



VARIETAL SCREENING OF COWPEA AGAINST PULSE BEETLES, *CALLOSOBRUCHUS MACULATUS* (FAB.) AND *C. ANALIS* (FAB.)

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ABSTRACT

Different cow pea varieties viz., C-152, KBC-2, KBC-1, KM-5, IT-38956, TVX-944 and CP-17 were tested for their susceptibility to *Callosobruchus maculatus* and *C. analis* at Department of Entomology, Agricultural College, Shimoga. Among them, CP-17 was comparatively less preferred host with lesser oviposition (81.33 eggs /100 g seeds), prolonged developmental period (34.67 days), least adult survival (84.67 %) and weight loss of grains (0.96%) followed by IT-38956 to *C. maculatus*. Similar trend in case of *C. analis* was observed with lesser oviposition (65.33 eggs / 100g seeds), prolonged developmental period (36.83 days), least adult survival (59.33%) and grain weight loss (0.90%) on CP-17 when compared with local variety. C-152 and local variety was recorded most preferred host for both the species.

KEYWORDS: African nightshade, fortified compost manure, *Solanum villosum*, *Solanum americanum* and *Solanum scabrum*.

INTRODUCTION

Cowpea is an important source of plant protein in many developing countries of the tropics and sub-tropics. In Nigeria most of the estimated 1.7 million tones of cowpea grain produced annually (Singh *et al.*, 1995) is normally stored threshed in sacks and in mud granaries by resource-poor farmers. The cowpea seed beetles *Callosobruchus* spp. (F.) (Coleoptera: Bruchidae) are the most important pest attacking cowpea in storage (Jackai and Daoust, 1986). The bruchids attacks cowpea both in the field and store. Females cement their eggs on the seed surface. Eggs hatch after 3–5 days and larvae bore through the seed coat into the underlying cotyledons. Larval development and pupation takes place in the seed and adults enclose and emerge from the seed. On emergence, adults are sexually matured and mate immediately, eggs being laid soon after mating. Varietal preference of cowpea by bruchids varies with seed characteristics like seed colour, texture, size, hardness and biochemistry. Keeping in view, the present attempt was made on varietal screening of cowpea against *Callosobruchus maculatus* and *C. analis*

MATERIALS AND METHODS

The cowpea accessions (C-152, KBC-2, KBC-1, KM-5, IT-38956, TVX-944 and CP-17) collected from pulse scheme, ZARS, GKVK was evaluated based on their preference to pulse beetle infestation. The adult beetles of *C. maculatus* and *C. analis* were studied separately. One hundred gram of each cowpea accessions was evaluated for the host preference to pulse beetle in three replications. Observations were based on ovipositional preference, mean developmental period, per cent adult survival and per cent weight loss of grains on cowpea varieties.

Two pair of freshly emerged adult beetles were drawn from stock culture and released in each of the glass jars (250 g capacity). Observations were recorded on

fecundity, mean developmental period, per cent adult survival and per cent weight loss.

Per cent grain weight loss was calculated by using formula, as detailed below.

$$\text{Per cent weight loss of grains} = \frac{\text{UND} - \text{DNU}}{\text{U} (\text{ND} + \text{NU})} \times 100$$

ND = Number of damaged grains

D = Weight of damaged grains

NU = Number of undamaged grains

U = Weight of undamaged grains

RESULTS AND DISCUSSION

a) *Callosobruchus maculatus*

Ovipositional preference

All the test varieties of cowpea were accepted by the *C. maculatus* for egg laying with restricted time. The mean number of eggs laid on the test cowpea varieties ranged from 81.33 to 132.67 eggs/ 100g seeds (Table 1). The lowest oviposition was noticed in CP-17 (81.33 eggs/100g seeds), IT-38456 (103.33 eggs/100 g seeds) and KBC-1 (106.00/100 g seeds). Whereas maximum oviposition was recorded in local variety (132.67 eggs/100 g seeds) followed by C-152 (125.67 eggs/100 g seeds).

