Indian J. Hort. 70(3), September 2013: 392-396

Post harvest storage losses by cigarette beetle (*Lasioderma serricorne* Fab.) in seed spice crops

Krishna Kant*, J.K. Ranjan, B.K. Mishra, S.R. Meena, G. Lal and M.K. Vishal
National Research Centre on Seed Spices, Tabiji, Ajmer 305206, Rajasthan

ABSTRACT

A laboratory study was conducted to determine the damage and reproductive potential of *Lasioderma serricorne* Fab. on some seed spice crops, *viz*., cumin, coriander, fennel, *ajowan* and dill at different storage conditions. The result showed that beetle causes huge storage losses which were maximum in fennel seed (58.02%) and minimum in dill seed (39.0%). Population growth was also related to damaging potential on different seed spices. Maximum population of insect was recorded in fennel seed and minimum in dill seed. In case of quarter monthly observation, maximum damage and reproduction was noticed in July to September and minimum in the month of January to March in seed of coriander, *ajowan* and cumin and April to June in case of fennel and dill.

Key words: Cigarette beetle, damage, post harvest storage, seed spices.

INTRODUCTION

India is known for its spices since ancient times. Western navigators reached India and did big trade in Indian spices including seed spices. Major seed spices of India are coriander (*Coriandrum sativum* L.), cumin (*Cuminum cyminumn* L.), fennel (*Foeniculum vulgare* Miller), and fenugreek (*Trigonella foenumgraecum* L.) which occupy large area. The minor seed spices consist of *ajowan* (*Trachyspermum ammi* L.), dill (*Anethum graveolens* L.), aniseed (*Pimpinella anisum* L.), and nigella (*Nigella sativa* L.) occupy small area. These are put to culinary uses as taste enhancers, flavouring agent, aromatics, appetizer, digestives antiflatulents and other beneficial effects to human health. Seed spices crops occupy a prominent place in the total basket of spices of the country and play a significant role in Indian economy. Altogether 9.7 lakh ha area is under cultivation of seed spices with the production ranging between 5-6 lakh tonnes annually (Anon, 1). These crops are mainly cultivated in Rajasthan and Gujarat (Meena *et al*., 6). Seed Spices are important export oriented commodities and about 10 per cent of the produce is exported in the form of raw as well as value added products realizing in foreign exchange worth more than Rs. 300 crores annually. Seed spices are generally stored for a year or more at farmer's level. Associations of storage insect-pests with seed spices are well documented. Stored insect pests are one of major quality deteriorating agents during storage of seed spices. The most common species infesting seed spices during storage are cigarette beetle *Lasioderma serricorne* Fab., Drugstore beetle *Stegobium panicum* L. and seed spices was *Systole albipennis* Walker. Others important species are red rust flour beetle *Tribolium* spp., rice moth *Corcyra cephalonica* and almond moth (*Cadra cautella* Syn. and *Ephestia cautella* Walker). Among different stored pests *Lasioderma serricorne* Fab., infestation level during storage is highly dependent on temperature, humidity, seed moisture and type of storage (Patel, 8; Rees, 9; Sharma, 12). The cigarette beetle *L. serricorne* Fab. is found world-wide in tropical and sub-tropical areas causing huge economic losses to stored products (Rees, 10). Besides the dubious honour of being the most damaging pest of stored tobacco, the cigarette beetle also is a major pest of many stored food. Most of seed spices are belonging to apiaceae family and storage losses due to insect pests are common to most of the seed spices. Maximum damage to stored products is caused by larval feeding of cigarette beetle, while adults make damage by making holes to penetrate or escape from packaged commodities. Beside the damage due to feeding, the presence of dead insects, cast skins residues from different larval life stages, pupal cases, and fras become contaminants in spices and render them unfit for consumption (Highland, 3; Minor, 7). The infestation of a commodity is usually initiated by dispersing gravid females which actively seek suitable hosts for oviposition and penetrate through the packaging materials of commodities to colonize new food resources (Howe, 4). Coriander seeds proved to be the most appropriate diet for the beetle for maximum survival and reproduction (Magd El-Din, 5). Present investigation was undertaken is to

*Corresponding author's E-mail: kknrcss@gmail.com

study the total annual loss and damaging potential of *Lasioderma serricorne* on different seed spices crops at laboratory conditions.

