±	0.248	0.336	0.692
CD 5%	0.764	1.034	2.132

* Figures in parenthesis are angular transformed values of percentage

Table 3: Effect of pulse beetle on germination loss at different population density levels

No. of Pair released	Mean germination loss (%) days after release		
	30	60	90
1	4.55(12.31)	12.42(20.63)	29.27(32.75)
2	11.37(19.70)	27.49(31.62)	56.48(48.72)
4	20.57(26.97)	46.54(43.01)	81.51(64.56)
8	32.34(34.66)	62.45(52.21)	94.55(76.51)
16	44.57(41.88)	81.47(64.52)	100.00(90.00)
SEm ±	0.492	0.508	0.653
CD 5%	1.515	1.566	2.011

* Figures in parenthesis are angular transformed values of percentage

containing 500g chickpea seeds. The experiment was replicated four times. The observations given below was recorded at 30, 60, 90 days after release of adults of beetles.

Mean grain damage (%)

A sample of 100g of chickpea grains was taken from the jars of each replicate of every set after 30 days. The damaged grains were separated out from the total number of grains taken for observation in each replication. Care was taken to avoid recount of damage grain. Suitable methods were adopted for observing the hidden infestation. The data taken was used for calculating the mean per cent grain damaged grains. The same procedure was adopted for recording observations at 60 and 90 days after release of pulse beetle. The following formula was used for determination of mean damage as described

$$\text{Mean grain damage}(\%) = \frac{\text{Number of damaged grains}}{\text{Total number of grains counted}} \times 100$$

Mean germination loss (%)

Three samples each of 100 chickpea grains was taken randomly from each experiment jar and placed in petri dish lined with blotting paper. Three such sets were prepared for germination test after 30, 60 and 90 days of release. These petri dishes were kept at room temperature for six days to allow sufficient time for all the grains to germinate. Water was poured regularly to prevent drying. The number of unsprouted grains was counted and the mean per cent germination loss was calculated by following formula:

$$\text{Mean germination loss (\%)} = \frac{\text{Number of unsprouted grains}}{\text{Total no. of seeds kept for germination}} \times 100$$

Mean weight loss

After removing the beetles from each jar the weight of grains were taken separately on an electric balance from each replicate after 60 and 90 days of release. The mean per cent loss in weight was calculated by the following formula:

$$\text{Mean weight loss} = \frac{I - F}{I} \times 100$$

Where, I = Initial weight of grains
F = Final weight of grains

RESULTS AND DISCUSSION

In the present investigation it was found that grain damage after 30 days of storage was lowest in case of release of 1 pair *i.e.,* 7.79 and was highest in case of release of 16 pair *i.e.,* 60.93 per cent. The grain damage was further increased up to 20.81 and 94.21 per cent after 60 days of storage and ultimately reached 41.44 and 100 per cent after 90 days of storage, respectively.

Similarly, weight loss after 30 days of storage was also lowest viz. 1.81 per cent in case of release of 1 pair of adult and highest in case of release of 16 pair of adult *i.e.,* 13.99 per cent. It was further increased up to 7.05 and 32.79 per cent after 60 days of storage and ultimately reached 19.26 and 46.13 per cent after 90 days of storage, respectively.

The mean germination loss after 30 days of storage was lowest in case of release of 1 pair of adult *i.e.,* 4.55 per cent and highest in case of release of 16 pair of adult *i.e.,* 44.57 per cent. The mean germination loss further was increased up to 12.42 and 81.47 per cent after 60 days of storage and ultimately reached 29.27 and 100 per cent after 90 days of storage, respectively.

The findings of present investigation are in close conformity with the findings of Doharey *et al.* (1987) who observed that the grain damage by *C. chinensis* increased from1.35 per cent to 99.91 per cent after 120 days of storage. Anandhi *et al.* (2008) studied on the population build up, grain damage, weight losses and evaluation of different storage containers against *C. chinensis* on chickpea during 30 to 180 days of storage. They reported that grain damage, weight loss increased with the period of storage. Patil *et al.* (2003) tested the chickpea seeds cv. PG-12 were stored in jars, each containing 0, 1, 2, 4 or 8 pairs of newly emerged adults of *C. maculatus* and they reported that population count and seed infestation were directly proportional to the number of pairs of adult beetles released. A significant reduction in germination was recorded

when more than 2 pairs of adult beetles were released in jars. A germination level of 61.0% was recorded for seeds stored with 8 pairs of adult beetles.

REFERENCES

Anonymous, 2007-2008. *Highlights of pulses research*. University of Agricultural Sciences, Dharwad, Karnataka, India.

Arora, G. L. 1977. Bruchidae of North-West India. Oriental Insects Supplement No. 7. *The association for the study of Oriental Insects, New Delhi.* pp.132.

Anandhi, P., Varma, S. and Sarvanan, L. 2008. Estimation of losses and evaluation of different storage containers against pulse beetle, *Callosobruchus chinensis* Linnaeus in Bengal gram. *J. Insect Science (Ludhiana),* **21:** 1, 40-43.

Dias, C. A. R. and Yadav, T. D. 1988. Incidence of pulse beetle in different legume seeds. *Indian Journal of Entomology*. **50(4):** 457-461.

Doharey, R. B., Katiyar, R. N. and Singh, K. M. 1987. Studies on the seed damage, weight and germination loss caused by pulse beetle in green gram *Vigna radiata* (L.) Wilczek. *Bull Grain Tech*. **20(1):** 12-16.

Gujar, G. T. and Yadav, T. D. 1978. Feeding of *Callosobruchus maculatus* (Fab.) and *Callosobruchus chinensis* (Linn.) in green gram. *Indian J. Entomology*. **40:** 108-112.

Pruthi, H. S. and Singh, M. 1950. Pests of stored grain and their control. *Manager of publications*, Delhi: pp. 68.

Patil, S. K., Tanpure, S. V. and Mate, S. N. 2003. Effects of different levels of pulse beetle [*Callosobruchus maculatus* (Fab.)] infestation on chickpea during storage. *Seed-Research*. **31(1):** 119-120.