Developmental period

The mean developmental period of the test cowpea varieties ranged from 26.00 to 34.67 days (Table 1). Significantly the least mean developmental period was noticed in case of KBC- 1 (26.00 days) followed by local variety (26.67 days), C-152 (27.67 days) and TVX-44 (28.33 days). Significantly maximum developmental period was noticed in case of CP-17 (34.67 days) followed by IT- 38956 (31.00 days), KM -5 (30.67 days) and KBC - 2 (28.67 days).

Adult survival

Varietal screening of cowpea against pulse beetles

The per cent adult survival ranged from 83.67 to 91.67 per cent (Table 1). The best varieties in recording significantly the least per cent adult survival was IT-38956 (83.67%) being on par with CP-17(84.64%) and KM-5 (85.67%). Significantly the maximum per cent adult survival was recorded in local varieties (91.67%) which were on par with KBC-1 (91.33%), C-152 (90.67%) and TVX-44 (90.00%).

Weight loss of grains

The weight loss caused due to feeding of grubs ranged from 0.96 to 4.16 per cent (Table 1). The weight loss was significantly less in CP-17 (0.96%) and was on par with IT-38956(1.17%). Local variety which permitted highest number of larva to feed and develop, sustained significantly higher weight loss of grains 4.16 per cent followed by C-152 (3.96%) ,TVX-44(3.57%), KBC-2 (2.70%) and KM-5 (2.64%).

TABLE 1. Varietal screening of cowpea against pulse beetle, *Callosobruchus maculatus*

Varieties	*No. of eggs laid per 100 g seeds	*Developmental period (Days)	**Adult survival (%)	**Weight loss of grains (%)
C-152	125.67 (11.23) ^b	27.67 (5.31) ^{cde}	90.67 (72.20) ^{ab}	3.96 (11.47) ^{ab}
KBC-2	114.33 (10.72) ^c	28.67 (5.40) ^c	88.33 (70.03) ^{bc}	2.70 (9.43) ^d
KBC-1	106.00 (10.32) ^d	26.00 (5.15) ^e	91.33 (72.87) ^a	3.37 (10.57) ^c
KM-5	113.33 (10.67) ^c	30.67 (5.58) ^b	85.67 (67.74) ^{cd}	2.64 (9.35) ^d
IT -38956	103.33 (10.19) ^d	31.00 (5.61) ^b	83.67 (66.15) ^d	1.17 (6.19) ^e
CP-17	81.33 (9.05) ^e	34.67 (5.93) ^a	84.67 (66.96) ^d	0.96 (5.60) ^e
TVX-44	116.67 (10.82) ^c	28.33 (5.37) ^{cd}	90.00 (71.55) ^{ab}	3.57 (10.89) ^{bc}
Local variety	132.67 (11.54) ^a	26.67 (5.21) ^{de}	91.67 (73.23) ^a	4.16 (11.76) ^a
S.Em. ±	0.10	0.05	0.79	0.25
CD (p=0.05)	0.31	0.16	2.38	0.74
CV (%)	1.68	1.69	1.94	4.53

* Figures in the parenthesis are square root transformed values

** Figures in the parenthesis are angular transformed values

Means in the same column showing similar alphabets are on par.

b) *Callosobruchus analis*

Ovipositional preference

The data on oviposition (Table 2) reveals significant effect on different cowpea varieties for egg laying by *C.analis*. The mean number of eggs laid on the test cowpea varieties ranged from 65.33 eggs to 109.33 eggs/ 100g seeds. Significantly less oviposition was noticed in case of CP-17 (65.33eggs/100g seeds) and IT-38956 (79.33 eggs/ 100g seeds). The local variety recorded highest oviposition of 109.33 eggs/ 100 g seeds followed by C-152 (104.00 eggs/ 100 g seeds), TVX-44 (100.33 eggs/ 100 g seeds) and KBC-1(99.33 eggs/ 100 g seeds).

Developmental period

The mean developmental period of the test cowpea varieties ranged from 27.33 to 36.83 days (Table 2). Significantly least mean developmental period was noticed in case of local variety (27.33 days) followed by KBC-1(28.50), KBC-2 (29.17 days) and TVX-44 (29.67 days). Maximum developmental period was noticed in case of CP-17 (36.83 days) followed by IT- 38956 (35.67 days), KM-5 (33.83 days) and C-152 (32.67 days).