MATERIALS AND METHODS

A laboratory study was conducted to determine the damage and storage losses by *Lasioderma serricorne* Fab. on five selected seed spice crops, *viz*., cumin, coriander, fennel, *ajowan* and dill at Entomology Laboratory of NRC on Seed Spices, Ajmer. Harvested mature seeds of these spices were obtained from experimental field of the institute, and stored for the further study. All the seed spices were thoroughly cleaned and packed in polythene bag of 500 gauge thickness and kept in temperature of -20°C in a deep freezer for 10 days to kill all the contaminated stored insect pests if any. After that all the seed materials were stored at room temperature (30 ± 2°C) for 30 days to examine and ensure insect free seed materials. One hundred gram seed of each spice was taken for each treatment and kept in plastic jar (Tarson®, India) of 500 g capacity. Test insect *L. serricorne* Fab. was collected from the entomology laboratory of NRCSS, in which culture was maintained on cumin seed. Two to three days old adult after emergence were collected having mix of male and female population and introduced in each container. Total of 20 adults were introduced in each container and mouth of container was sealed with muslin cloth. Each treatment as replicated five times and kept at room temperature in the laboratory in 1st week of April for feeding and damage potential. Observation on total population level of beetle including immature, dead and live insects and total losses were recorded at every three month during one year storage period. Total four observations were taken and data were statistically analyzed in using SAS 9.2 software.

RESULTS AND DISCUSSION

Study on feeding and reproductive potential of *Lasioderma serricorne* Fab. on different seed spices showed that beetle feeds and developed on all seed spices throughout storage period and causes significant losses. Significant variation in feeding and reproduction of beetle was observed in different seed spices at each observation. Feeding and reproduction of cigarette beetle at quarterly interval showed that maximum damage and reproduction of beetle was take place during July to August in all seeds except dill fallowed by October to December and least to April to June (Table 1). In dill it was observed in the month of October to December. At quarterly observation on the damage of different seed spices showed that maximum loss of 29.0% was observed in fennel seed followed by

Table 1. Feeding and reproductive potential of *Lasioderma serricorne* Fab. on different seed spices at quarterly intervals.

Month	Fennel		Coriander		*Ajowan*		Cumin		Dill	
	% Damage	Total population	% Damage	Total population	% Damage	Total population	% Damage	Total population	% Damage	Total population
April-May-June	3.40 (2.10)*	79 (8.94)	8.16 (3.03)	160 (12.68)	7.56 (2.92)	155 (12.48)	8.34 (3.05)	170 (13.07)	3.76 (2.18)	86 (9.32)
July-Aug.-Sep.	29.0 (5.47)	537 (23.14)	20.56 (4.64)	490 (22.10)	20.61 (4.64)	356 (18.85)	21.08 (4.69)	328 (18.09)	6.37 (2.71)	125 (11.20)
Oct.-Nov.-Dec.	19.0 (4.47)	364 (19.10)	16.04 (4.13)	326 (18.08)	15.12 (4.01)	301 (17.38)	16.67 (4.20)	294 (17.17)	16.12 (4.14)	388 (19.72)
Jan.-Feb.-Mar.	6.62 (2.76)	162 (12.76)	4.82 (2.41)	82 (9.11)	4.46 (2.34)	101 (10.10)	4.93 (2.43)	115 (10.77)	12.75 (3.71)	303 (17.43)
CD at 5%	0.42	2.48	0.86	2.29	0.63	2.51	0.54	2.61	0.81	

