Rich protein content was observed in one mutant in Himso 1563 (37.73 percent) at 30kR gamma ray treatment and one mutant from TS 82 (39.49 percent) at 5mM EMS treatment where as in control the protein content was 36.62 percent for Himso 1563 and 36.55 percent for TS 82. Sonali Sengupta and Animesh Datta (2004) also did this work in sesamum and Vanniarajan and Vijendra Das (1996) in blackgram.

Less fibre content was also observed in two mutants, one from Himso 1563 (7.27 percent) at 25mM EMS treatment and another in TS 82 (10.55 percent) at 20mM EMS treatment.

In this study negative correlation was observed between yield parameters and protein and fibre contents. In vegetable soybean less fibre content is one of the desirable characters. Two less fibre content mutants and two protein rich mutants also observed. This work was also done by Alt *et al.* (2002) and Hajduch (2000) in soybean. These four mutants could be further used as parents in breeding programme.

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Research Notes

Hetreosis and inbreeding depression for yield and yield attributes in urdbean

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The scope for exploitation of hybrid vigour will depend on the direction and magnitude of heterosis, biological feasibilities and the type of gene actions involved. Although the advantages of hybrid vigour can not be exploited commercially in highly self pollinated crops like black gram, it can be used to isolate a higher frequency of productive derivatives in their later generations. Inbreeding is the basic mechanism for providing the base materials for selection. The information regarding nature and magnitude of inbreeding depression is helpful in determining the effectiveness of selection. Therefore, the

Table. 1 Mean Performance of Nine Characters for Different Generations in Urdbean

S. No.	Crosses		Days to 50% flowering	Plant height	Branches per plant	Clusters per plant	Pods per plant	Pod length	Seeds per pod	100 seed weight	Seed yield per plant
1.	2KU53XLC216	P_1	33.40	27.33	2.33	8.93	23.73	4.64	4.73	4.78	5.20
		P_2	35.80	23.40	3.07	9.20	34.87	4.85	5.87	4.62	8.34
		F_1	31.80	25.07	2.87	10.67	39.20	4.89	6.00	4.87	10.39
		F_2	33.55	27.18	2.82	11.89	40.07	4.88	5.89	4.82	10.05
2.	99V48XLC216	P_1	36.60	28.20	2.73	10.07	30.53	4.69	6.47	4.27	7.37
		P_2	35.80	22.40	3.20	9.40	36.27	4.78	6.20	4.58	8.79
		F_1	38.60	28.60	3.13	10.93	40.07	4.99	6.33	4.93	10.68
		F_2	37.53	28.88	2.86	10.83	37.85	4.91	6.29	4.94	9.95
3.	LC216X2KU53	P_1	35.13	23.00	2.93	9.80	36.20	4.87	6.40	4.67	8.71
		P_2	32.40	24.80	2.40	8.93	23.53	4.79	5.73	4.86	5.65
		F_1	32.73	23.20	2.80	11.40	39.60	4.84	6.27	4.81	10.19
		F_2	33.09	24.77	2.81	10.80	37.18	4.80	6.01	4.82	9.46
4.	ADT5X2KU53	P_1	31.40	26.07	2.87	8.27	26.67	4.80	5.40	4.61	5.73
		P_2	32.40	24.80	2.40	8.93	23.53	4.79	5.73	4.86	5.65
		F_1	35.20	30.07	3.07	10.07	37.20	5.11	6.00	5.11	9.51
		F_2	34.69	27.87	2.90	10.86	35.54	5.26	6.18	5.19	9.49
5.	ADT5XLC216	P_1	31.40	26.07	2.87	8.27	26.67	4.81	5.40	4.61	5.73
		P_2	35.13	23.00	2.94	9.67	36.20	4.87	6.40	4.67	8.71
		F_1	34.47	29.00	3.20	12.47	43.47	5.06	6.07	4.95	11.51
		F_2	34.13	28.59	2.99	12.32	41.78	5.05	6.10	4.82	11.27

present investigation was made to study the heterosis and inbreading depression in blackgarm.

Five intervarietal crosses were effected by using four parental lines *viz.,* 2KU 53, LC 216, 99V48 and ADT5. The parents, F_1 and F_2 were raised in randomized block design with three replications during January 2006. The row to row and plant to plant distances were 30 and 15cm respectively. Observations on various metric traits listed in Table 1 and 2 were recorded on randomly selected ten and twenty competitive plants from non-segregating and segregating generations respectively. Heterosis over mid and better parents in F_1 and inbreeding depression in F_2 were calculated by the formula suggested by Haldane (1948).

The mean performance of different characters for parents, F_1 and F_2 are given in Table 1. Among the parents, LC 216 yield more seeds per plant. The F_1 and F_2 generations of the cross ADT 5 X LC 216 showed the highest seed yield per plant. Mean seed yield of all the hybrids were higher to their respective parents indicating the presence of substantial heterosis for seed yield per plant.

