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COMBINING ABILITY FOR POD YIELD AND SEED PROTEIN IN COWPEA (*VIGNA UNGUICULATA* (L.) WALP.)

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In cowpea, earlier studies revealed the predominance of both additive and nonadditive gene actions for yield [1, 2] and of nonadditive gene action for seed protein [3].

MATERIALS AND METHODS

Five genotypes of cowpea belonging to three cultigroups, viz. Birsa Sweta and Check Barbati of *sesquipedalis*, Pusa Dofasli of *unguiculata*, and Assam Local 1 and Dumca Local 1 of *biflora* groups were diallel-mated excluding reciprocals. The 10 F_1 and 5 parents were grown in randomized block design with two replications in single-row plots of 3 m length, row-to-row and plant-to-plant distance being 60 and 30 cm, respectively. Tender pods were harvested from all the plants to record pod yield. Seeds of 50 dry pods per replication were used to estimate protein as per Lowry et al. [4]. Combining ability analysis was done following Model I, Method II of Griffing [5].

RESULTS AND DISCUSSION

The variances due to both general (gca) and specific combining ability (sca) were significant for pod yield/plant, whereas only gca variance was significant for seed protein. Estimates of genetic variance suggested both additive and nonadditive gene effects for pod yield/plant, additive gene effect being predominant, which agrees to the earlier reports [1, 2]. On the other hand, predominance of additive gene effects for seed protein did not support the earlier report of Mak and Yap [3]. Narrow sense heritability estimate was moderate (55.1%) for pod yield/plant and appreciably high (77.0%) for seed protein.

Based on gca effects, the best combiner for pod yield/plant was Birsa Sweta of *sesquipedalis* and for seed protein Assam Local 1 of *biflora* (Table 1). The best specific cross

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combination for pod yield, Birsa Sweta x Dumca Local 1 (*sesquipedalis* x *biflora*), was also the highest yielder (Table 2). The estimates of sca effects for seed protein were very low, however, the best specific combination was the cross Assam Local 1 x Pusa Dofasli (*biflora* x *unguiculata*). In fact, good combiners for pod yield/plant were poor combiner for seed protein (Table 2), which is possibly due to marked negative correlation between pod yield and seed protein (r = - 0.77). Such negative associations between yield and seed protein in cowpea have also been reported earlier [6, 7]. This situation imposes restrictions on the enhancement of seed protein without concomitant loss in pod yield, therefore necessitates some compromise in the breeding strategy. It appears that there is limited scope for utilization of nonadditive variance to develop successful high-protein hybrids in cowpea. Additive gene action needs to be exploited to develop high yielding varieties with appreciable level of seed protein content.

Table 1. Mean pod yield/plant and seed protein content of the parent and their gca effects

Parent	Pod yield/plant		Protein content	
	g	gca	%	gca
Assam Local 1	54.0	- 58.7**	25.2	0.9**
Pusa Dofasli	107.6	- 10.7**	23.9	0.0
Check Barbati	130.0	- 9.8**	24.1	0.0
Birsa Sweta	293.6	78.1**	22.7	- 0.6**
Dumca Local 1	69.9	1.1	23.7	- 0.3**

**Significant at 1% level.

Table 2. Mean pod yield per plant and seed protein content in the F1s of cowpea crosses and their sca effects

Cross	Pod yield/plant		Protein content	
	g	sca	%	sca
Assam Local 1 x Pusa Dofasli	118.6	10.4**	25.3	0.4**
Assam Local 1 x Check Barbati	129.7	20.6**	25.1	0.1
Assam Local 1 x Birsa Sweta	167.3	- 29.7**	24.6	0.3**
Assam Local 1 x Dumca Local 1	131.0	11.0**	24.8	0.2
Pusa Dofasli x Check Barbati	174.4	17.3**	23.9	- 0.2
Pusa Dofasli x Birsa Sweta	229.4	- 15.6**	23.5	0.1
Pusa Dofasli x Dumca Local 1	252.9	84.9**	23.4	- 0.3*
Check Barbati x Birsa Sweta	255.9	10.0**	23.6	0.1
Check Barbati x Dumca Local 1	177.0	8.1*	23.7	- 0.1
Birsa Sweta x Dumca Local	372.7	115.8**	22.9	- 0.3*

*,**Significant at 5% and 1% levels, respectively.

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