*Data within parenthesis are square root transformed value

cumin (21.08%) observed during July to September. Loss in coriander and *ajowan* seed was ranged in 20 to 21 % in same period. Similarly, population growth of beetles was also noticed maximum in fennel crop (537 insects) followed by coriander (490 insects). In cumin seed, population of beetles was less than coriander but damage was more than that of coriander. In dill, maximum damage of 16.12% and population of 388 insects was observed in October to November month. Among all seed spices, least preference for feeding and reproduction of beetles was observed in dill crop. The population growth of beetle and feeding behaviour was continuing in nature on subsequent observations. The second major damage of seed and high population growth was observed during October to December and together with July to September account for more than 75% of total damage and beetle population. Maximum annual losses (Table 2) were recorded in fennel seed (58.02%) and minimum in dill seed (39.0%). Damage in fennel and cumin ranged in between 50 to 60%, while 40 to 50% in coriander and *ajowan* and 30 to 40% in dill. The growth of population was also related with the damage potential of insect which was maximum (1,142 insects) in fennel seed and minimum (902 insects) in dill seed. Magd El-Din (5) reported that coriander was most appropriate diet for the cigaratte beetle showing three generations during the period from May to October. Bhutani (2) also recorded cigarette beetle as major pest of coriander in storage. Pheromone trap study in adult cigarette beetle of 16 factories in Japan showed that trapping population increased from May to August and then declined (Suezawa, 13). Rees (9) also reported shortest development period (26 days) of *L. serricorne* with optimum condition of 30°C temperature and 70% relative humidity.

Diffogram has been plotted to quickly compare treatment means (effect of month duration for the stored product) are statistically significant or not has been shown in Fig. 1. The point estimate of the differences between pairs of group mean can be found at the intersection of the grey lines. Here in damage of seed spices vs treatment (effect of different months) plot, all the treatments comparisons are significant for damage in case of fennel. In case of coriander, except treatment comparisons 1-4 & 2-3, all other differences are significant. Similarly, in case of *ajowan* except 1-3, 1-4 & 2-3; in case of cumin except 1-4 & 2-3; in case of dill except 1-2 & 3-4 all were significant with respect to damage in different seed spices. In case of diffogram for population in Fig. 2, for fennel and coriander all treatment comparisons were significant whereas in case of *ajowan* differences between 1-4 & 2-3; in case of cumin between 1-4 & 2-3 and in case of dill between 1-2 & 3-4 were non-significant.

Table 2. Annual losses and population of cigarette beetle.

Seed spices	% loss	Total reproduction
Fennel	58.02	1142
Coriander	49.58	1058
Ajowan	47.75	899
Cumin	51.02	907
Dill	39.0	902
CD at 5%	0.54	2.72
CV (%)	5.17	5.91

REFERENCES

1. Anonymous. 2012**.** Spices Board of India (Ministry of Commerce, Government of India). Statistics: Import, Export and Production. http://www.indianspices.com.

2. Bhutani, D.K. 1984.Spices and pest problems: 3. Coriander. *Pesticides*, **18:**15**-**17.

3. Highland, H.A. 1991. Protecting packages against insects. **In**: *Ecology and Management of Food Industry Pests*. Gorham, J.R. (Ed.), Assoc. Off. Anal. Chem., Arlington, VA, pp. 309-20.

4. Howe, R.W. 1957. A laboratory study of the cigarette beetle, *Lasioderma serricorne* (F.) (Col., Anobiidae) with a critical review of the literature on its biology. *Bull. Entom. Res.* **48**: 119-35.

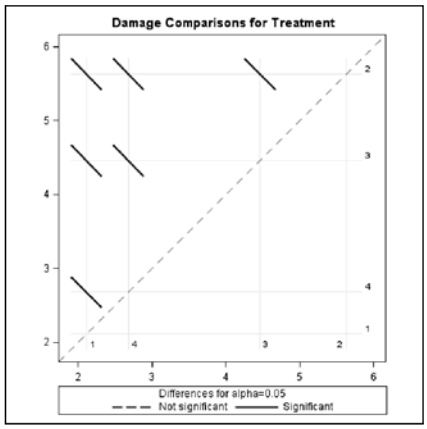
5. Magd El-Din, M.A. 2003. Studies on diets and population dynamics of the cigarette beetle *Lasioderma serricorne* Fab. (Col., Anobiidae). *Anzeiger für Schädlingskunde*, **76**: 14-16.

