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Store Grain Insect Pests' Identification, Feeding Behaviors and Damage Severity in District Battagram

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Abstract

Stored product pests have the ability to infiltrate grain storage facilities at various stages of grain processing and storage, starting from the standing crop in the field. While there are approximately one thousand species of insects associated with stored products worldwide, only a few of them are considered significant pests that cause extensive damage to stored grains. These pests can be classified based on their feeding behavior as either internal or external feeders, or as major or minor pests depending on the severity of the damage they inflict. This article provides an overview of the damage symptoms and biology of several major stored grain pests, including the rice weevil (*Sitophilus oryzae*), lesser grain borer (*Rhyzopertha dominaca*), khapra beetle (*Trogoderma granarium*), red flour beetle (*Tribolium castaneum*), cigarette beetle (*Lasioderma serricorne*), drug store beetle (*Stegobium paniceum*), pulse beetles (*Callosobruchus* spp.), Angoumois grain moth (*Sitotroga cerealella*), rice moth (*Corcyra cephalonica*), saw toothed grain beetle (*Oryzaephilus surinamensis*), long-headed flour beetle (*Latheticus oryzae*) and almond moth (*Cadra cautella*).

INTRODUCTION

Rice weevil, *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae), and the lesser grain borer, *Rhyzopertha dominica* (F.) (Coleoptera). Management of insect pests by farmers or elevator managers should be based upon a knowledge of the grain storage environment and the ecology of insect pests. Wheat kernels remain on the plant for only a few weeks after they mature. However, the same seeds may spend several months or years in storage before being processed into food. During storage, seeds are vulnerable to attack by stored-product insects. Several cosmopolitan insect species are commonly found in stored-grain. The most damaging insect pests of stored^[1]. They consume significant portions of an infested kernel, deposit feces and cast skins, and can cause localized increases in heat and moisture that lead to accelerated mold growth. Cast larval head capsules and adult exoskeletons of internal feeding insects leave fragments in flour when wheat is milled. Other insect species in the genera *Tribolium*, *Oryzaephilus*, *Cryptolestes*, *Ahasverus* and *Typhaea* are commonly found in stored wheat but cause little damage to grain and contribute little to the insect fragment count in flour^[2]. Insect infestations are common in farm-stored wheat in the United States. Storey *et al.* (1983) detected insects in about 1/4 of over 4,000 grain samples from wheat stored for 1-4 years on farms in several states and the mean density in infested lots was 19 insects per kilogram of grain. More recent studies have shown that insect densities were lower when newly-harvested wheat was stored for less than a year^[3,4]. A variety of grain sampling devices are available commercially in the United States for detection of insects in stored grain. Compartmented brass or aluminum grain triers, probes and spears have been widely used to take samples from bulk grain in on-farm storage bins, trucks, railcars, barges and ship holds^[5,6]. These devices collect grain samples of 0.5-1.0 kg, generally in the upper areas of the grain mass^[5]. The sampled grain is sieved and the insects passing through the screen are counted. These methods are widely used by farmers and grain buyers to determine the extent of infestation^[7] because they give a quick indication of the number and species of insects that are present in the grain sample^[6], Reed *et al.* 1991,^[8]. These methods also have been reported to be inaccurate when detecting population densities below four insects per kilogram^[7], White and Loschiavo 1986, Wilkin and^[8] and they do not indicate the presence of insects feeding inside kernels. These internally feeding insects are responsible for insect fragments in products produced from the grain because internally feeding insects cannot be easily cleaned from the grain during processing. If the grain will be stored before use, then these internally feeding insects may quickly develop and reproduce, resulting in loss of quality of the stored

