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SCREENING OF MAIZE VARIETIES AGAINST *SITOPHILUS ORYZAE* (LINN.)

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ABSTRACT

Of the seven maize varieties *viz.*, Makka-3, Pratap Makka-5, Mahi Kanchan, Mahi Dhawal, Navjot, PEHM-2 and PEHM-1 were screened for their susceptibility to *Sitophilus oryzae* (Linn.), none was resistant to *S. oryzae* infestation. The variety Pratap Early Makka-3 and Pratap Makka-5 were relatively less susceptible (55.61 to 60.00% oviposition; 225 to 270 adult emergence; 39.61 to 41.0 days to complete life cycle; 34.88 to 40.02% grain damage and 13.60 to 15.34 % weight loss). On the basis of these parameters, Mahi Kanchan, Mahi Dhawal and Navjot were moderately susceptible, while PHEM-2 and PHEM-1 were most susceptible.

Key words: *Sitophilus oryzae*, maize varieties, varietal susceptibility.

Stored maize is infested by a number of insect pests; among them *Sitophilus oryzae* (Linn) has been reported as an important pest causing considerable loss (Pathak and Jha, 2003). It is a cosmopolitan species; widely distributed in the tropics and sub-tropics and is known to prefer maize grains for oviposition (Khare and Agarwal, 1963). Limited work has been done on the promising varieties of maize, therefore, screening of some new varieties was done for their susceptibility to *S. oryzae* on the basis of ovipositional preference, number of adults emerged, developmental period (days), grain damage and weight loss.

MATERIALS AND METHODS

The experiment on varietal screening was conducted in the laboratory of Department of Entomology, Rajasthan College of Agriculture, Udaipur (Rajasthan) during 2007-08. The grains of seven promising varieties of maize namely Pratap Early Makka-3, Pratap Makka-5, Mahi Kanchan, Mahi Dhawal, Navajot, PEHM-2 and PEHM-1 were obtained from All India Coordinated Maize Improvement Project, RCA Udaipur and ARS Banswara. The grains of these varieties were sieved, cleaned, graded, washed with water and dried. Grains of all varieties were exposed to a temperature of 55°C for 4 hours in an oven to safeguard from hidden infestation if any. These sterilized seeds were kept at 30 ± 1°C temperature and 75 ± 5 per cent relative humidity for 24 hours before use. Grain samples of 100 g for each of the variety were taken in plastic container in which 10 pairs of newly emerged adults were released. The mouth of containers was covered with muslin cloth tightened with rubber band. The experiment was laid out in CRD with three replications. All the tests were conducted in B.O.D. incubator maintained at 30 ± 1°C temperature and 75 ± 5 per cent relative humidity. The newly emerged beetles were counted and removed regularly after emergence to check further breeding. The ovipositional preference in each variety and developmental period was also calculated accordingly. The damaged and healthy grains were counted separately after completion of the experiment and grain damage was calculated by adopting the following formula:

$$Grain\ damage\ (\%) = \frac{Number\ of\ damaged\ grains}{Total\ number\ of\ grain\ used} x\ 100$$

The grain samples were weighted with the help of single pan electric balance separately for each variety and the percent weight loss was calculated according to Adams and Schulten (1978):

$$Weight\ loss\ (\%) = \frac{(Wu \times Nd) - (Wd \times Nu)}{Mu \times (Nd + Nu)} \times 100$$

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Where,

Wu = Weight of undamaged grains

Nu = Number of undamaged grains

Nd = Number of damaged grains

Wd = Weight of damaged grains

RESULTS AND DISCUSSION

The data on duration for ovipositional preference, adult emergence, life cycle, grain damage and weight loss under laboratory condition are presented in Table 1. None of the variety was free from infestation of *S. oryzae*, however, there was wide variation of oviopsitional preference, adult emergence, developmental period, grain damage and weight loss. Mean oviposited grains varied from 55.61 to 88.01 per cent in different varieties. Minimum preference for oviposition (55.61%) was observed in Pratap Early Makka-3 followed by 60.00 per cent in Pratap Makka-5, but was statistically at par. Maximum preference with 88.01 per cent oviposited grains was observed on PEHM-1, followed by 85.61 per cent on PEHM-2 being statistically at par. PEHM-1 and PEHM-2 were significantly more preferred for oviposition compared to other tested varieties. Mahi Kanchan and Mahi Dhawal gave 70.09 and 72.41 per cent oviposited grains, respectively, but did not differ significantly. Similarly Mahi Dhawal was also statistically at par with Navjot.

Maximum number of adult emergence (450 adults) was recorded in variety PEHM-1 followed by 435 and 420 in PEHM-2 and Navjot, respectively, though were statistically at par. Mahi Kanchan and Mahi Dhawal ranked in the middle order of preference, where the average number of adults emerged was 380 and 405, respectively. Minimum numbers of adult weevils (225) emerged in Pratap Early Makka-3 followed by Pratap Makka-5 (270).

