Proc. Indian Acad. Sci. (Anim. Sci.), Vol. 93, No. 1, January 1984, pp. 25–28.

Screening of mothbean *Vigna aconitifolia* Jacq varieties against the pulse beetle *Callosobruchus chinensis* Linn.

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MS received 5 February 1983; revised 10 October 1983

Abstract. The oviposition response and development of *Callosobruchus chinensis* Linn was studied on twenty promising varieties of mothbean. Though the beetle oviposited on all varieties, the preference for oviposition was not related to the suitability of seeds for the development. The development of grub was also not dependent on the amount of food consumed. There was significant difference among the varieties in the amount of food consumed per grub and the loss of 100 seed weight. 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, moderately susceptible and highly susceptible varieties.

Keywords. *Vigna aconitifolia*; *Callosobruchus chinensis*; oviposition; mothbean

1. Introduction

Mothbean *Vigna aconitifolia* Jacq is one of the important kharif pulses commonly grown in the arid zone of Rajasthan. All pulses including the mothbeans are badly damaged by pulse beetles both in field and storage conditions. The damage is caused by the grubs which bore into the seeds and feed on the contents. The extent of damage and relative susceptibility of different pulses to the attack of bruchids *viz. Callosobruchus chinensis* Linn and *Callosobruchus maculatus* Fab. have been reported earlier (Ragupathy and Rathinaswamy 1970; Reddy and Singh 1972; Singh and Talluri 1972; Singh and Singh 1973; Wadnerkar *et al* 1978; Dabi *et al* 1978, 1979; Satya Vir 1981). However, practically no work has been done on the screening of mothbean varieties to the pulse beetles. The present investigation was undertaken to screen the most promising varieties of mothbean for their relative susceptibility to the pulse beetle, *Callosobruchus chinensis* Linn.

2. Material and methods

Twenty promising varieties of mothbean commonly grown in the Western part of Rajasthan were obtained and uncontaminated, healthy seeds were sterilized and the moisture contents of seeds maintained between 12·5 to 13 %. One hundred seeds of each variety were weighed and kept in plastic vials (5 × 4 × 3 cm). The experiments were replicated four times for each variety. Three pairs of newly emerged adults from uniparental culture were introduced into each vial except the fourth replication, which was kept without beetles 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 ± 2 °C and humidity of 50–60 % r.h.

The emergence of beetles was recorded daily for 45 days. After each observation the emerged beetles were removed to prevent further breeding. The damaged seeds were weighed after removing all dough and unhatched eggs. The food consumed per grub and loss of 100 seed weight was worked out after correcting the total seed loss with the weight loss in the control. The average development period and percentage emergence of adults were calculated. The correlation coefficient (r) was calculated between various life processes of the beetle and the physical characters of seed to establish possible relationship between them.

3. Results and discussion

The results (table 1) reveal that all the varieties of mothbean were utilized by the beetle for egg laying. The response of oviposition however varied significantly. Varieties G-I, IPCMO-909, IPCMO-884 and Jhalawar-1 (with average of 207·33 to 235·33 eggs) showed preference for oviposition as compared to variety PLMO-149 (with an average of 134 eggs). The remaining varieties showed non-significant difference and the average number of eggs laid varied from 150·33 to 198. The minimum number of eggs laid per seed was 1·34. The r value between the average number of eggs laid and the seed characters *viz* seed weight and seed volume was not significant (table 2). Since the texture of seed coat was smooth in all the varieties tested, it is not a criterion for the preference for oviposition.

The average food consumed per grub is a good criterion for the assessment of relative susceptibility of different varieties (Ragupathy and Rathinaswamy 1970; Dabi *et al* 1979). There was significant difference among the varieties in the amount of food consumed per grub (table 1). The varieties with 13.69 to 15.57 mg of food consumption per grub were grouped into least susceptible varieties whereas, those varieties that recorded 17·28 to 19·83 mg food consumption/grub were considered as moderately susceptible varieties. The criterion for highly susceptible varieties was with 20·39 to 22·86 mg of food consumption/grub. The r value between the amount of food consumed per grub and seed characters *viz* seed weight and seed volume was not significant (table 2). Similar observations were reported in experiments with *C. chinensis* reared on different varieties of pigeonpea (Ragupathy and Rathinaswamy 1970) and with *C. maculatus* reared on different varieties of cowpea (Dabi *et al* 1979; Satya Vir 1981). Apparently some factor other than physical seed characters governs the mechanism of resistance in mothbean to the attack of pulse beetle.