grain. To detect insect contamination in railcars, millers normally take one sub sample (0.5 kg) with a hand trier from each of the three compartments in a railcar and then combine the three sub samples from each car. The composite grain sample is sieved and the numbers of live insects are recorded. Loads are often rejected or accepted based on this sampling technique, but the probability of detecting insect infestation from one grain sample is very low. For example, if only one grain sample per 1000 bushels is taken, the probability of detecting a mean density of two insects per kilogram is 76%^[9]. Selecting management strategies for insect pests in stored grain requires decisions that are based on measurable, interacting factors^[9]. These factors include type of grain, initial storage time, grain temperature, grain moisture content, storage duration, prior insecticide use, degradation rate of protectant insecticides and number and species of pest insects present. Correct identification of pest insects can be critical for management decisions. For example, the lesser grain borer, *Rhyzopertha dominica* (F.) (Coleoptera: Bostrichidae) and the rusty grain beetle, *Cryptolestes ferrugineus* (Stephens) (Coleoptera: Laemophloeidae), are major pests of wheat in the Midwest grain belt^[10]. On-farm storage studies made in Eritrea under the Drylands Coordination Group showed that staple grains of cereals and pulses produced by small farmers in Eritrea are attacked by different storage pest species of insects, rodents and birds. The germination loss due to the attack of storage pests on cereals and pulse grains ranges from 3-37 and 4-88%, respectively. The weight loss for these grains also ranges from 4.4-14 and 9-29% for cereals and pulses, respectively^[11]. Insects damage grain directly by feeding on kernels and indirectly by contaminating the grain with their wastes, webbing and body parts. Common stored grain insects may be separated into four groups according to their feeding habits. Internal feeders enter the kernel as very young larvae and spend most of their life cycle inside the kernel. These insects cause an obvious hole in damaged kernels where the adult insect exits the kernel to mate and begin the next generation. Examples of internal feeders are the rice weevil, maize weevil and Angoumois grain moth. Both larvae and adult insects can usually be found in the grain, Bruchids (*Callosobruchus* spp.) cause a potential loss in legume by feeding on the protein content of the grain and their damage ranges from 12-30% in developing countries (Tsedeke^[12], FAO, 1994). Farmers in Eritrea use different pest control methods., some use internationally banned chemicals like DDT, chemicals that leave residue, kerosene and different traditional methods such as mixed cropping, ash, sand, chilli, pepper, smoke and plant materials. However, some of these traditional methods need further investigation to study the proportion of mixing small grain with large

grains and the ratio of ash or sand with grain. After harvest, grain often contains small amounts of straw, weed seeds and dirt. These unwanted materials decrease the value of the crop if they remain in the grain. They also cause the grain to deteriorate during storage. Dirt holds moisture, insects and molds. Dirt also keeps air from moving well through the grain^[13]. Chickpea (*Cicer arietinum* L.) is an ancient crop that has been grown in Asia, the Middle East and parts of Africa for many years (Tesfu, 2011., FAO, 2005). In Eritrea it is one of the major pulse crop cultivated in the highlands and mid altitudes with an area of 11,013 ha and total production of 8472 tones^[14]. It provides high quality protein and considered to be best food for vegetarian population in Asia and during the fasting periods in Eritrea (FAO, 2010., MoA^[14]). Chickpea is used in a range of different food preparations and has a good source of energy, that is, 416 calories/100 g (Shrestha, 2001., Vance, 2001) along with protein (18-22%) and carbohydrate (52-70%) (Ali and Prasad, 2002., Bhalla et al., 2008). Furthermore, it plays a vital economic role to fix atmospheric nitrogen, thereby reducing agricultural cost through a reduction of fertilizer use and decreasing environmental contamination and enriches the soil fertility (Omeozor, 2005., Hauggaard-Nielsen et al., 2007., Kantar et al., 2007). Chickpea is very high in subsistence farmers' storage conditions. The major factor for heavy loss of the grain legumes in the storage is pulse beetle (*C. chinensis* L.). It is frequently, reported that worldwide in minimum of 10% of cereals and legumes are lost after harvest (Boxall et al., 2002). It is widely agreed that food losses after harvest can be substantial and are important in terms of quantity, quality, nutritional and economic value (Golob et al., 2002., Homan and Yubak Dhoj, 2011). *Callosobruchus chinensis* L. attacked chickpea are significantly affected not only in terms of quantitative and qualitative, but also these grains lose their germinating capacity completely as well (Ahmed et al., 2003., Ahmed and Din, 2009., Kumar^[15]). Reduction of insect damage in stored grains is mainly a serious problem in developing countries of the tropics due to favorable climatic conditions and poor storage structures. A warm and humid climate of the region is most conducive for losses of stored chickpeas by insects and storage moulds and the insect damage intensifies mould development^[15]. Chickpea, *Cicer arietinum* L. Walp is an important grain legume crop of South Asia, with the region accounting for about 87% of the world area of the crop. The crop is normally grown rainfed in the post rainy season (Oct-Mar) of the subtropics of South Asia with minimal inputs of fertilizer or pesticides. Chickpea is normally grown with and is being increasingly relegated to marginal lands, due to its displacement from irrigated and better water endowed lands by higher and more stable yielding crops such as wheat^[16].