Adult survival

The data on the per cent survival of adults (Table 2) reveals that significantly less survival was noticed in CP-17 (59.33%), IT-38956 (70.00%) and KM-5 (79.63%). Significantly the highest survival of adults was noticed in

local varieties of cowpea (90.33%) followed by TVX-44 (85.00 %) and C-152 (83.33%).

Weight loss of grains

Weight loss due to feeding of grains ranged from 0.45 to 3.19 per cent (Table 2). The weight loss was significantly less in case of IT-38956 (0.45%) followed by CP-17 (0.94%). Local variety recorded 3.19 per cent weight loss of grains, being on par with C-152 (2.93%)

The local variety and C-152 has smooth skinned and are bigger in size than any other varieties which might have caused the beetles to prefer for egg laying which lead to food consumption and more weight loss.

CP-17, IT-38956, KBC-2 and KBC-1 are less susceptible to pulse beetle compared to other varieties of cowpea. The present finding are in line with the reports of Satyavir (1983) who screened twenty four promising varieties of cowpea, *Vigna unguiculata* (Linn.) for their relative resistance to *C. maculatus* (Fab.) Among these genotypes V.C. 5, 25/8/2/2. R.S. 9, C.G. 28 and Sel-1476 proved to be relatively resistant. whereas Copusa-1, V-7, Copusa-2, 26/4/1, Culture-2, 5262 and P.T.B.1 were found to be most susceptible varieties. Varieties J.C.10, K-39, Culture-1, C.G.11, V-37, C-G.69, V-16, Copusa-3, PLS-382, H.G.22, C-152, C.G.5 showed as intermediate behavior and none was found immune to attack of *C. maculatus*. More or less

similar trend was observed even for *C. analis* in all the varieties which were infested by *C. analis*. The local variety and C-152 which was more preferred for egg laying, developmental period, per cent adult survival and per cent weight loss. This is because of physical properties of grains like viz., bigger size, smooth skin and seed coat

surface. Sibi (2003) reported varietal resistance of cowpea was studied for relative resistance to pulse beetle. Among these varieties KBC-1 and KBC-2 showed intermediate behavior on oviposition, per cent weight loss and per cent seed damage.

TABLE 2. Varietal screening of cowpea against pulse beetle, *Callosobruchus analis*

Varieties	*No. of eggs laid per 100 g seeds	*Developmental period (Days)	**Adult survival (%)	**Weight loss of grains (%)
C-152	104.00 (10.22) ^{ab}	32.67 (5.76) ^c	83.33 (65.89) ^{bc}	2.93 (9.85) ^{ab}
KBC-2	94.67 (9.75) ^{cd}	29.17 (5.27) ^e	81.87 (64.78) ^{bc}	2.50 (9.09) ^{cd}
KBC-1	99.33 (9.99) ^{bc}	28.50 (5.38) ^{de}	82.33 (65.14) ^{bc}	2.33 (8.78) ^d
KM-5	91.33 (9.58) ^d	33.83 (5.86) ^{bc}	79.63 (63.18) ^c	2.62 (9.30) ^{bcd}
IT -38956	79.33 (8.93) ^e	35.67 (6.01) ^{ab}	70.00 (56.81) ^d	0.45 (3.79) ^f
CP-17	65.33 (8.11) ^f	36.83 (6.11) ^a	59.33 (50.37) ^e	0.90 (5.44) ^e
TVX-44	100.33 (10.04) ^{bc}	29.67 (5.49) ^d	85.00 (67.19) ^b	2.73 (9.51) ^{bc}
Local variety	109.33 (10.48) ^a	27.33 (5.45) ^{de}	90.33 (71.86) ^a	3.19 (10.29) ^a
S.Em. ±	0.09	0.06	0.97	0.19
CD (p=0.05)	0.28	0.17	2.94	0.56
CV (%)	1.65	1.76	2.67	3.88

* Figures in the parenthesis are square root transformed values

** Figures in the parenthesis are angular transformed values

Means in the same column showing similar alphabets are on par.

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