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IMPACT OF DIFFERENT MAIZE CULTIVARS ON PRE HARVEST INFESTATION BY *SITOTROGA CEREALELLA* (OLIVIER) (LEPIDOPTERA: GELECHIIDAE)

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ABSTRACT

This experiment was carried out in the Maize research station at Vaagarai during the year of 2013-2014 for assessing the "Effect of different cultivars on the pre harvest infestation by *Sitotroga cerealella*". A total of 41 samples collected from the maize field. They were of four types: extra early, early, medium and late maturing hybrids. Among the 41 samples, 14 are extra early, nine are early, nine samples are medium and 9 are late maturing hybrids. From all the samples, adult emergence was recorded for every day up to eight weeks. Adult emergence was recorded in all the four samples types. There is no relation between type of hybrids and sowing date and harvesting time. But compared to the late and extra early samples types, the early and medium types were infested with less percentage of adults. The possible reasons for the field incidence may be due to Harvesting of crop in phased manner because of non synchronisation in grain maturation in a particular place, which in turn is due to staggered sowing. So the infestation from matured crop is carried over to the late maturing crop in the field itself, In double and triple cropped areas, its field incidence may be prolonged because of the continuous availability of host as at Vaagarai, In single and double cropped areas, during the off season it may survive on the alternate hosts like rice, sorghum, pearl millet and barnyard millet, Migrations of *S. cerealella* from the nearby the godown to the field and he variations in the level of infestation might be due to variation in cropping systems, seasons, time of harvest, availability of alternate hosts and debris.

Keywords: *Sitotroga cerealella*, Pre harvest, Samples, Cobs and Adults.

INTRODUCTION

The Angoumois grain moth, *Sitotroga cerealella* (Olivier) is one of the principal insect pest that causes severe losses at storage. It is carried-over from field to the stores through field infected grains. A field infestation of 0.26 per cent at harvest could cause the total loss in storage (Simmons and Ellington, 1927). *Sitotroga cerealella* is an important insect pest of whole cereal grains. Cereal grains, including maize, are often infested in the field before harvest as well as during storage (Dobie, 1984). Initial infestation takes place when the cob is in or passing the 'roasting ear stage' and usually involves only a small percentage of cobs. From harvest until grain is threshed and stored, infestation by moth increases with great rapidity. Koone (1952) observed the increased incidence of *Sitotroga cerealella* on maize in the field from 8% in the

roasting ear stage to 62% as maize was ready for harvest. *S. cerealella* are field to storage insect pests (Nyiira, 1970; Williams and Floyd, 1971). The adults lay their eggs on mature grains in the field. This field infestation serves as initial inoculum for infestation in the store. The level of infestation in the field determines the level of infestation in the store such that higher field infestation leading to higher infestation in the store (Floyd, 1970; Eman, 1993). The degree of field infestation largely depends on the completeness of the husk cover of the cobs (Gwinner *et al.*, 1996). Bare ears at the tip, exposes cobs to high field infestation of storage pests such as *Sitophilus zeamais* and *S. cerealella* (Eman, 1999).

MATERIAL AND METHODS

The experiment was conducted in Maize Research Station at Vaagarai. It is situated at latitude of 10° 57' N, longitude of 77° 56' E and altitude of 254.45m MSL. The average rainfall at this research station is around 700 mm of which 70% recorded during north east

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monsoon. One cob from each hybrid was collected, the initial weight was recorded and separately confined to a polythene bags to record the emergence of adult moths. Data on the number of insects emerged and number of days taken for adult emergence to reach the mean development period were recorded. Finally, the total number of adults emerged from ear heads of each hybrid was projected as

number of adults emerged per 100 g of maize grains. The experiments were conducted in Completely Randomized Design with three replications and data were statistically analyzed following the methods adapted by Panse and Sukathme (1985).

RESULTS

Among the 41 samples collected from Maize Research Station (MRS) Vaagarai, 15 samples

showed field infestation by *S. cerealella* accounting for 36.55% of field carryover (Table 1 and Figure. 1). The remaining twenty six samples were free from field infestation. In extra early types cobs were collected on 95th day (38th standard week) after sowing. Adult emergence was recorded from 3rd week (40th standard week) after collection of cob from the field (Table 1 and Figure 1).

Table 1. Field studies of carry-over of *Sitotroga cerealella* in Vaagarai samples (Extra Early Hybrids) (2014-2015).