The most economically important insect pest of chickpea is the pod borer, *Helicoverpa armigera* Huebn. Substantial yield losses due to this pest have been reported across South Asia. For example, in various chickpea growing areas of India, yield losses in particular fields or plots in the range of 10-85% have been documented (Reed, 1983., Ahmed, 1984., Lal et al., 1985., Das, 1987; Qadeer and Singh, 1989., Yadava and Lal^[17-29]). Large scale cultivation of cotton and pigeonpea (preferred hosts of *H. armigera*) in south and central India has further aggravated the pest situation in general due to population shifts of the pest from one host to another host. In Pakistan, during chickpea season 2001-2002, an out break of *H. armigera* was reported by farmers growing chickpea near cotton areas (Anonymous, 2002). The next most important insect pest of stored chickpea is the grain weevil, or bruchid (*Callosobruchus maculatus* F.), which attacks stored grain. Losses can be total in infected seed containers. Ahmed et al. (1989a, 1993, 1991) and Afzal et al. (1987) reported genetic parameters of resistance in chickpea, stating that number of bruchid holes is a better indicator of seed resistance. Although other insect pests may be of local and intermittent occurrence, [e.g. *Aphis craccivora* (Koch), *Agrotis ipsilon* (Hufnagel), *Autographa nigrisigna* (Walker) (Reed et al., 1987., Ranga Rao and Shanover, 1999).

MATERIALS AND METHODS

Study Area: A survey was conducted in the month of June 2020 in district Battagram to collect the insect pest stored wheat and chickpea. stored grain sample were collected from different areas of District battagram, like Alae Thahkot Ajmera Jambura Kanai Peshawra Rajdari Chattar and Jaisol.

Taxonomic Study: Samples were collected two days/ weeks during the day time. The sample were than sieved for the presence of insects. The insects were separated from the grains immature stages were reared till adult emergence. The adults were than identified at the laboratory of Entomology under the Supervision of late Dr sajjad Ahmad taxonomist and professor Department of Entomology faculty of Crop Protection Sciences the University of Agriculture Peshawar.

Basic Equipment's: Aspirator forceps, magnifier jar, rearing jar, wheat and chickpea grain for rearing immature stage.

Preservation: Adult insects were killed in killing jar containing tubes. The insects were then pinned on the right elytra. They were the identified and preserved in insect collection box naphthalene balls were placed to prevent the attack of museum pests.

This pest can also infest cereal crops at maturing stage in the field. Female starts laying eggs after 4-5 d of the emergence and 300-400 eggs are laid by each individual. Eggs are translucent and white. measures 0.7mm long and 0.3mm broad. Female makes a slit like opening with mandibles and rostrum in sprout part of the grain to lay egg in the hole and plug it with secreted material from the ovipositor. Eggs hatch in about four to five days under hot and humid weather but might take six to nine days during cooler months. The newly hatched grub bores into the kernel of the grain. Grubs are white, curved, translucent, with yellow or brown head and biting jaws. As soon as it emerges from egg, it starts feeding on the starchy material of the seeds, till it becomes fully grown and leaves behind only an intact pericarp shell filled with frass. The grub stage lasts for 19-34 d and then pupates to a non-feeding pupal stage after passing 2-3 d as prepupa. Pupal period lasts for one wk and the adult emerging out of grain is at once ready for breeding. Grain with emergence hole becomes quite hollow and can float in water. This pest completes its life cycle within a month at $28\pm 1^{\circ}\text{C}$ and 70% RH. Severely damaged grains resemble mouldy grains.