Mean duration of life cycle varied from 30.00 days to 41.00 days. The shortest developmental period (30.00 days) was recorded in variety PEHM-1 followed by 32.00 days in PEHM-2, but was statistically at par. Maximum duration of life cycle (41.00 days) was recorded in Pratap Early Makka-3 followed by 39.67 days in Pratap Makka-5. Singh *et al*. (1998) also noticed difference in developmental period, that ranged from 22.77 to 36.22 days.

Significant difference was observed among different maize varieties in terms of per cent damaged grains due to infestation of *S. oryzae*. The extent of damage ranged from 34.88 to 66.51 per cent in different varieties. All varieties were significantly different to each other for grain damage

Table 1. Screening of maize varieties to *S. oryzae*

S. No.	Varieties	Effect of different maize varieties on *S. oryzae*				
		Development			Infestation	
		Oviposited grain (%)	Number of adult emerged	Life-cycle (days)	Grain damage (%)	Weight loss (%)
1.	Pratap Early Makka-3	55.61	225	41.00	34.88	13.611
		(48.23)$^{++}$	(15.01)$^{++}$	(6.44)$^{+}$	(36.19)$^{++}$	(21.63)$^{++}$
2.	Pratap Makka-5	60.00	270	39.67	40.02	15.34
		(50.78)	(16.44)	(6.34)	(39.24)	(23.00)
3.	Mahi Kanchan	70.09	380	36.33	47.10	19.98
		(56.87)	(19.50)	(6.07)	(43.34)	(26.55)
4.	Mahi Dhawal	72.41	405	35.00	49.99	21.95
		(58.34)	(20.14)	(5.96)	(44.99)	(27.93)
5.	Navjot	78.04	420	34.00	51.97	25.45
		(62.13)	(20.50)	(5.87)	(46.13)	(30.30)
6.	PEHM-2	85.61	435	32.00	61.99	32.48
		(67.76)	(20.87)	(5.70)	(51.94)	(34.74)
7.	PEHM-1	88.01	450	30.00	66.51	35.33
		(69.77)	(21.22)	(5.52)	(54.64)	(36.46)
	S.Em. ±	1.29	0.25	0.08	0.45	0.69
	C.D. at 5%	3.92	0.75	0.25	1.38	2.10
	C.V. (%)	3.79	2.25	2.39	1.74	4.19

$^{+}$Data in parentheses are square root (X + 0.5) transformed values

$^{++}$Data in parentheses are angular transformed values

except to Mahi Dhawal and Navjot. Maximum grain damage (66.51%) was recorded in PEHM-1 followed by 61.99, 51.97, 49.99, 47.10, 40.02 and 34.88 in PEHM-2, Navjot, Mahi Dhawal, Mahi Kanchan, Pratap Makka-5 and Pratap Early Makka-3, respectively. Vinita *et al.* (2007) reported 2.0 to 24.8 per cent damage in seed of pearl millet of different varieties due to *S. oryzae* and noted that the variation may be due to host varieties. Chavan *et al.* (2008) recorded difference in susceptibility of maize genotypes to *S. oryzae*. CML-324, CML-228, CA-00106 were found least susceptible and Across 9745 and LM-5 highly susceptible to weevil on the basis of adult emergence, per cent infestation and weight of frass.

The average weight loss in tested varieties during the present investigation ranged from 13.61 to 35.33 per cent. Maximum weight loss (35.33 per cent) was recorded in PEHM-1 followed by 32.48 per cent in PEHM-2 but was statistically at par. Mahi Kanchan and Mahi Dhawal were statistically at par with 19.98 and 21.95 per cent weight loss, respectively. Weight loss (25.45 per cent) in Navjot was higher to Pratap Early Makka-3, Pratap Makka-5, Mahi Kanchan and Mahi Dhawal. Minimum weight loss (13.61%) was observed in Pratap Early Makka-3 but was at par with Pratap Makka-5 (15.34 per cent) and was categorized as least susceptible. It is apparent from the results that the order of preference of maize varieties for susceptibility was PEHM-1> PEHM-2> Navjot> Mahi Dhawal> Mahi Kanchan> Pratap Makka-5> Pratap Early Makka-3. Earlier, Tiwari *et al.* (1989) reported 14.52 to 48.37 per cent weight loss in different varieties of wheat after 150 days of storage due to infestation by *S. oryzae*. Dushyant *et al.* (2009) reported positive correlation between adult weevil populations of *S. oryzae* and per cent weight loss.

Dethe *et al.* (1981) and Singh *et al.* (1991) also reported that none of the varieties was found free from the attack of *S. oryzae*. Krishna and Lakshmi (2008) observed that seed hardness, total ash and silica contents of maize grains had negative and significant correlation to *S.oryzae* adult emergence, index of susceptibility, damaged grains and weight loss and it was positive and significant with developmental period of the rice weevil; whereas, the intergranular space showed adverse trend with the above parameters.

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