The Pharma Innovation Journal 2023; 12(4): 1040-1042

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 1040-1042

www.thepharmajournal.com
Received: 11-01-2023
Accepted: 23-02-2023

Vaishali Zote
Ph.D. Student, N.M. College of Agriculture, Navsari, Gujarat, India

Abhishek Shukla
Head Department of Entomology, N.M. College of Agriculture, Navsari, Gujarat, India

Corresponding Author:
Vaishali Zote
Ph.D. Student, N.M. College of Agriculture, Navsari, Gujarat, India

Host preference of Angoumois grain moth, *Sitotroga cerealella* Olivier

Vaishali Zote and Abhishek Shukla

Abstract
The adult of Angoumois grain moth is reared on ten different type of hosts for their feeding preference. From the pooled data of two year, it is observed that paddy recorded more number of adult emergence, less development period and higher susceptibility index. Maize is second preferred host of *S. cerealella* followed by wheat and sorghum. The larva of *S. cerealella* does not feed on the grain of pea, pigeonpea and black gram. The order of host suitability of different commodities was paddy > maize > wheat >sorghum green > chickpea > green gram > Indian bean.

Keywords: Paddy, Angoumois grain moth, *S. cerealella*, host preference

Introduction
Paddy is the staple food of more than 60 percent of the world's population especially for most of the people of South-East Asia. Among the paddy growing countries in the world, India has the largest area under paddy crop and ranks second in production next to China. Total production of paddy during 2021-22 is estimated at record 130.29 million tonnes. It is higher by 13.85 million tonnes than the last five years' average production of 116.44 million tonnes. Thus, harvested as well as processed paddy retains high moisture content, which predisposes grains for considerable storage losses every year (Prakash *et al*., 1981) [1]. After harvesting, unprocessed paddy is stored for varied periods of time depending on market demand, size of production and the farmer's needs. Storage of the unprocessed paddy is the most important and critical postharvest operation. In India, according to an expert committee 9.33 percent of the total food grains produced are lost during post-harvest operations, of which 1.68 percent is at the threshing yard, 0.15 percent in transport, 0.92 percent in processing and 6.58 percent in storage.

In India, the annual storage losses were estimated as 14 million tonnes of food grains worth $16,000 million every year. Out of this, food grain losses due to insects alone account for a monetary loss of $ 300 million (Mohan and Kavitharaghavan, 2008) [2]. During storage, paddy is highly vulnerable to infestation by a variety of insect pests and diseases.

Among seventeen species of insects reported so far infesting stored paddy/rice, Angoumois grain moth (*Sitotroga cerealella* Olivier), lesser grain borer (*Rhizopertha dominica* Fabr.), rice weevil (*Sitophilus oryzae* L.), saw-toothed grain beetle (*Oryzaephilus surinamensis* L.) and rust red flour beetle (*Tribolium castaneum* Herbt) are of major significance in India (Prakash *et al*., 1987) [3]. Angoumois grain moth, *S. cerealella* would certainly rank high among stored grain pest species. The Angoumois grain moth is a species belongs to family Gelechiidae, commonly referred to as the "Paddy grain moth". It is most abundant in the temperate or tropical climates of India, China, South Africa, Indonesia, Malaysia, Japan, Egypt and Nigeria, with its location of origin being currently unknown. It is most commonly associated as a pest of field and stored cereal grains as they burrow within the kernel grains of crop plants, rendering them unusable for human consumption. By laying eggs between the grains themselves and hatching at a later time, often during the processing, transportation or storage stages, the moth can be transported to households or countries presently free of Angoumois grain moth infestations. The pest is cosmopolitan in distribution. Considering the potential for this pest to cause heavy damage and the economic importance of the *S. cerealella*, there is a critical need for broader and more precise information on host preference and suitability of this pest. This information is indispensable to better understand the potential effect of the *S. cerealella* on different host species. However, currently, there is no much more information available in the literature on the host preference of *S. cerealella*.

Considering the importance of Angoumois grain moth, the present investigation is carried out to find its host preference under laboratory condition at N.M. College of Agriculture Navsari in Completely Randomized Design with ten different host.