Lesser Grain Borer-Rhyzopertha Dominaca (Coleoptera: Bostrychidae): Originated from India, this insect has now spread throughout the world. Lesser grain borer is regarded as second in importance to rice weevil as destroyer of the stored grains. At one time this was often found in wheat packings but now it is the major pest of nearly all cereals. It is mostly found in warmer regions of the world and damages wheat, barley, maize, paddy, sorghum and other products. It belongs to that group of insects, which bore into wood in both larval and adult stages. These beetles resemble rice weevil in color but without snout. It is nearly 2-2.5 mm long with a small triangular head which is deflexed under the thorax. It possesses powerful jaws to cause serious damage to grains. Wings are well developed, and adults are good fliers. It prefers dark and dingy places. Both adult and larvae cause serious damage. Heavily infested grains become hollowed out and only thin shell remains. As many as four beetles can be present in bigger grain like maize. Female lays 300-500 eggs in its total lifetime. Eggs are laid either on the seed surface near the embryo end which is soft and easy for young larva to penetrate or interstices of the grain or in other parts of the stores like on cracks and crevices, bags wall etc. Eggs are pear shaped and white but later on changes to pinkish opaque. The larvae bore straight into the grain immediately or feed on farinaceous material in the store for some period and

then penetrate into the grain in first or second instar. Incubation period is 4-7d. Newly hatched larva is active and campodeiform and undergo five molts. Full grown larva is dirty white with pale brown head and curved abdomen covered with tiny hairs. Larva lasts for 35-40 d. With fall in temperature, it becomes less destructive. A single kernel of wheat provides food for 5-6 larvae. Pupal period is 7-8 d. It completes life cycle normally in 6-8 wk. Adults are good fliers and can migrate from one godown to other. After severe infestation adults produce frass and spoil more than what they eat. Profuse powdery substance is the characteristic of its damage (Fig. 2).

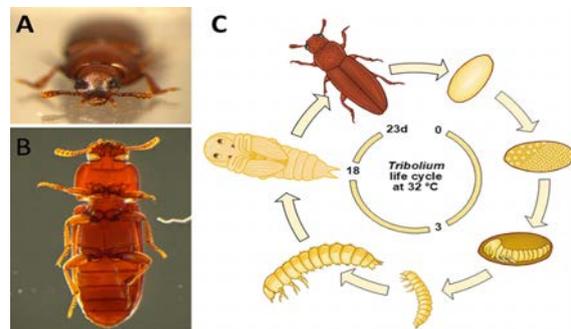


Fig.2: Reference Ty-Jourau-Klingler, Martinau-Bucher, Gregorpy-2022/07/19sp-t1-the Red Flour Beetle. *Castaneum*red

Khaphra Beetle, Trogoderma Granarium (Coleoptera: Dermestidae): Its habit of congregation in cracks and crevices of bricks, masonry and wood storage has given it, the name 'khaphra'. It is a tropical/subtropical insect mainly found in hot and dry regions. It prefers low humidity and high temperature. It is an external feeder and none of the stage lives in the grain. It is a serious pest of wheat but can also damage jowar, rice, maize, sorghum, oilseeds and pulses. Generally, infestation occurs in superficial layers of grain as this insect is not able to penetrate beyond some depth into the grain but in case of heavy infestation, whole lots are damaged (Fig. 3A). Adult is oval in shape and has grey and pale brown markings (Fig. 3B). Head is essentially hidden beneath hood like pronotum. Female lays eggs 5-6 d after breeding. A single female lays about 100-120 eggs on grain surface or crevices. At 35°C, incubation period is 4-6 d but it can vary depending upon the temperature and humidity. The larva is brownish white in color, body covered with bundles of long, reddish brown movable and erectile hair on the posterior segments and forming a sort of tail in the posterior end. First stage larvae feed on broken grains