6. Meena, R.S., Anwar, M.M., Lal, G., Mehta, R.S., Kakani, R.K. and Panwar, A. 2010. Genetic diversity analysis in fennel. *Indian J. Hort.* **67**: 500-4.

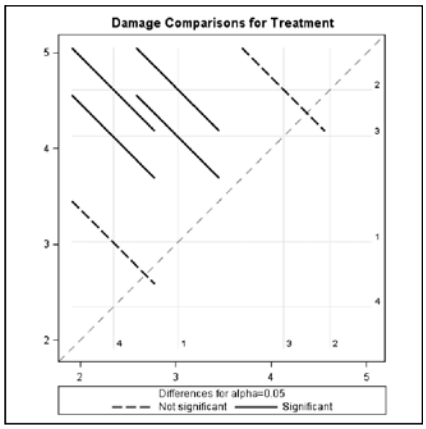
7. Minor, M.F. 1979. Do adult cigarette beetle feed? *Tobacco Sci.* **23**: 61-64.

8. Patel, N. 2007. Management of storage pests of seed spices. **In**: *Production, Development, Quality and Export of Seed Spices*. Malhotra, S.K. and Vashishtha, B.B. (Eds.), NRC on Seed Spices, Tabiji, Ajmer, India, pp. 149-61.

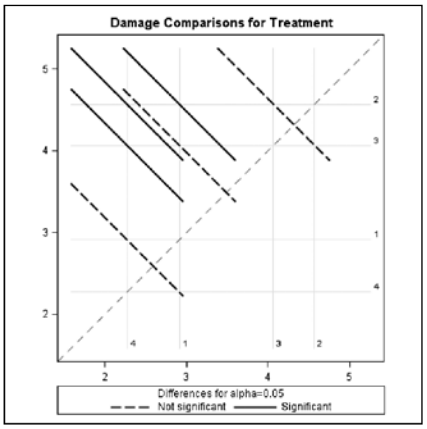
9. Rees, P.D. 1995. Coleoptera. **In**: *Integrated management of Insects in Stored Products*.