Materials and Methods

Fifty grams uninfected grains each of maize (*Zea mays*), sorghum (*Sorghum bicolour*), paddy (*Oryza sativa*), green gram (*Vigna radiate*), black gram (*Phaseolis mungo*), peas (*Pisum sativum*), Indian bean (*Dolichus lablab*), pigeonpea (*Cajanus cajan*), chickpea (*Cicer arietinum*), wheat (*Triticum aestivum*) and some other host available during the study period, were taken separately in plastic jars (diameter 8cm.; height 10cm.). Three pairs of newly emerged male and female moths were released into each jar for oviposition. The jars were closed from the top by tying a piece of muslin cloth to prevent the escape of moths. Three days later the moth was removed and the jars were remaining that way until the eggs laid in them develop into adults. The experiment was repeated three times in a complete randomized block design. From the day the moth emergence started, moths were counted daily and removed immediately from the jars to prevent fresh oviposition. The moth emergence was recorded until end.

The period required from oviposition to adult emergence were considered a developmental period. The susceptibility index was worked out by adopting the formula suggested by Dobie (1974 and 1977) as under.

$$\text{Susceptibility Index} = \frac{\text{Natural log F}}{\text{D}} \times 100$$

Where,

- F= Number of adults emerged; - D=Mean developmental period;
- On the basis of the index host suitability will be determined.

Result and Discussion

Ten different hosts were studied in laboratory for their suitability as hosts of *S. cerealella*. The hosts were evaluated on the basis of susceptibility Index. The results obtained are presented Table 1,2 and 3.

During the year 2021-22 from the Table 1, it can be clearly seen that out of ten commodities tested, the pest could develop only on six commodities *viz*., maize, sorghum, paddy, green gram, chickpea and wheat. The average number of adults emerged in these commodities ranged from 6.00 to 86.00 days with mean developmental period of 31.67 to 40.67 days. The data on susceptibility index indicated that the highest (14.06) susceptibility Index was recorded for paddy and it was at par with maize (13.88) significantly higher than rest of the commodities. The susceptibility Index for wheat was 12.98, which was at par with sorghum but significantly superior over the remaining commodities. The pulses *viz*. green gram, Indian bean and chickpea had susceptibility index were 4.68, 4.08 and 5.49, respectively and proved least suitable to *S. cerealella* as host. The commodities *viz.* black gram, peas and pigeonpea, had zero susceptibility index and proved unsuitable hosts for the pest.

The average number of adults that emerged in 2022–23 (Table 2) varied from 3.0 to 84.33, with a mean development period of 30.00 to 41.67 days. The paddy registered the highest susceptibility index (14.76) which was significantly superior over rest of the treatment. The second highest susceptibility index was recorded in maize (13.85). The susceptibility index for wheat is (12.90). The susceptibility indexes of Sorghum (12.18). The susceptibility index of green gram, and Indian bean and chick pea was 4.26, 2.07 and 5.17, respectively.

From the pooled data of two year (Table 3) it was observed that the susceptibility index of paddy was highest (14.41) however it was at par with maize (13.87) and wheat (12.94). The green gram, Indian bean and chick pea recorded 4.17, 3.38 and 5.33 susceptibility index, respectively. Thus, from the above results, it can be concluded that the cereals were more suitable hosts among different commodities tested. The order of host suitability of different commodities was paddy > maize > wheat >sorghum green > chickpea > green gram > Indian bean. The citation on *S. cerealella* is considerable, but most work addresses the use of varieties of cereals and different parameters of the insect or grains. Many factors are responsible for the preference of cereals, legumes and pulses by stored grain insect pests. Our result is either directly or indirectly are consistent with the previous work on the effects of various grains. Hammed and Nadeem (2012) [6] studied the effect of cereals on the development of *S. cerealella* and reported that the tested cereals had a pronounced and significant effect on adult weight from highest to lowest in order of corn > wheat > barley > paddy > sorghum = oat > millet. Further damage assessment of second generation of Angoumois grain moth *Sitotroga cerealella* (olivier) in the laboratory on Paddy, wheat and maize seeds and reported that the female of *S. cerealella* preferred more paddy grain for egg laying than maize and wheat (Ali *et al*., 2015) [7].