and debris resulting from the feeding of older larvae as it cannot attack the whole grain. Larval period extends up to 20-25 d at 30°C whereas pupal period is 4-8 d. It is highly resistant to starvation. Under abnormal conditions, larva can survive without food for few years. Although it attacks almost all part of the grain, it prefers germ portion and as such the viability of the seed is lost long before any quantitative damage occurred. Severe infestation results in a reduction of whole grains to mere frass. Adults do not feed and are short lived. Destructive stage is larva.

Red Flour Beetle *Tribolium Castaneum* (Coleoptera: Tenebrionidae): Cosmopolitan in distribution, it is the worst pest of flour mills. It feeds on cereals, flour, starchy material, fruit nuts, millets and prepared cereal foods. It usually feed on broken grains and results in dust formation. Infested flour emits sour and pungent smell, which is due to some secretions of beetles. Destructive stage is adult and larva. Adults are flat, 5-6 mm in length and reddish brown (Fig. 4). Head, thorax and abdomen are distinct and antennae are well developed of which the last segment being abruptly much larger than preceding ones. Neither adult nor larvae can usually damage sound grains but feed only on those grains which have already been damaged by other insects. Apical portion of antenna is clubbed. Individual female lays 400-450 eggs in its whole life. Eggs are sticky and are laid on the grains or debris of the grains. These are small, cylindrical, rounded at both ends and of wheathish color. Incubation period is 5-10 d. Larvae are very active, cylindrical and pupate after 3-4 wk. Pupation takes place on the grain surface, which lasts for 6-8d. Adult has 4-5 d longevity and feeds throughout the life. The presence of larval stage, dead and live adults and odor represent damaged material. Both adults and larvae cause damage

Cigarette Beetle *Lasioderma Serricorne* (Coleoptera: Anobiidae): It is a cosmopolitan but prefers warm environment. It feeds on a large number of foods varying from spices, chocolate, cocoa and tobacco leaves. Adult is a small, oval, reddish brown beetle of about 2.5 mm length. Head is projected downwards with concealed antennae. Adults can fly freely. After a day of emergence, female starts laying eggs on the grains. Eggs are laid in folds and crevices of food material. Eggs are ovoid, elliptical, whitish becoming opaque and dull in colour just before hatching. A single female lays about 110 eggs, which hatch in 5-6 d and larval stage lasts for 25 d followed by pupal period of 5-7 d. Newly hatched larvae are less than one mm in length and covered with fine hairs. Head of larvae is

yellowish, has a semitransparent and whitish body. The larvae cause damage by making small galleries. After 25-30 d of larval life, it constructs a smooth lined cell in which it rests. Larvae lay quiescent in curved position within the cell, which gradually took pupal form. Newly formed pupa is glossy white but changes to reddish brown colour after a few days. Female adult is slightly bigger than males. Insect prefers higher temperature.

Drug Store Beetle *Stegobium Paniceum* (Coleoptera: Anobiidae): It is distributed in tropical, subtropical and temperate regions. It is primary pest of turmeric, ginger, pepper, coriander seeds, cumin seeds, etc. Adults and grubs feed/destroy the grains/seeds. Adults are short lived, pale brown, smaller than *L. serricorne*. Females can lay 50-80 eggs in the powdered material, which hatches within 8-10 d. Larval life is for 4-5 wk followed by pupal period of 6-10 d.

Pulse Insect Pests: All pulse pests belong to the family Bruchidae of order Coleoptera. According to Pruthi and Singh (1948), these beetles can be grouped into three categories depending upon their behaviour: (a) those which remain breed in stored grains in stores; (b) those which breed both in field and stores. A large number of pulse beetles belong to this group. These infest grains when it is in the field and after harvesting move to stores and cause more damage; and (c) those which infest grain in field and brought to store but cannot breed in the store. Adult bruchids fly from infested stores to nearby fields. As pod develops females lay eggs on it or within it. Eggs hatch and grub bore into soft developing pulses.

