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Survey on the Occurrence of Insect Pests in Stored Grains in Thiruvananthapuram District, Kerala State

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ABSTRACT

To identify the species composition and relative abundance of insect pest in stored grains, a preliminary investigation was conducted by collecting grain samples from 16 grain merchant stores in Thiruvananthapuram District, Kerala state. Insect pest collected during the study were pulse beetle, *Callosobruchus chinensis*, cow pea beetle, *C. maculatus*, grain weevil, *Sitophilus granarius*, long headed flour beetle, *Latheticus oryzae*, rice weevil, *Sitophilus oryzae*, red flour beetle, *Tribolium castaneum*, lesser grain borer, *Rhyzopertha dominica*, saw toothed grain beetle, *Oryzaephilus surinamensis*, Angoumois grain moth, *Sitotroga cerealella*. *Tribolium castanaeum*, *Sitophilus oryzae*, *Rhizopertha dominica* (32.25%, 24.51%, 21.91% respectively per 200 g sample) were the most abundant pest species in the grain samples.

Keywords Insect pests, Pulses, Cereals, Stored grains.

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INTRODUCTION

The class insecta are widely distributed and found in all ecosystems. Members are serious pests in agriculture, forest, cultivated plants. Many species are known to transmit bacterial diseases on crops and vegetables. Larval forms of many insect species are voracious feeders causing damage to food plants worldwide (Dhaliwal *et al.* 2007). Grains are important food source for Indian population, cereals and pulses are the two prime groups of grain crops. Nearly 600 species of insects are found to occur in stored grains of these, about 100 species caused economic losses (Neethirajan *et al.* 2007). In India, 14 million tons of food grains worth Rs 7000 crores are lost annually. Insect alone causes economic loss of about Rs 1300 crores (Banga *et al.* 2020). A number of insect pest ravaged the stored grains resulting in qualitative and quantitative losses (Chitra and Subramanian 2016). Two major groups of insects, Coleoptera and Lepidoptera causes damage to storage grains. Coleoptera causes more destruction and members of about forty families of this order are harmful to stored products worldwide (Rees 1996). In many developing countries grain storage practices are often inadequate to prevent their deterioration of stored products (Abraham 1995). Pest infestation often affect the nutritional quality and marketability of stored grains (Tadeos 2018). Insect pests differ in their host specificity, climatic requirements, mode of damage and their susceptibility to insecticides so that proper identification of insect species for the depredation of stores are important for successful

Table 1. Insect pest identified in different stored grains.

Sl. No.	Species/genus	Common name	Order/ family	Type of grain
1	*Callosobruchus chinensis* Linnaeus, 1758	Pulse beetle	Coleoptera : Chrysomelidae	Chick Pea
2	*C. maculatus* Fabricius, 1775	Cow pea beetle	Coleoptera:Bruchidae	Whole green gram dal
3	*Sitophilus granarius* Linnaeus, 1758	Grain weevil	Coleoptera: Curculionidae	Wheat
4	*Latheticus oryzae* Waterhouse, 1880	Long headed flour beetle	Coleoptera : Tenebrionidae	Raw rice
5	*Sitophilus oryzae* Linnaeus, 1763	Rice weevil	Coleoptera:Curculionidae	Raw Rice, chick pea, red rice
6	*Tribolium castaneum* Herbst, 1797	Red flour beetle	Coleoptera: Tenebrionidae	Raw rice
7	*Rhyzopertha dominica* Fabricius, 1792	Lesser grain borer	Coleoptera:Bostrichidae	Red cow pea, black gram
8	*Oryzaephilus surinamensis* Linnaeus, 1758	Saw toothed grain beetle	Coleoptera:Silvanidae	Yellow spilt dal, finger millet
9	*Sitotroga cerealella* Olivier, 1789	Angoumois grain moth	Lepidoptera: Gelechiidae	Red cow pea

control measures (Ahmed 1983). Information on the occurrence of insect pests on stored grains in merchant stores are limited. Therefore, the current study was undertaken to find out the common insect pests on stored grains in different grain merchant stores in Thiruvananthapuram District in Kerala state so as to provide a baseline data for to design and implement new preservation strategies in the region.

MATERIALS AND METHODS

Present investigation was carried out in Thiruvananthapuram District located at 8.5307° N latitude, 77.1025° E longitude. About 200 g each of damaged grains were collected from 16 grain merchant stores for insect identification. Both pulses, cereals and millets were collected for identification. Collected grains first soaked in water to get the insects and preserved in 70% alcohol for observation. Various pests were identified with the help of standard keys (David 2007).