Table 1: Susceptibility index of different commodities against *S. cerealella* (2021-22)

Sr. No	Commodities	Av. no. of adult emerged	Mean development period	Average Susceptibility Index
1	Maize	81.00	32.00	3.86 (13.88)
2	Sorghum	65.00	36.67	3.55 (11.62)
3	Paddy	86.00	31.67	3.88(14.06)
4	Green Gram	6.33	41.00	2.25 (4.68)
5	Black Gramm	0.00	0.00	1.00 (0.00)
6	Peas	0.00	0.00	1.00(0.00)
7	Indian Bean	6.00	40.33	2.38 (4.08)
8	Pigeon pea	0.00	0.00	1.00 (0.00)
9	Chick Pea	9.00	40.67	2.55 (5.49)
10	Wheat	79.67	34.00	3.74 (12.98)
	S.Em +			0.04
	CD at 5%			0.10
	CV (%)			2.46

Figure in parentheses are retransformed values, those outside are square root (X+1) transformed values

Table 2: Susceptibility index of different commodities against *S. cerealella* (2022-23)

Sr. No	Commodities	Av. no. of adult emerged	Mean development period	Average Susceptibility Index
1	Maize	81.33	31.67	3.77(13.85)
2	Sorghum	72.33	35.33	3.46(12.18)
3	Paddy	84.33	30.00	3.97(14.76)
4	Green Gram	5.00	40.67	2.27(4.26)
5	Black Gramm	0.00	0.00	1.00 (0.00)
6	Peas	0.00	0.00	1.00(0.00)
7	Indian Bean	3.00	40.00	2.09(2.07)
8	Pigeon pea	0.00	0.00	1.00 (0.00)
9	Chick Pea	9.00	41.67	2.52(5.17)
10	Wheat	77.00	33.67	3.73(12.90)
	S.Em +			0.04
	CD at 5%			0.11
	CV (%)			2.63

Figure in parentheses are retransformed values, those outside are square root (X+1) transformed values

Table 3: Susceptibility index of different commodities against *S. cerealella* (Pooled)

Sr. No	Commodities	Av. no. of adult emerged	Mean development period	Average Susceptibility Index
1	Maize	81.17	31.83	3.85(13.87)
2	Sorghum	68.67	36.00	3.59(11.89)
3	Paddy	85.17	30.83	3.93(14.41)
4	Green Gram	5.67	40.83	2.27(4.17)
5	Black Gramm	0.00	0.00	1.00 (0.00)
6	Peas	0.00	0.00	1.00(0.00)
7	Indian Bean	4.50	40.17	2.06(3.38)
8	Pigeon pea	0.00	0.00	1.00 (0.00)
9	Chick Pea	9.00	41.17	2.52(5.33)
10	Wheat	78.33	33.83	3.73(12.94)
	S.Em +			0.105
	CD at 5%			0.337
	CV (%)			2.55

Figure in parentheses are retransformed values, those outside are square root (X+1) transformed values

Conclusion

From the above study, it can be concluded that paddy is the most preferred host of *S. cerealella* followed by maize, wheat and sorghum. Further, the larva of *S. cerealella* does not feed on the grain of pea, pigeonpea and black gram.

Acknowledgement

The authors are thankful to Director of Research and Dean, P.G. Studies, Navsari Agricultural University, Navsari as well as Principal and Dean, N.M. College of Agriculture, Navsari Agricultural University, Navsari for providing all the necessary facilities.

References

1. Prakash A, Pasalu IC, Mathur KC. Population fluctuations of insect pests of stored paddy under natural and controlled conditions. *Oryza.* 1981;18(2):90-92.
2. Mohan S, Kavitharaghavan Z. Studies on the popularization of TNAU stored product insect management kit technology. Green Farming. 2008;46:53.
3. Prakash A, Rao J, Pasalu IC, Mathur KC. Rice storage and insect pest management, B. R. Publishing Corporation, Delhi; c1987. p. 337.
4. Dobie P. The laboratory assessment of the inherent susceptibility of maize varieties to post-harvest infestation by *Sitophilus zeamais*. J Stored Prod. Res. 1974;10:183-197.
5. Dobie P. The contribution of the tropical stored products centre to the study of insect resistance in stored maize. J Trop Agric. 1977;34:722.
6. Hamed M, Nadeem S. Effect of Cereals on the Development of *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) and Subsequent Quality of the Egg Parasitoid, *Trichogramma chilonis* (Ishii) (Hymenoptera: Trichogrammatidae). Pak. J Zool. 2012;44(4):923-929.
7. Ali MA, Khatun MR, Mony FTZ, Bhuiyan AA, Sarker MEH. Bi-ology and damage assessment of second generation of Angoumois grain moth Sitotroga cerealella (Olivier) in the laboratory. Int. J bus. Soc. sci. res. 2015;4(1):01-05.