Pulse Beetle *Callosobruchus Maculatus* (Coleoptera: Bruchidae): This is a very important pest of grain legumes both in storage and field. It is distributed throughout India. It attacks peas, chickpea, pigeon pea, black gram, horse gram, cowpea etc. Larva which grows inside eats endosperm and then the seed is totally damaged (Fig. 5). Adults are non-feeding. Cross infestation is very common, as adults are capable of flying. Adults are black, dark 5-6 mm in size. It can be identified from other species by elevated ivory like spots near the middle of the body., elytra bear white patches., antennae are prominent. Infestation starts from maturing pods. Females lay about 80-100 eggs per individual., the eggs are attached to the substratum by means of transparent glue-like substance. Freshly laid eggs are creamy but become white later on. Egg period is for 3-7 d. Legless larva is cylindrical, fleshy and with wrinkled body. It is white or creamy yellow in colour and remains inside the seed in

curved position. Mouthparts are dark brown. Newly hatched larvae enter in the seed through the seed coat. Larval stages develop inside the whole pulse seed after hatching from egg. Seed germination is spoiled even during developing stages of beetle. Adults come out of the seed after pushing out a circular lid prepared by prepupal stage of larvae and generally one hole is present in the infested seed but sometimes it may be higher depending on the size of the seeds.

Pulse Beetle: Is smaller than *C. maculatus* and it is less brownish. Habits and nature of damage match with those of *C. maculatus* but this species can develop in smaller seeds also and >one emergence holes are present on a damaged seed. Duration of life cycle is also shorter comparatively (Raina, 1970).

Saw Toothed Grain Beetle *Oryzaephilus Surinamensis* (Coleoptera: Silvanidae): This is generally associated with starchy food and found in warm places. Common name is due to its peculiar structure of thorax which bears six tooth like projections on each side. It is a cosmopolitan pest of stored grain and grain products and reported to occurs in flour mills, warehouses, glossary stores, etc. Generally beetles live from six to ten months. Female lays six to ten eggs per day and 50-300 small and white eggs in her life span, loosely in food medium or in cracks and crevices. Larvae moult three times generally. Adults live 6-8 months but die in dust free undamaged grain. Larvae feed on endosperm of broken grains or starchy food.

Long Headed Flour Beetle *Latheticus Oryzae* (Coleoptera: Tenebrionidae): It was first recorded in 1880 from Kolkata in rice. It infests broken grain and bran. Generally associated with *T. castaneum* and lifecycle and behaviour is almost similar to flour beetle. Eggs are translucent and smooth. Grubs are creamy white with dark eyes. Body of larvae is covered with pale coloured hairs. Lifecycle is completed in about 25 to 39 d at normal temperature and humidity.

Angoumois Grain Moth *Sitotroga Cerealella* (Lepidoptera: Gelechiidae): It is named because first in 1736 it was noticed as a pest in Angoumois province of France. It is regarded as one of the most destructive internal feeder in stored grains. The initial infestation takes place when the grain is in or passing through milk stage in the field and usually a small percentage of grain kernels is infested. When wheat is in straw it is easy for the moths to make their way from one wheat head to another. By the time grains are threshed and stored, infestation increase rapidly. In storage, the