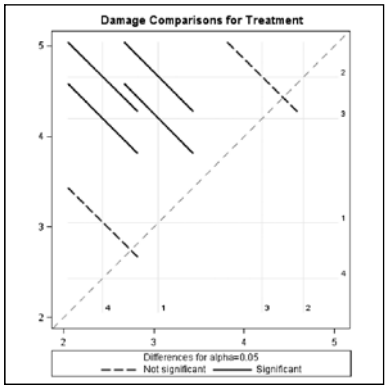
Fennel



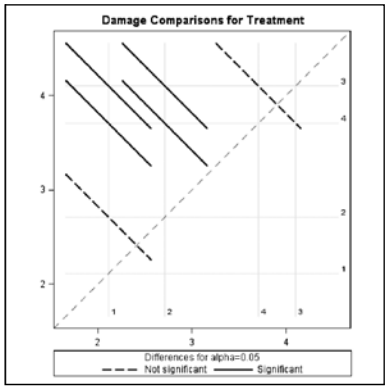
Coriander



Ajowain

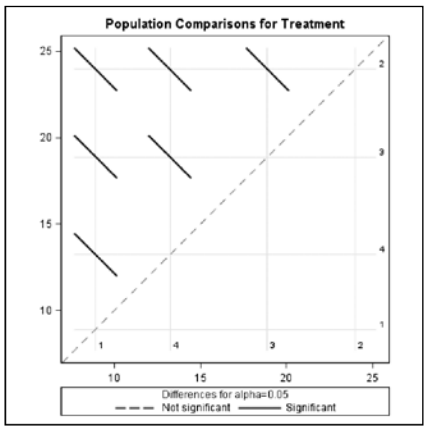


Cumin

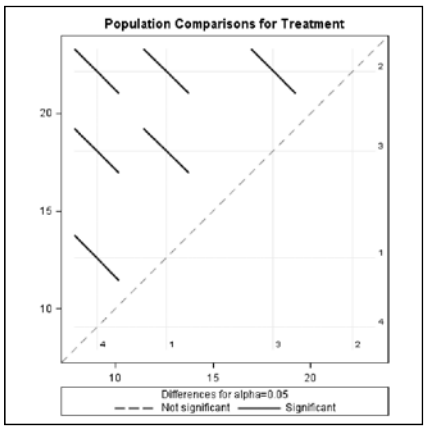


Dill

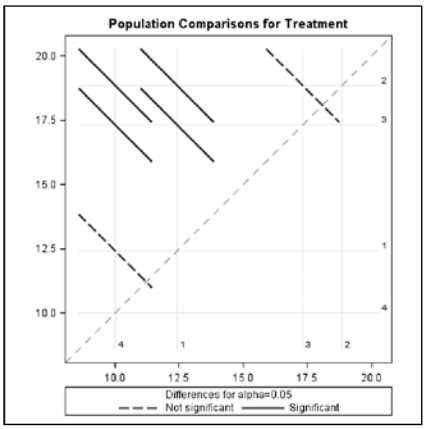
Fig. 1. Comparision of treatment means (storage time) for damage in seed spices.



Fennel



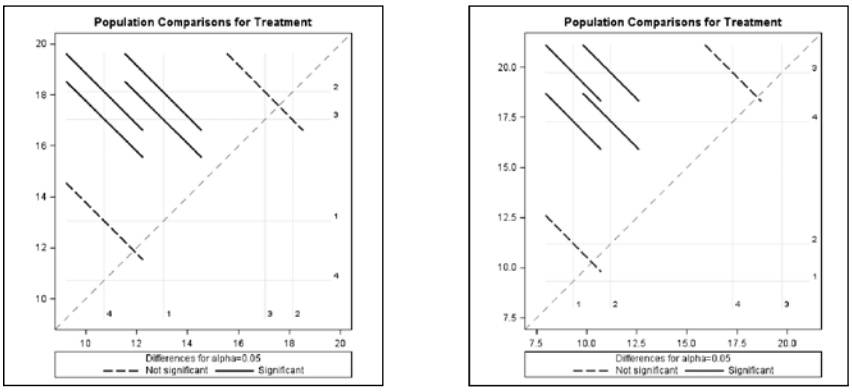
Coriander



Ajowain

Contd...

Contd...



Cumin Dill

Fig. 2. Comparision of treatment means (storage time) for population growth of the beetle in seed spices.

Subramanyam, B. and Hagstrum, D.W. (Eds.), Markel Dekker Inc. New York, pp. 1-39.

10. Rees, D. 2004. *Insects of Stored Products*, CSIRO Publishing, Collingwood, Australia.

11. Rees, D. 2008. Insect as pest of stored Product. **In**: *Insect of Stored Products*. SBS Publishers & Distributors Pvt. Ltd., New Delhi, India, pp. 18-21.

12. Sharma, B.D. 1976. Occurrence of *Gibbium sylloides* Czenp in stored foods in Jammu and Kashmir state. *Indian J. Entom*. **36**: 365

13. Suezawa,Y., Miyashiro, R. and Tamura, A. 1987. Estimation of population of cigarette beetle *Lasioderma serricorne* (F.) by a synthetic sex pheromone and food attractant in factories of hand extended fine noodles. *Nippon Shokuhin Kogyo Gakkaishi*, **34**: 635-39.

Received: January, 2013; Revised: June, 2013;
Accepted: August, 2013