Sr. No.	Hybrids	*Weight of the sample(g)	Total No. number <i>Sitotroga cerealella</i> adults emerged from Vaagarai samples (2013)								Total	Number of insects emerged in 100g of sample	
			38 th Std. Week	39 th Std. Week	40 th Std. Week	41 th Std. Week	42 th Std. Week	43 th Std. Week	44 th Std. Week	45 th Std. Week			
1	EE4001	201.1	0	0	0	0	0	0	0	0	0	0	0.0
2	EE4002	96.3	0	0	0	0	0	0	0	0	0	0	0.0
3	EE4005	150.0	0	0	0	0	0	0	0	0	0	0	0.0
4	EE4006	169.9	0	0	0	0	0	0	0	0	0	0	0.0
5	EE4007	143.0	0	0	1	0	0	0	0	0	1	0.7	0.7
6	EE4008	139.4	0	0	0	0	0	0	0	0	0	0	0.0
7	EE4009	149.8	0	0	4	13	2	0	0	0	19	12.6	12.6
8	EE4010	195.3	0	0	1	0	0	0	0	0	1	0.5	0.5
9	EE4011	98.3	0	0	2	13	0	0	0	0	15	15.2	15.2
10	EE4012	71.2	0	0	0	0	0	0	0	0	0	0	0.0
11	EE5721	170.1	0	0	1	0	0	0	0	0	1	0.6	0.6
12	EE5722	255.4	0	0	1	0	0	0	0	0	1	0.34	0.34
13	EE5723	230.0	0	0	1	13	4	0	0	0	18	7.8	7.8
14	EE5724	292.8	0	0	0	0	0	0	0	0	0	0	0.0
Mean			0	0	0.8	2.8	0.4	0	0	0	4.0	2.7	2.7

* Each sample contains single cob collected at or after roasting stage

Adult emergence was recorded only for three week-period from the 40th to 42nd standard week. The maximum emergence of 2.6 was recorded during the 41st standard week i.e. 4 weeks after

samples' collection. On the hybrids EE4009, EE5723 and EE4011 were recorded the maximum number of adults (15-19) with the peak emergence during 41st standard week. On the

hybrids EE4007, EE4010, EE5721 and EE5722 were recorded the minimum emergence of one adult moth. The remaining hybrids were free from infestation (Table 2 and Figure 2).