The percentage of heterosis in F_1 over mid and better parents and inbreeding depression in F_2 over F_1 are presented in Table2. The hybrid combinations which showed higher estimates of heterosis in general, also exhibited higher inbreeding depression (Shinde and Deshmukh, 1990 and Sawale *et al* ., 2003). In most of the crosses significant positive as well as negative heterosis over mid and better parents were observed for all the characters. Out of five hybrid combinations, two crosses exhibited significant negative heterosis over better parent for days to 50 per cent flowering and plant height. All the crosses exhibited significant positive heterobeltiosis for number of clusters per plant, number of pods per plant and seed yield per plant; three crosses for test weight, two crosses for number of branches per plant and one cross for pod length and number of seeds per pod. The study of heterotic expression of all the five crosses over seed yield per plant indicated that there is a direct dependence of heterosis with number of clusters and pods per plant. The variation in heterotic effects were displayed for seed yield per plant (16.99 to 67.13 per cent), clusters per plant (8.54 to 39.01 per cent) and pods per plant (9.39 to 48.20 per cent) with maximum heterosis over mid parent for the same characters. Similar result was also reported by Joseph and Santhoshkumar (2000).

The character wise result on inbreeding depression has been presented in Table 2. For the cross 2KU 53 X LC 216, positive significant in breeding depression was observed for days to 50 per cent flowering, plant height and clusters per plant, whereas, negative significant in breeding depression was observed for number of branches, seeds per pod and grain yield per plant. In the cross 99 V 48 X LC 216 only negative significant inbreeding depression was observed for days to 50 per cent flowering, number of branches, number of pods and seed yield. The inbreeding depression was significant positive for plant height and negatively significant for number of clusters, number of pods, number of seeds and seed yield in the cross LC 216x 2KU 53 the cross ADT 5 X 2KU 53 exhibited positive significant inbreeding depressions for three characters and negative significant for two characters. The cross ADT 5 X LC 216 showed only negative significant inbreeding depressions for number of branches, test weight and seed yield per plant. Inbreeding depression was observed in

Table 2. Heterosis per cent over mid parent (RH), better parent (HB) and inbreeding depression (ID) for nine

S. No.	Crosses		Days to 50% flowering	Plant height	Branches per plant	Clusters per plant	Pods per plant	Pod length	Seeds per pod	100 seed weight	Seed yield per plant
1.	2KU53XLC 16	RH	- 8.09 **	-1.14	6.29 **	17.77 **	33.78 **	3.16	13.20**	3.61	53.47**
		HB	-11.43**	- 8.27**	-6.51**	15.97 **	12.41**	0.82	2.21	1.88	24.58**
		ID	5.50 **	8.42 **	- 1.74 **	11.43**	2.21	-0.20	-1.83**	-1.02	- 3.27**
2.	99V48XLC216	RH	6.63 **	13.04 **	5.74	12.33 **	19.97**	5.49**	-0.15	11.53**	32.17**
		HB	5.46	1.42	-2.18	8.54 **	10.47**	4.39	-2.16	7.64**	21.50**
		ID	- 2.77 **	0.98	- 8.62 **	-0.91	- 5.54 **	- 1.60	-0.63	0.20	-6.83**
3.	LC216X2KU53	RH	-3.05	-2.93	5.23	21.79**	32.61 **	-1.62	3.46	1.05	41.92**
		HB	- 6.83 **	- 6.45**	-4.43	16.32 **	9.39**	-0.61	-2.03	- 1.02	16.99**
		ID	1.10	6.77 **	0.35	- 5.26**	-6.11**	-0.82	-4.14**	0.20	-7.16**
4.	ADT5 X 2KU 53	RH	10.34 **	18.19**	16.73**	17.09**	48.20**	6.68 **	7.91**	8.03**	67.13**
		HB	8.64 **	15.34 **	6.96**	12.76**	39.48 **	6.45**	4.71**	5.14**	65.96**
		ID	-1.45	-7.31**	-5.53**	7.84**	-4.46	2.93**	3.00**	1.56	-0.21
5.	ADT5XLC216	RH	3.64	18.22**	10.34 **	39.01**	38.30**	4.54	2.88	6.68**	59.41**
		HB	-1.88	11.23**	8.84 **	28.95**	20.06**	3.90	-5.15**	7.49**	32.14**
		ID	-0.98	-1.41	-6.56**	-1.20	-3.97	-0.19	0.49	-2.62**	-2.08**

** Significant at 1 per cent

F_2 generation for all the characters, its extent varied from character to character. Two hybrids namely 2KU 53 X LC 216 and ADT 5 X 2Ku 53 yield more in F2 generation for number of clusters per plant, which indicated the role of fixable gene effects. In such crosses pedigree method of selection may be adopted for development of high yielding varieties by increasing the number of clusters. On the other hand except ADT5 X 2KU 53, all the four crosses revealed significant heterobeltiosis in F_1 coupled with high inbreeding depression in F_2 generation indicating the presence of non-additive gene action (dominance and epistasis) for seed yield per plant. These results are in agreement with the findings of Deshmukh and Bhapkar (1981). Therefore, the segregating materials generated during this study may be utilized in identification and selection of desirable recombinants in later generations in order to develop high yielding varieties with specific attributes.

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Research Notes

Assessment of drought and flood in Cauvery Delta Zone with a special reference to Tamil Nadu Rice Research Institute, Aduthurai

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In India for the past 120 years, drought occurred 425 times in 29 out of 35 meteorological observations. One fifth of the total geographical area are affected by severe drought once in 5 years, l/3rd of the area are affected by moderate drought once in 10 years and 1/2 of the area are affected by less drought once in 50 years. The total rainfall received out of 8670 available hours per year, in 100 hours only (or 50 rainy days). Hence nearly 30 per cent of country's total rain fall (400 m ha m of water) is being lost through runoff. The South-West monsoon is gross supplier of rainfall over North India, while in Southern Part of India, especially Tamil Nadu receive more than 60 per cent