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Extent of Losses in Maize Storage due to Infestation by Maize Weevil *(Sitophilus zeamais* (Motschulsky)

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ABSTRACT

An investigation was carried out on the extent of losses caused due to infestation by *Sitophilus zeamais* (Motschulsky) in maize at Department of Seed Science and Technology, Rajendranagar, Hyderabad during the year 2010-11. The infestation of maize hybrid, DHM –117 with ten pairs of *S. zeamais* revealed that loss in weight and per cent seed damage increased with increase in storage period and adult emergence while the germination and vigour index was decreased.

Key words : *Sitophilus zeamais,* Loss in weight, Per cent Seed Damage, Germination, Vigour index

Maize (*Zea mays* L.) is one of the most important cereal crops and occupies prominent position in global agriculture owing to its diversified uses. In India, maize occupies third position next to rice and wheat with an area of 7.89 m ha under cultivation producing 15.09 m t, with an average productivity of 1904 kg ha^{-1}. In Andhra Pradesh, it covers an area of 0.85 m ha with a production of 4.15 m t and an average productivity of 4073 kg ha^{-1} (CMIE, 2010).

Maize is subjected to both quantitative and qualitative losses due to infestation by a number of insect species in field as well as in storage. The maize weevil, *Sitophilus zeamais* (Motschulsky) is one of the most serious cosmopolitan pests of stored cereal grain, especially of maize in tropical and subtropical regions (Throne, 1994). Worldwide seed losses ranging from 20 to 90% have been reported for maize due to *S. zeamais* (Giga *et al*., 1991). Damage to grain caused by this weevil includes reduction in nutritional value, germination, weight and commercial value (Yuya *et al*., 2009). Hence keeping in mind the future demand of maize and the possible threat by the maize weevil to food security, the present investigation has been undertaken to assess the extent of loss in weight, seed damage, germination and vigour due to *S. zeamais*.

MATERIAL AND METHODS

The experiment was carried out in the Department of Seed Science and Technology, College of Agriculture, Hyderabad during 2010-11.Freshly harvested, uninfested, untreated and sound seeds of the maize hybrid DHM-117 were weighed upto 250 grams, placed in separate glass bottles that were replicated four times. Number of seeds in each replication was counted. Ten pairs of 20 day old adult weevils of *S. zeamais* were released in to each bottle. The bottles were covered with muslin cloth and maintained under ambient conditions for a period of six months and losses in terms of per cent seed damage, loss in seed weight and adult emergence and other seed parameters like per cent seed germination, seedling vigour were recorded at monthly intervals.

RESULTS AND DISCUSSION

Mean Adult Emergence

The data presented in Table 1 showed that there was no increase in adult emergence for the first two months while it was significant between third and fourth month and between fifth and sixth month. The number of adults emerged from maize seed over a period of six months ranged from 49 to 307. Release of second generation population might be the reason for more population during fourth and fifth month.

Weight Loss (Per cent)

There was a gradual increase in the calculated weight loss with increase in adult emergence and storage period (Table 1). Weight loss due to *S. zeamais* in maize varied significantly over a period of six months that ranged from 0.71 to 9.24 per cent. Weight loss might be due to increasing humidity that caused fungus proliferation and dry matter loss. Christensen and Meronuck (1989) also confirmed

Table 1.Quantitative loss due to attack by *S. zeamais* in maize

Months	Number of adults emerged	Weight loss (per cent)	Damaged seeds (per cent)
1	49.50	0.71	13.94
	(7.09)	(4.75)	(21.83)
2	74.75	2.04	20.22
	(8.69)	(8.10)	(26.68)
3	100.25	5.20	27.02
	(10.04)	(13.16)	(31.21)
4	216.50	5.87	32.01
	(14.57)	(14.00)	(34.36)
5	244.25	7.41	40.46
	(15.54)	(15.78)	(39.41)
6	307.75	9.24	48.24
	(17.55)	(17.67)	(43.95)
SEm±	0.746	0.517	2.242
CD (P =0.05)	2.233	1.549	6.661

Figures in parentheses are angular values

Table 2. Qualitative loss due to attack by *S. zeamais* in maize.

Months Initial	Germination (per cent)	Per cent reduction in germination	Vigour index	Per cent reduction in vigour index
1	94.75	-	2537	-
	(76.76)			
2	89.50	5.55	2356	7.24
	(71.22)			
3	84.75	10.55	2036	20.04
	(67.05)			
4	75.25	20.57	1802	29.4
	(60.16)			
5	65.00	31.39	1508	41.16
	(53.79)			
6	58.00	38.72	1118	56.00
	(49.64)			
	55.00	41.94	1007	61.00
	(47.89)			
SEm±	1.509		86.972	
CD (P =0.05)	4.440		255.834	

Figures in parentheses are angular values

that the weight loss in corn could be due to the invasion of molds, being accentuated with the increase of humidity and the storage period and the number of insects inside the kernel.

Extent of damage

The extent of damage caused by *S. zeamais* was expressed in terms of percent damaged seed. The damaged seed due to *S. zeamais* in a period of six months ranged from 13.94 to 48.24 per cent (Table 1).The lowest per cent of damaged seeds was recorded in the first month (13.94 per cent) and progressively highest per cent of damaged seed was recorded in sixth month (48.24 per cent) Taylor (1977) reported that in case of *S. zeamais*, damage was done by both the adult and larva that fed on endosperm of seed which would have resulted in appearance of exit holes indicating the extent of damage.

Germination (Per cent)

A highly significant difference was observed in the germination of seeds over a period of six months. After one month, 89.50 per cent germination was recorded which was on par with the second month (84.75 per cent) followed by third month (75.25 per cent). Minimum seed viability was recorded by sixth month (55.00 per cent) followed by the fifth month (58.00 per cent) which was on par with the fourth month (65.00 per cent). The prescribed seed viability of 90.00 per cent for maize was not maintained beyond first month. The maize weevil, *S. zeamais* being an internal feeder where internal infestation might have resulted in a progressive reduction of germination with storage period. Yuya *et al*. (2009) reported death of the embryo due to infestation by *S. zeamais* in maize causing consequent loss in germination.

Vigour index

Initially at the beginning of experiment, vigour index was 2537. No significant reduction in seedling vigour was observed up to one month. However, it was significantly reduced by second month (2036) (20.04%) and further by third month. It was found to be 1508 (41.16%) by fourth month and by fifth and sixth months, infestation has resulted in significant reduction in vigour to 1118 and 1007 (56%), respectively. By sixth month, 61.00% vigour index was reduced. With increase in adult emergence, weight loss, damaged seed and storage period, there was a progressive reduction in vigour index along with germination. Such decrease in vigour may be attributed to the internal and external infestations which contributed to the reduction of physiological and physical quality of maize seeds.

The above results indicate losses in terms of weight, seed damage, germination and seedling vigour due to infestation by the maize weevil during storage thus causing serious losses to the poor farmers who store grains on farm for use as food and seed without any chemical protectants. Thus it necessiates the urgent need to formulate appropriate measures to control this pest during storage.

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