Relative abundance of pest species

Relative abundance of each species was determined after identification and their number was counted from the grain sample collected.

$$\text{Relative abundance} = \frac{\text{Number of individual pest species in the given sample}}{\text{Total insect species in the sample}} \times 100$$

RESULTS AND DISCUSSION

Insect pest identified from the food grain samples collected from different grain merchant stores in Thiruvananthapuram District, Kerala state was given in the Table 1. 9 insect species belonging to 6 families were identified in the study and the major insect orders were Coleoptera and Lepidoptera. The various species identified include, *Callosobrauchus chinensis, C. maculatus* (Bruchidae), *Sitophilus granarius*, *S. oryzae* (Curculionidae), *Latheticus oryzae* and *Tribolium castaneum* (Tenebrionidae), *Rhyzopertha dominica* (Bostrichidae), *Oryzaephilus surinamensis* (Silvanidae), *Sitotroga cerealella* (Gelechiidae). Most species attacked more than one type of grains. Among different species of insect pests, 6 species are primary pests and 3 species are secondary pests. Most species are Coleopterans and most destructive species identified were *Sitophilus*, *Tribolium* and *Rhyzopertha* genus (Dal Bello *et al.* 2001).

Pulses are highly valuable food crops grown in most part of the world, they are rich source of protein, amino acids, minerals and vitamins and affordable to common people (Ahmad *et al.* 2018). Properly stored

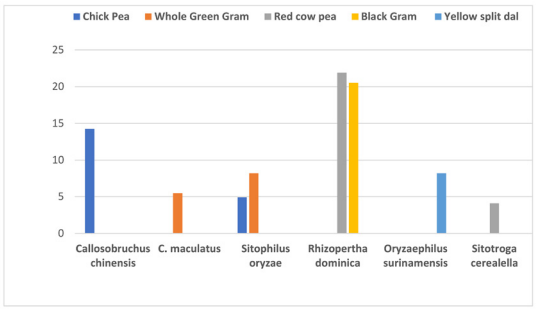

Fig. 1. Relative abundance of insect pests on pulse grains (in 200 g).

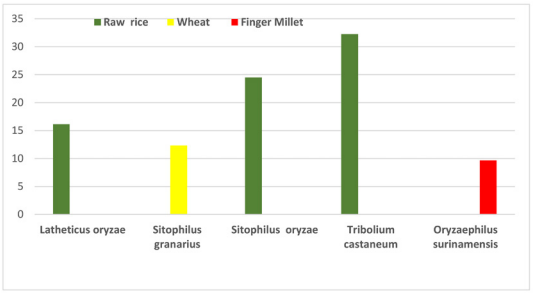

Fig. 2. Relative abundance of insect pests on cereals/ millet grains (in 200 g).

seeds remain edible for several years (Alemayehu and Getu 2015). In the present study, considering the density of different insects in pulse grains, species which was most destructive is *Rhyzopertha dominica* causing heavy destruction to red cow peas (21.91%) and black gram (20.54%) followed by *Callosobrauchus chinensis* in chick pea (14.24%), *Sitophilus oryzae* in chick pea (4.93%), whole green gram (8.21%), *C. maculatus* in whole green gram (5.47%), *Oryzaephilus surinamensis* in yellow split dal (8.21%), *Sitotroga cerealella* in red cow pea (4.1%) (Fig. 1).

Rhizopertha dominica was found in grain, leguminosa and other products and it causes huge losses in grains and seeds (Pires and Nogueira 2018). *R. dominica* is a major pest of stored wheat (Patel *et al.* 1993). *Callosobruchus chinesis*, *C. maculatus* and *C. analis* were the major pulse beetles in India (Raina 1970). *C. chinensis* is known to be a prolific breeder and can cause quantitative reduction of stored grains. Present study showed infestation of *C. chinensis* on chick pea, this is in agreement with Ahmad *et al.* (2018) who reported highest egg deposition of *C. chinensis* on chickpea. This could be attributed to the longer seed size with greater surface area which favored egg deposition of pulse beetles (Chakraborty and Mondal 2016). Hampanna *et al.* (2006) reported *C. chinensis* as an important pest in chick pea. *C. maculatus* infestation was seen on green gram in the present study. Seram *et al.* (2016) reported preferred oviposition of *C. maculatus* on green gram.

Species like *Latheticus oryzea*, *Sitophilus oryzea*, *S. granarius, Tribolium castaneum* and *Oryzaephilus surinamensis* were found to damage cereals/ millet grains (Fig. 2). *S. oryzae* is found to attack major types of cereals including maize and wheat which in turn pave the way for the secondary pest infestation like *Tribolium castaneum* which is one of the most resistant pest to insecticides (Kouninki *et al.* 2007) moreover, it was reported to depreciate the quantity and quality of cereal flour (Delobel and Tran 1993). *Rhizopertha dominica* and *Tribolium* require hot and dry conditions for their prevalence (Padmasri *et al.* 2020) and can also survive in variable conditions (Chaudhary *et al.* 1993).

CONCLUSION

Insect infestation causes huge loss in stored grains by contaminating or by eating it. Insect pest infestation has been reported to hamper the quality of cereals and pulses in terms of protein, amino acids, starch, vitamins and also responsible for creating unhygienic conditions making it unfit for consumption. Inadequate storage and sanitary measures led to the proliferation and prevalence of insect species and may lead to cross infestation. Adequate prophylactic measures should be adopted to protect the grain from pest infestation. It is necessary to understand behavior, type and life cycle of insects to reduce the storage loses. Knowledge of insect pests enable us to assess the extent of their damage in stored food grains.

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