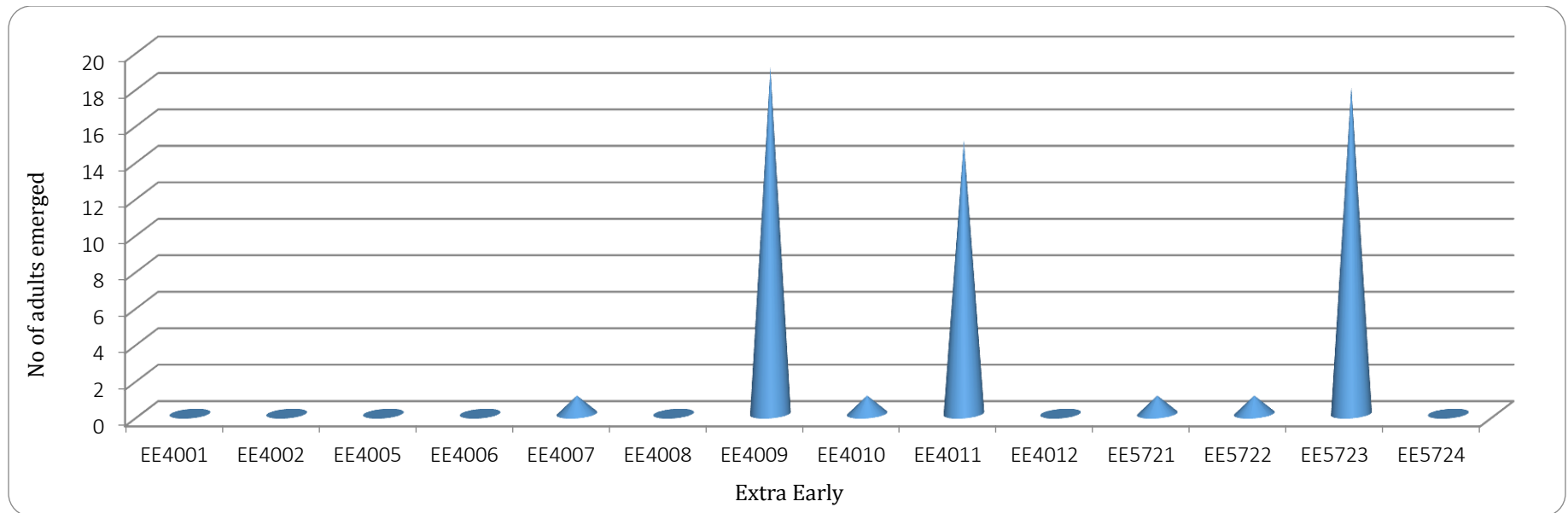


Figure 1. Number of *Sitotroga cerealella* adults emerged in Vaagarai samples (Extra Early Hybrids) (2014-2015).

Table 2. Field studies of carry-over of *Sitotroga cerealella* in Vaagarai samples (Early Hybrids) (2014-2015).

Sr. No.	Hybrids	*Weight of the sample(g)	Total No. number <i>Sitotroga cerealella</i> adults emerged from Vaagarai samples (2013)								Total	Number of insects emerged in 100g of sample	
			40 th Std. Week	41 th Std. Week	42 th Std. Week	43 th Std. Week	44 th Std. Week	45 th Std. Week	46 th Std. Week	47 th Std. Week			
1	E5591	165.1	0	0	0	0	0	0	0	0	0	0	0.0
2	E5592	180.4	0	0	0	0	0	0	0	0	0	0	3.3
3	E5593	183.5	0	4	1	0	0	0	0	0	0	5	0.0
4	E5594	150.2	0	0	0	0	0	0	0	0	0	0	0.0
5	E5595	215.1	0	0	0	0	0	0	0	0	0	0	0.0
6	E5596	350.3	0	0	0	0	0	0	0	0	0	0	0.0
7	E5597	220.0	0	0	0	0	0	0	0	0	0	0	0.0
8	E5598	180.1	0	0	0	0	0	0	0	0	0	0	2.8
9	E5599	230.6	0	0	0	0	0	0	0	0	0	0	0.0
Mean			0	0.44	0.11	0	0	0	0	0	0	0.56	0.44

* Each sample contains single cob collected at or after roasting stage.

