

Studies on preference of *Callosobruchus maculatus* Fabricius to some high yielding varieties of arhar (*Cajanus cajan* L.)

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Abstract. The oviposition response and development of *Callosobruchus maculatus* Fabricius were studied on 14 high yielding varieties of arhar. There was significant difference among the varieties in the amount of food consumed per grub. The average development period was not dependent on the amount of food consumed. The development of grub was also not better on the grain preferred by the beetle for oviposition. There was significant difference among the varieties in the loss of 100 seed weight. Average weight of female was more than the male developed on all varieties. On the basis of food consumed per grub and loss of 100 seed weight as a combined criterion, the varieties are grouped into least susceptible, intermediate in susceptibility and the most susceptible varieties.

Keywords. Varietal preference ; *Callosobruchus maculatus*.

1. Introduction

Storage of pulse seeds is a problem owing to the severe damage caused by the pulse beetle, *Callosobruchus maculatus* Fabricius. The damage is sometimes so serious that whole of the seed material is eaten and only thick seed coat with empty cavities are left behind. Gokhale (1973), Wadnerker *et al* (1978) and Dabi *et al* (1979) assessed the relative susceptibility of some varieties of different pulses to *C. maculatus*. Attempts have also been made to investigate the cause of differential response of different pulses on various life processes of this beetle (Girish *et al* 1974). But the available literature reveals that practically no attention has been paid towards the susceptibility of high yielding varieties of arhar under cultivation to *C. maculatus*. The present investigation was therefore undertaken.

2. Materials and methods

Fourteen varieties of arhar (*Cajanus cajan* L.) were obtained from the Chief Scientist, Dry Farming, Central Arid Zone Research Institute, Jodhpur. Healthy and uncontaminated seeds were sterilized and the moisture contents of seeds were maintained between 12.5 to 13.0%. 100 seeds of each variety were weighed and kept in plastic vial (5 × 4 × 3 cm). The experiment was replicated five times.

Four pairs (4 males + 4 females) of newly emerged adults from uniparental culture were introduced into each vial except the fifth replication, which was kept without beetle as control for each variety. After 10 days the beetles were removed and the number of eggs laid on each variety was counted. All the experiments were carried out in an incubator at a constant temperature of $28 \pm 2^\circ \text{C}$ and humidity 50–60% r.h.

Commencing from the 20th day of the experiment, the newly emerged beetles were counted daily till the emergence of last adult. After each observation the emerged beetles were removed to prevent further breeding. The weight of seeds and adults were recorded separately with a single pan electric balance (with 0.1 mg precision). The average development period and percentage emergence of adults was calculated. All the data were statistically analysed. The correlation coefficient (r) was calculated between the various life processes of the beetle and physical characters of seed to establish possible relationship between them.

3. Results and discussion

The results (table 1) reveal that all the varieties of arhar were utilized by the beetle for egg laying. The response of oviposition however varied significantly. Varieties 4-84, 4-64, BS. 1, K-28 and T-7 (with average of 238.25 to 273.25 eggs) showed preference for oviposition as compared to variety T-17 (with average of 170.00 eggs). There was no significant difference in the rest of the varieties where the average number of eggs laid varied from 199.50 to 229.75. The minimum number of eggs laid per seed was 1.70. The correlation coefficient (r) between the average number of eggs laid and the seed characters, viz., seed weight, seed volume and colour of seed was not significant (table 2). Further, the texture of seed cannot be taken as a criterion for the preference for oviposition as the texture was smooth in all the varieties tested.

The average food consumed per grub is a good criterion for the assessment of relative susceptibility of different varieties (Regupathy and Rathinaswamy 1970; Dabi *et al* 1979). There was significant difference among the varieties in the amount of food consumed per grub (table 1). Varieties HP (WP)-15, T-17, K-16, B.S. 1, T.T. 4 and 4-64 were least susceptible to *C. maculatus* (with 30.69 to 34.39 mg of food consumption per grub) than the other varieties. The correlation coefficient (r) between the amount of food consumed per grub and the seed characters, viz, seed weight, seed volume and colour of seed was not significant (table 2). Similar observations were reported in the experiment with *Callosobruchus chinensis* reared on different varieties of pigeonpea (Regupathy and Rathinaswamy 1970) and with *C. maculatus* reared on different varieties of cowpea (Dabi *et al* 1979). Apparently some factor other than seed characters governs the mechanism of resistance in pulse seed to the attack of pulse beetle.

