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INHERITANCE OF POD WEIGHT IN COWPEA (*VIGNA UNGUICULATA* (L.) WALP.)

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ABSTRACT

The inheritance of pod weight in cowpea was studied using three intraspecific cultigroups in fields planting of the parents, F_1s, F_2s and backcrosses to both parents of three crosses: Assam Local 1 x Birsa Sweta (*biflora* x *sesquipedalis*), Assam Local 1 x Yard Long Bean (*biflora* x *sesquipedalis*) and Pusa dofasli x Check Barbati (*unguiculata* x *sesquipedalis*). Pod weight was inherited quantitatively. *Biflora* x *sesquipedalis* crosses showed that light pod partially dominant over heavy pod, while in the *unguiculata* x *sesquipedalis* cross mean pod weight in F_1 and F_2 was almost equal to the midparental value. Gene action was predominantly additive, although dominance, additive x additive, additive x dominance and dominance x dominance gene actions were significant in the *biflora* x *sesquipedalis* crosses.

Key words: Cowpea, *Vigna* spp., pod weight, inheritance.

Pod weight is an important yield attributing character in vegetable cowpea [1], but inheritance of this trait has not been studied. In vegetable cowpea breeding, the combination of erect growth habit, early maturity and synchronous pod bearing in the genotypes from the *biflora* or *unguiculata* varietal groups with the pod length and tenderness of the *sesquipedalis* group has been proposed so as to develop relatively short, nonviny varieties with synchronous bearing and medium long succulent pods [1–3]. The relative importance of different genetic components of pod weight has been determined in three cowpea crosses involving varieties from the three cultigroups, *unguiculata, biflora* and *sesquipedalis.*

MATERIALS AND METHODS

Five cowpea genotypes belonging to three cultigroups (intraspecific) as defined by Marechal et al. [4], viz. Birsa Sweta, check Barbati and Yard Long Bean of *sesquipedalis*, Pusa

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Dofasli of *unguiculata* and Assam Local 1 of *biflora* [5] were used to make three crosses: Assam Local 1 x Birsa Sweta, Assam Local 1 x Yard Long Bean, and Pusa dofasli x Check Barbati. The parents, F_1s, F_2s and backcross (BC_1 and BC_2) populations were grown at Horticulture garden, Bidhan Chandra Krishi Viswavidyalaya, North Bengal Campus, Coochbehar from December to April in randomized block design with two replications. The plot sizes were one 3 m long row for parents, F_1 and backcross generations; and two rows for F_2 populations. The spacing was 60 cm between and 30 cm within rows. All the plants in the six populations were used to record observations on pod weight. Average weight of single pod on each plant was determined by recording weight of ten green pods of 15-day maturity.

Generation means were obtained from the average of plant means. The variances and standard error of means for each population were obtained from sum of squares within the plant. The Mather's scaling test [6] was used to test the significance of additive and dominance gene effects, and the generation means were partitioned following the six-parameter model of Jinks and Jones [7].

RESULTS AND DISCUSSION

The *biflora* x *sesquipedalis* crosses (Assam Local 1 x Birsa Sweta and Assam Local 1 x Yard long Bean) presented more or less similar picture, while the *unguiculata* x *sesquipedalis* cross (Pusa Dofasli x Check Barbati) gave a different pattern of inheritance of pod weight. The F_1 mean in the *biflora* x *sesquipedalis* crosses was less than the midparental value and F_2 mean was between the pod weight in F_1 and the light podded parent (Assam Local 1). The mean pod weight in the backcross to the heavy podded parent (BC_2) was intermediate between the mean value of F_1 and their heavy podded recurrent parent (Birsa Sweta and Yard Long Bean) but closer to the F_1 value than in the backcross (BC_1) to the light podded parent (Assam Local 1), which was intermediate between the mean pod weight of the F_1 and the light podded parent (Table 1). These data suggest partial dominance of light pod over heavy pod. Almost similar inheritance pattern was reported for pod length and girth, where short pod was shown to be partially dominant over long pod [8, 9] and narrow pod over broad pod [8].

This picture however was very different in the *unguiculata* x *sesquipedalis* cross. The mean pod weight of the F_1 and F_2 in this cross was almost equal to the midparental value (Table 1) suggesting additive gene action for this trait. Earlier studied with cross between genotypes of these two cultigroups also reported complementary additive gene action for pod length [10]. However, there is little chance of getting transgressive segregation for heavy pods in the F_2 population of *biflora* x *sesquipedalis* crosses.

Table 1. Mean pod weight (g) in six populations of three cowpea crosses

Population	Assam Local 1 x Birsa Sweta	Population	Assam Local 1 x Yard Long Bean	Population	Pusa Dofasli x Check Barbati
Assam Local 1	2.46 ± 0.01	Assam Local 1	2.46 ± 0.01	Pusa Dofasli	3.52 ± 0.02
Birsa Sweta	13.97 ± 0.07	Yard Long Bean	15.25 ± 0.07	Check Barbati	7.28 ± 0.02
Assam Local 1 x Birsa Sweta (F_1)	5.07 ± 0.03	Assam Local 1 x Yard Long Bean F_1	6.45 ± 0.07	Pusa Dofasli x Check Barbati F_1	5.18 ± 0.02
F_2	5.67 ± 0.23	F_2	6.32 ± 0.22	F_2	5.35 ± 0.14
F_1 x Assam Local 1 (BC_1)	4.44 ± 0.10	F_1 x Assam Local 1 (BC_1)	5.04 ± 0.11	F_1 x Pusa Dofasli (BC_1)	4.35 ± 0.08
F_1 x Birsa Sweta (BC_2)	9.76 ± 0.04	F_1 x Yard Long Bean (BC_2)	10.35 ± 0.07	F_1 x Check Barbati (BC_2)	6.17 ± 0.05

The Mather's scaling test [6] was significantly different from zero in the *biflora* x *sesquipedalis* crosses, suggesting significant role of epistasis in the inheritance of pod weight. Gene effects estimated from generation means indicated that all the genetic parameters, viz. additive (d), dominance (h), additive x additive (i), additive x dominance (j), and dominance x dominance(l) were significantly different from zero. Interallelic interactions were not conspicuous in the *unguiculata* x *sesquipedalis* cross as the scaling test was not significant. Only additive gene action (d) was significant (Table 2). Thus, one may arrive at different con- clusions about inheritance of pod weight from the *biflora* x *sesquipedalis* and *unguiculata* x *sesquipedalis* crosses. However, the importance of additive gene action in the control of pod weight in cowpea seems to be a common feature in all the crosses. These results support the earlier observations that the expression of pod characters in cowpea was largely controlled by additive gene action [11, 12].

Table 2. Gene effects for pod weight estimated from generation means of three cowpea crosses

Estimates of gene effect	Assam Local 1 x Birsa Sweta	Assam Local 1 x Yard Long Bean	Pusa Dofasli x Check Barbati
m	2.48 ± 0.95*	3.37 ± 0.92*	5.77 ± 0.60*
d	- 5.75 ± 0.04*	- 6.40 ± 0.04*	- 1 .88 ± 0.02*
h	10.16 ± 1.96*	8.40 ± 1.94*	- 1.08 ± 1.28
i	5.74 ± 0.95*	5.49 ± 0.92*	- 0.37 ± 0.60
j	0.88 ± 0.22*	2.17 ± 0.27*	0.13 ± 0.21
l	- 7.56 ± 1.02*	- 5.65 ± 1.04*	0.50 ± 0.69

*Significant at P = 0.05 level.

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