The average development period varied significantly and ranged from 24·83 to 27·87 days (table 1). The r value between the amount of food consumed per grub and the average development period was not significant (table 2). The study revealed that the development period of grub was not dependent on the amount of food consumed. Further, the development of grub was also not better on the grain which was preferred by the beetle for oviposition (table 1). Thus the preference for oviposition is not an indication of suitability for development. These observations agree with those of Girish *et al* 1974 and Singh *et al* 1977.

The loss of 100 seed weight varied from 1·093 to 1·951 g (table 1). Varieties IPCMO-884, JMM-259, IPCMO-937, Jhalawar-1, PLMO-169, G-1 and IPCMO-344 showed

Table 1. Performance of *Callosobruchus chinensis* Linn on mothbean varieties.

Variety	Eggs laid/ 3 females/ 100 seeds*	Food consumed/ grub (mg)	Loss of 100 seed weight* (g)	Average development period (days)	Percentage emergence of adults	Average weight of 100 seeds*	Number of seeds/10 ml volume*
T-3	168·66	13·69	1·093	25·01	49·40(44·66)**	2·280	263
PLMO-130	150·33	14·88	1·138	25·06	51·10(45·63)	1·256	244
PLMO-91	169·33	15·21	1·252	25·77	56·70(48·85)	2·428	250
PLMO-149	134·00	15·57	1·370	25·62	52·50(46·43)	2·227	208
IPCMO-926	198·00	17·28	1·505	26·11	62·20(52·06)	2·363	238
Sogat local	160·33	17·30	1·630	25·41	52·95(46·69)	2·620	294
Balaswar-12	168·00	17·36	1·526	27·33	50·08(45·05)	2·479	232
IPCMO-909	235·33	17·61	1·579	26·11	54·70(47·70)	2·450	256
PLMO-84-A	162·33	18·26	1·471	27·66	64·98(53·71)	2·514	263
MG 1	163·00	18·28	1·472	27·87	57·75(49·46)	2·494	240
IPCMO-880	171·33	18·45	1·600	25·57	57·72(49·44)	3·270	200
IPCMO-344	153·33	18·61	1·696	26·15	62·10(52·00)	2·368	250
G-I	207·33	19·21	1·707	25·06	66·98(54·92)	2·838	227
PLMO-169	165·33	19·28	1·758	26·24	67·80(55·43)	2·955	222
IPCMO-349	163·66	19·30	1·625	26·69	56·67(48·82)	2·584	227
IPCMO-856	186·33	19·83	1·622	26·88	59·25(50·33)	2·904	232
Jhalawar-1	216·66	20·39	1·709	24·83	67·17(55·04)	2·615	228
JMM-259	164·33	21·37	1·926	25·49	69·23(56·30)	2·513	218
IPCMO-884	216·00	22·21	1·951	27·23	75·95(60·63)	2·494	222
IPCMO-937	185·00	22·86	1·822	25·52	72·67(58·48)	2·677	208
SEm	±17·965	±0·670	±0·720	±0·596	(±1·622)		
CD at 5%	51·321	1·915	0·207	1·702	(4·633)		
CD at 1%	68·598	2·560	0·277	2·275	(6·193)		

* Average of three replications; ** 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	Average development period
Average number of eggs laid	0·196	0·048	−0·048
Level of significance	NS	NS	NS
Average food consumed/grub	0·160	0·474	0·203
Level of significance	NS	NS	NS

NS = Non-significant

significantly greater loss in seed weight as compared to T-3, PLMO-130, PLMO-91 and PLMO-149. Percentage emergence of beetles on varieties IPCMO-926, PLMO-84-A, IPCMO-344, G-1, PLMO-169 Jhalawar-1, JMM-259, IPCMO-884 and IPCMO-937 was significantly higher than the other varieties.

From the overall results, on the basis of average food consumed per grub of emerged beetles and the loss of 100 seed weight as a combined criterion, varieties T-3 PLMO-130, PLMO-91, PLMO-149 proved to be least susceptible whereas IPCMO-937, IPCMO-884, JMM-259, Jhalawar-1 were susceptible varieties. The remaining varieties were intermediate and none was found resistant to the attack of *C. chinensis*.

Acknowledgement

The author is grateful to the authorities of the Institute for facilities.

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