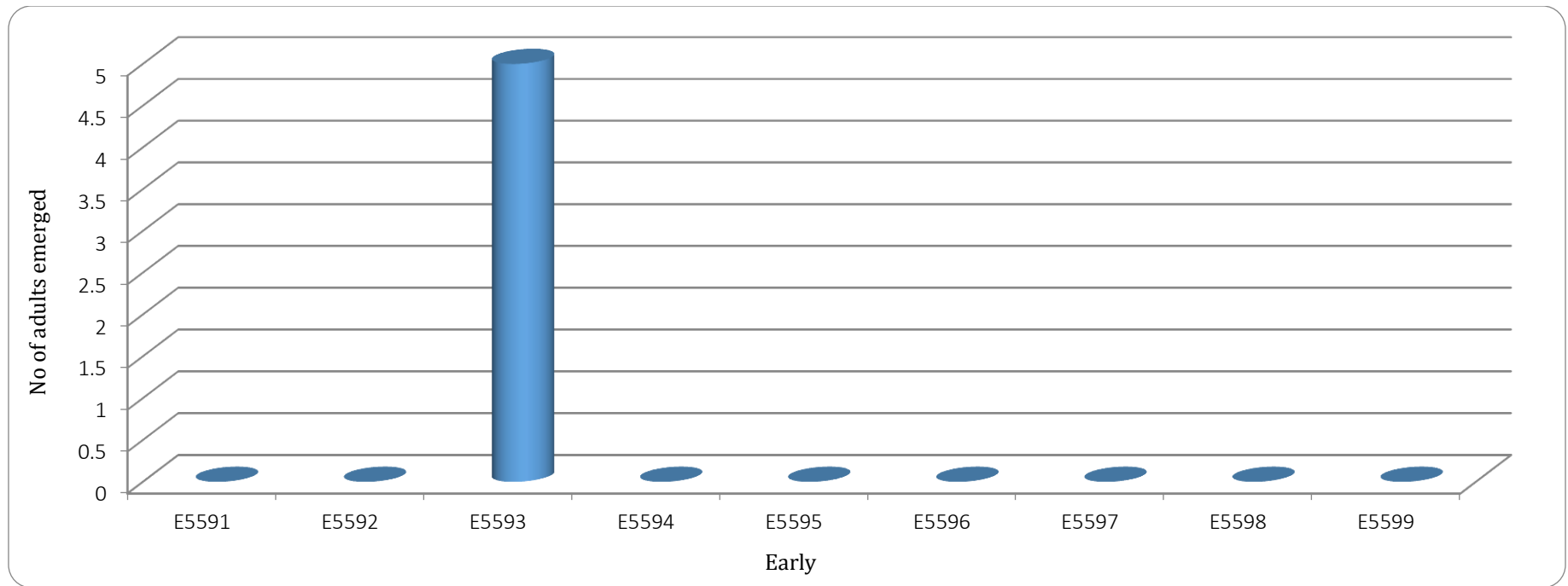


Figure 2. Number of *Sitotroga cerealella* adults emerged in Vaagarai samples (Early Hybrids) (2014-2015).

In early types cobs were collected on 105th day (40th standard week) after sowing. In early types cobs were collected on 105th day (40th standard week) after sowing. In early type's cobs, adult emergence was recorded from the 2nd week (41st standard week) after collection of cob from field. Adult emergence was recorded only for two week-period from 41st to 42nd standard week. The maximum emergence of (0.44) was recorded during the 41st standard week. Hybrids E5593 recorded the maximum number of adult emergence (5) with the peak emergence during the 41st standard week. No adults were recorded on the remaining hybrids (Table 3 and Figure 2).

The medium type cobs were collected on 115th day (42nd standard week) after sowing. Adult emergence was recorded from 2nd week (43rd standard week) after collection of cob from field. Adult emergence was recorded for four week period from 43rd to 46th standard week. The maximum emergence (0.56) was recorded during 45th and 46th standard week. On the hybrids M5392 and M5398 were recorded the maximum number of adults, with 5-6 adults with the peak emergence during 45th and 46th standard week. The remaining hybrids were not infested (Table 3 and Figure 3). In the remaining types of cobs collected on 125th day (43rd standard week)

after sowing, adult emergence was recorded from 3rd week (45th standard week) after cob sampling from the field. Adult emergence was recorded only for three week period from 45th to 47th standard week. The maximum emergence of 0.89 adult) was recorded during 46th standard week. On the hybrids L5082, L2085 and L5087 were recorded the maximum number of adult emergence with the peak emergence of 4-7 during 46th standard week. On the hybrids L5084 and L5088 were recorded the minimum adult emergence of one adult moth. The remaining hybrids were not infested (Table 4. and Figure 4).

Table 3. Field studies of carry-over of *Sitotroga cerealella* in Vaagarai samples (Medium Hybrids (2014-2015)).

Sr. No.	Hybrids	*Weight of the sample(g)	Total No. number <i>Sitotroga cerealella</i> adults emerged from Vaagarai samples (2013)								Total	Number of insects emerged in 100g of sample	
			42 th Std. Week	43 th Std. Week	44 th Std. Week	45 th Std. Week	46 th Std. Week	47 th Std. Week	48 th Std. Week	49 th Std. Week			
1	M5391	148.6	0	0	0	0	0	0	0	0	0	0	0.0
2	M5392	168.2	0	1	0	0	5	0	0	0	0	6	3.3
3	M5393	171.3	0	0	0	0	0	0	0	0	0	0	0.0
4	M5394	136.9	0	0	0	0	0	0	0	0	0	0	0.0
5	M5395	202.9	0	0	0	0	0	0	0	0	0	0	0.0
6	M5396	329.0	0	0	0	0	0	0	0	0	0	0	0.0
7	M5397	211.0	0	0	0	0	0	0	0	0	0	0	0.0
8	M5398	153.4	0	0	0	5	0	0	0	0	0	5	2.8
9	M5399	211.7	0	0	0	0	0	0	0	0	0	0	0.00
Mean			0	0.11	0	0.56	0.56	0	0	0	0	1.22	0.68

* Each sample contains single cob collected at or after roasting stage.