The average development period was found to vary significantly which ranged from 27.82 to 34.71 days (table 1). Coefficient of correlation (r) between the amount of food consumed per grub and the average development period was not significant (table 2). The study thus reveals that the development period of the grub is not dependent on the amount of food consumed. Further, the development of grub was also not better on the grain which were preferred by the beetle for oviposition (table 1). Thus the preference for oviposition is not an indication

Table 1. Differential preference of the pulse beetle, *C. maculatus* to different varieties of arhar.

Variety	Number of eggs laid/100 seeds	Food consumed/grub (mg)	Loss of weight/100 seeds (g)	Average development period (days)	Percentage emergence of adult	Average weight of adult (mg)		Average weight of 100 seeds (g)	Number of seeds/10 ml volume
						Male	Female		
'HP (W.P.)-15'	199.50	30.69	2.765	34.71	40.30 (41.70)*	7.44	8.76	7.889	100
'T-17'	170.00	32.42	2.775	29.69	40.55 (40.71)	7.20	8.36	8.904	86
'K-16'	228.25	32.79	3.059	30.36	40.85 (39.72)	7.60	8.80	9.604	78
'B.S.1'	246.00	32.92	3.046	28.83	37.90 (37.98)	7.32	8.88	7.393	87
'T.T.4'	229.75	34.09	3.266	29.85	40.07 (39.69)	7.32	8.60	8.640	87
'4-64'	240.00	34.39	3.227	30.37	39.80 (39.08)	7.08	8.80	7.253	107
'K-28'	251.25	34.51	3.077	29.75	38.05 (38.08)	7.40	9.16	9.091	79
'T.T.2'	213.25	35.23	3.243	28.29	43.17 (41.07)	7.40	9.00	7.610	96
'K-23'	227.75	35.36	3.231	30.63	40.22 (39.35)	7.28	9.36	9.260	73
'4-84'	238.25	35.83	3.407	27.82	40.42 (39.45)	7.36	9.24	7.572	94
'T.T.6'	211.75	36.20	3.391	30.23	44.72 (41.95)	7.72	9.20	8.952	80
'T-7'	273.25	37.66	3.579	30.29	46.15 (42.35)	7.92	9.76	10.430	76
'P.S.41'	224.75	37.87	3.428	32.28	47.67 (43.67)	7.64	9.56	9.663	71
'Basant'	221.75	41.00	3.638	32.78	52.20 (46.26)	7.84	9.48	10.499	64
S.Em.	±16.97	±0.97	±0.126	±0.31	±1.18	±0.35	±0.33		
C.D. at 5%	48.52	2.79	0.366	0.89	3.37	1.02	0.96		
C.D. at 1%	64.92	3.73	0.490	1.19	4.51	1.75	1.26		

* Figures in parenthesis are angular transformed values.

Table 2. Coefficient of correlation (r) between physical characters of seed and life processes of the beetle.

	Average weight of 100 seeds	Average number of seeds/10 ml volume	Colour of seed	Average development period
Average number of eggs laid	0.137	-0.165	0.210	
Level of significance	NS	NS	NS	
Average food consumed/grub	0.588	-0.628	-0.125	0.168
Level of significance	NS	NS	NS	NS

NS = Not significant.

of suitability for development. These observations are in accordance with the findings of Girish *et al* (1974) and Singh *et al* (1977). The loss of 100 seed weight varied from 2.765 to 3.638 g. Varieties Basant, PS-41, T-7, T.T.6, T.T.-5, 4-84 showed significantly greater loss in seed weight as compared to HP (WP)-15, T.T.17, K-16, B.S.1 and K-28 at C.D. value of 0.05%. The percentage emergence of adults on varieties Basant and PS-41 was significantly more than of the other varieties. Average weight of female was more than the male emerged on all the varieties tested in the present investigation. Similar tendency was observed earlier by Howe and Currie (1964) and Gokhale (1973).

From the overall results on the basis of average food consumed per grub of emerged beetles and loss of 100 seed weight as a combined criterion, varieties HP (WP) -15, T-17, K-16 and B.S. 1 proved to be the least susceptible whereas T.T.6, T-7, PS-41 and Basant as the most susceptible varieties. The varieties T.T.4, 4-64, K-28, K-23, T.T.2 and 4-84 are intermediate in susceptibility and none of the varieties was found immune to the attack of *C. maculatus*.

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