infestation is restricted to upper surface. Early infestation is difficult to detect because hole made by young is so small that it cannot be seen. Larva enters and eats its way in the grain, then turns about and spins a silken web over the opening by which it entered thus it is difficult to locate it. The appearance of moths in the stores and round holes on the grain or sometimes heating of the grain in the bin provides the first indication of infestation. Infested grains are hollow and filled with excreta or webs of larva leaving a circular opening for moths' emergence. If the pest is breeding in farm godowns, the moth is attracted by instinct to the nearby field in search of maturing grains to lay eggs. It is found throughout the world mostly in warm temperate climate. It attacks grains in field as well as in storage. It is a serious pest of whole grains of paddy, sorghum, bajra, wheat etc. Only larvae feed on the kernel. It is capable of tunneling sound grains. Infestation is hidden and cannot be easily assessed in the early stages. Germination is seriously affected after infestation. Out of all lepidopteran storage insect pests, it is the most destructive. Adult moth measures 8-10 mm with fringed wings and is good flier. Adult longevity is about 1-2 wk. Infestation starts in maturing cereal crops right in fields. Each individual lays about 120-350 eggs, laid singly or in small clusters on the surface of the grain, which look white at early stage but changes to bright red later on. Small larvae hatch out after nearly one wk and enter inside the grain through joints of the husk. Larvae feed inside the grain (endosperm) for about 3-4 wk and then it pupates. Full grown larvae are nearly 5 mm long, white with yellowish head. Larva spins a silken cocoon inside the grain and changes into reddish brown pupa. Before pupation, larvae cut a small circular opening on the husk which is covered by silken cover to come out. Pupal stage is for 7 d. Destructive stage is larva and damaged grain is very light in weight.

Rice Moth *Corcyra Cephalonica* (Lepidoptera: Pyralidae): It is widely distributed in all rice growing areas of the world and serious pest of stored paddy, rice and other cereals. It flourishes well in humid climates and also attacks wheat, maize, sorghum, barley, millets, soybean and oilseeds. Larva is mainly responsible for damage. Young larva feeds on the broken grain or on the grains, which are already damaged by other insects. As the larvae grow old it becomes capable of feeding on entire grains, which are already damaged by others. Besides polluting the grain with large quantities of frass and silken cocoons, webbing together the grains into large lumps occur. Presence of such webbing leads to serious public discrimination. Adults are 10-12 mm in length, readily

distinguished by closed straight beak formed by palpi pointed forward and antennae are not crossed over wings while insect is at rest. Female is larger than males and adult life is short about 7-10 d. Head has tufts of hair, with greyish forewings and creamy hind wings. Females lay about 200 eggs which are small, oval, white and are laid anywhere on bags, walls, or on grains, Young larva is creamy white with prominent pale brownish yellow head. Larva webs silken shelter soon gets densely covered with broken grain and frass. Larval life is for 4-5 wk and it pupates inside the silken cocoon for 8-10 d.

Almond Moth *Cadra Cautella* (Lepidoptera: Phycitidae): Almond moth, also known as fig moth is widely spread in the tropics and subtropics. It is a serious pest of figs, rough rice, dry fruits, wheat, barley, sorghum, soybean and oilseeds etc. Adult moth has a dark band on the forewings and is three fourth of the size of *C. cephalonica*. It has greyish body, while at rest, its forepart is elevated giving a distinct slope to the wings. Females lay about 200-250 eggs per individual, indiscriminately scattered in stores, in cracks, on grains or other surfaces. Eggs measure less than 1 mm and hatch within 3-4 d. The young larvae spin silk profusely and at maturity these form small silken tubes among the food particles or in the grain wherein they remain lodged and grow. Larval stage is the damaging stage. Full grown larvae are white with pinkish tinge. Its characteristic colour and habit of spinning tubes in food material are most conspicuous diagnostic characters. Pupal period is 7-10 d. Moths are generally more abundant during rainy and humid seasons.

CONCLUSION

Stored grains provide diverse niches for a variety of insect pests to thrive and complete their life cycle. While external feeders are conspicuous by their presence, the internal feeders are very often discernible only after a considerable damage is caused. Understanding the symptoms of damage, life cycle and biology of major stored product insect pests would help in monitoring and assessment of their damage so as to devise suitable strategies for controlling these pests. Grain handlers are essentially to be imparted with the knowledge of identification of major stored product insect pests, their life stages and associated damage symptoms in the grains to ensure safe storage of grains.

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