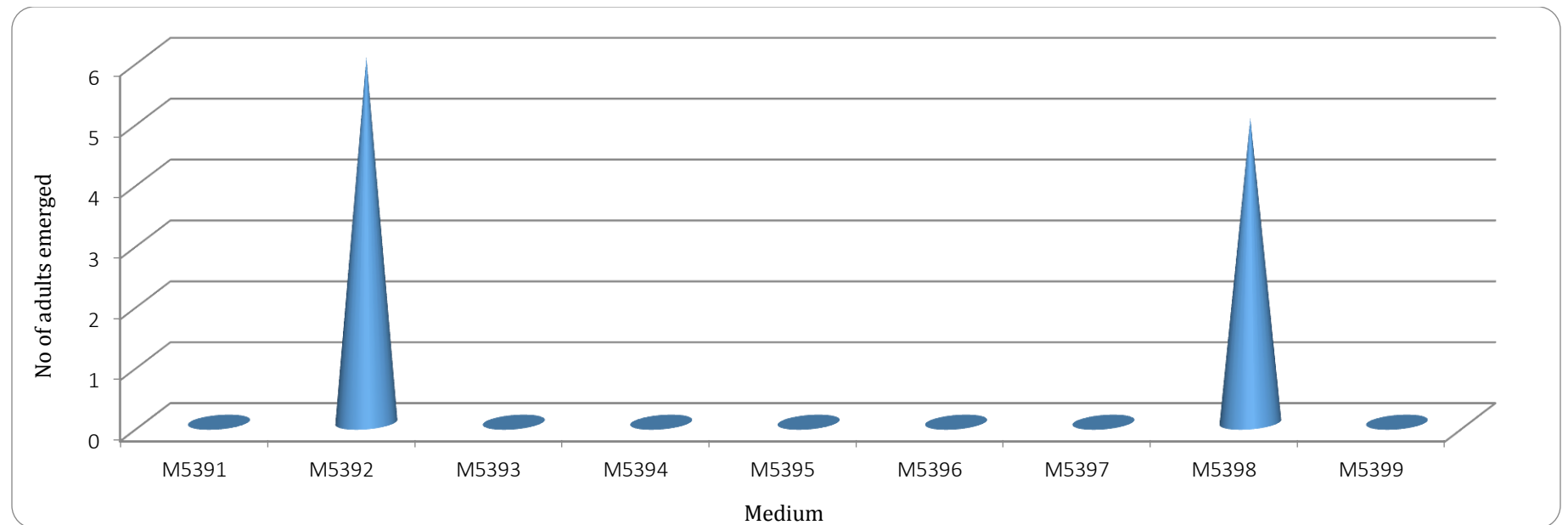


Figure 3. Number of *Sitotroga cerealella* adults emerged in Vaagarai samples (Medium Hybrids) (2014-2015).

Table 4. Field studies of carry-over of *Sitotroga cerealella* in Vaagarai samples (Late Hybrids (2014-2015)).

Sr. No.	Hybrids	*Weight of the sample(g)	Total No. number <i>Sitotroga cerealella</i> adults emerged from Vaagarai samples (2013)								Total	Number of insects emerged in 100g of sample	
			43 th Std. Week	44 th Std. Week	45 th Std. Week	46 th Std. Week	47 th Std. Week	48 th Std. Week	49 th Std. Week	50 th Std. Week			
1	L5081	121.1	0	0	0	0	0	0	0	0	0	0	0.0
2	L5082	90.1	0	0	2	4	1	0	0	0	7	7.78	
3	L5083	154.0	0	0	0	0	0	0	0	0	0	0.0	
4	L5084	196.1	0	0	1	0	0	0	0	0	1	0.5	
5	L5085	189.0	0	0	0	0	5	0	0	0	5	2.7	
6	L5086	297.9	0	0	0	0	0	0	0	0	0	0.0	
7	L5087	246.1	0	0	0	4	0	0	0	0	4	1.6	
8	L5088	192.0	0	0	1	0	0	0	0	0	1	0.5	
9	L5089	175.0	0	0	0	0	0	0	0	0	0	0.0	
	Mean		0	0	0.44	0.89	0.67	0	0	0	2	1.45	

* Each sample contains single cob collected at or after roasting stage

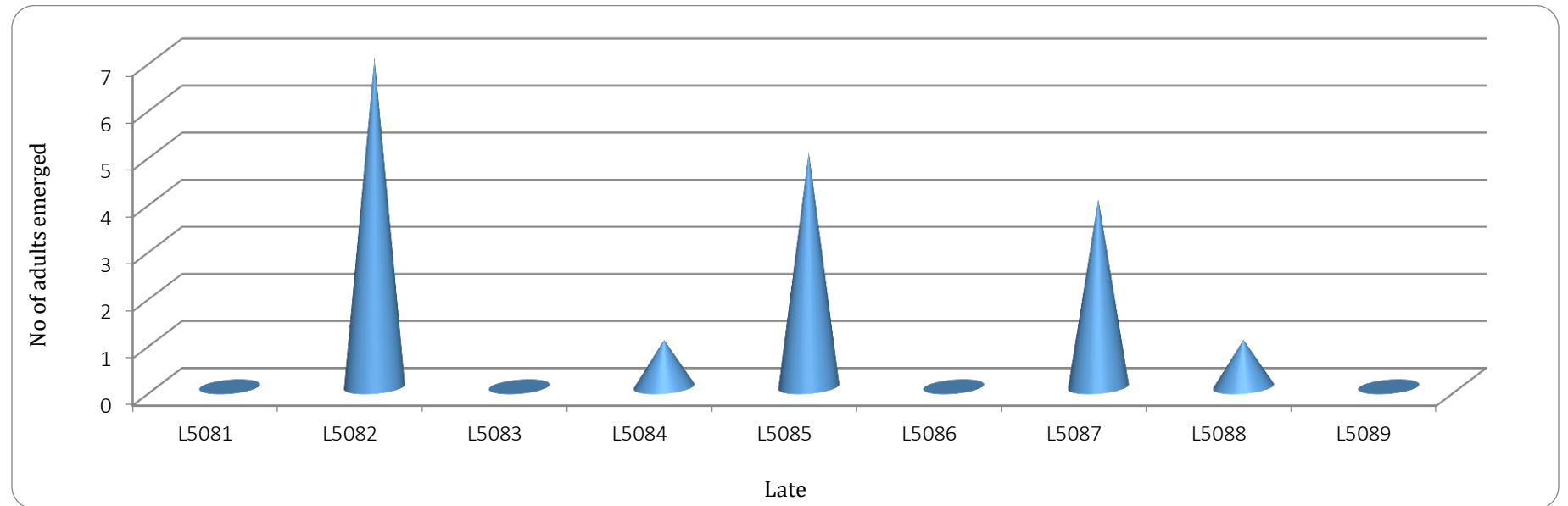


Figure 4. Number of *Sitotroga cerealella* adults emerged in Vaagarai samples (Late Hybrids) (2014-2015).

DISCUSSION

In all the cob types, infestation was recorded. There is no relation in the types of hybrid and the field carryover. Adult emergence was as high as 15-19 per sample of single cob from extra early type, 5 in early, 5-6 in medium and 4-7 in late hybrids collected. If the adults start emerging from 2 to 3 week period after stage of maize crop, there are egg laying by those adults on cobs of standing crop. The variations in the level of infestation might be due to variation in cropping systems, seasons, time of harvest, availability of alternate hosts and debris. Field leftover serves as one of the important sources of inoculum for the field infestation by a stored product pest. Such occurrences had been reported on sorghum (Cartwright, 1939; Russell, 1968; Subramanian et al., 1959; Turner, 1976), wheat (King, 1918; Simmons and Ellington, 1927) and cowpea (Hagstrum, 1985). Though infestation of the field crop by the stored product pests is common, adult emergence of these pests in the field itself has not been reported. The infestation in field normally serves as inoculum for further build up in storage and adult emergence occurs during storage only. The field infestation in maize by *S. cerealella* has already been reported (Koone 1952; Singh et al., 1978; Gwinner et al., 1996; Eman, 1999). Infestation of the commodities in field by pests of stored products has also been observed in other pests like *Sitophilus Zeamais* (Linn) and *Rhizopertha dominica* in sorghum and *Callosobruchus* spp in cowpea (Caswell, 1961; Hagstrum, 1985; Prevett, 1961) and red gram (Gunathilagaraj et al., 1977). *S. cerealella* can thrive better in ecological zones having higher RH (Mookherjee et al., 1968) as proved in laboratory studies (Grewal and Atwal, 1967; Shazali and Smith, 1985). If any management strategies in terms of chemical spray and others are available for field carried population of *S. cerealella*, they may be coincided during 2 to 5 week period after reaching roasting stage for it effective control. This strategy can very well be followed for crops grown for seed purpose which has to be stored for long time without quality deterioration, rather than grain purpose which goes to consumption immediately.

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