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HETEROSIS AND INBREEDING DEPRESSION IN PEA

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ABSTRACT

Heterotic effect of eight characters were studied in Generation means analysis of five pea (**Pisum sativum** L.) crosses. Highest values of heterosis was observed for yield per plant and number of pods per plant. The extent of heterosis was 55.14 per cent for grain yield per plant and 49.92 per cent for pods per plant. Cross which showed manifestation of high degree of heterosis also exhibited high inbreeding depression in F_2. The results showed that selection in advanced segregating generations would be advantageous.

Exploitation of hybrid vigour depends on the direction and magnitude of heterosis, biological feasibility and type of gene action involved. Falconer (1960) pointed out that the heterosis breeding based on the identification of the parents and their cross combination capable of producing the highest level of trangresive segregates. With a view to examine the manifestation of heterosis and inbreeding depression in pea, the present investigation was undertaken.

MATERIALS AND METHODS

The experimental materials consisting of six pea cultivars viz., Bonneville, S-35, A.F., 6587-1, R-839 and R-177 were intercrossed. The F_1s were multiplied to obtain F_2 seeds in the following year. The parents, F_1s and F_2s were grown at Research Farm of Rajasthan College of Agriculture, Udaipur in randomized block design with three replications. The parents and F_1s were grown in two row plots and F_2s were grown in four row plots of 4 m length. The observations were recorded on 10 randomly selected plants from each of parents and F_1 and 25 plants from F_2 on days to flowering, days to maturity, plant height (cm), number of primary branches per plant, number of pods per plant, number of seeds per pod, seed yield per plant (g) and 100 seed weight (g). Statistical analysis of variance was done. Heterosis and inbreeding depression were estimated as per methodology suggested by Hayes et al (1955).

RESULTS AND DISCUSSION

The analysis of variance revealed that the differences among treatments were highly significant for all the characters in all the crosses under study. There were significant differences among parents and their filials. Heterosis and inbreeding depression are presented in Table-1. The results in general, indicated that magnitude as well as direction of heterosis differed from character to character depending upon the cross combination.

The cross Bonneville x S-35 showed highest heterotic response for seed yield (55.14%) and pods/plant (49.92%) among all the crosses studied. The cross had also high heterosis for primary branches/plant (19.2%) and 100 seed weight (13.98%). The cross Bonneville x A.F. showed high heterosis for seed yield (47.73%), pods/plant (42.94%) and seeds/pod (8.63%). Thus, heterosis for grain yield in the above crosses was obviously due to increase in one or more components of yields.

All the hybrids showed positive and significant heterosis for seed yield. The value of heterosis for this trait ranged from 11.84 per cent (R-838 x R-177) to 55.14 per cent (Bonneville x S-35). Highest manifestation of heterosis was obtained for seed yield in comparison with other traints under study. These reults, in agreement with the findings of Ardnt (1980) and Singh et al. (1985), indicate the possibilities of improving pea by exploiting hybrid vigour which is based on the identification of the parents and their cross

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Table 1. Heterosis and inbreeding depression of intervarietal crosses in pea

Character		Bonneville x S-35	Bonneville x A.F.	A.F. x 6587-1	A.F. x R-839	R-839 x R-177
Days to flowering						
	Heterosis	-4.03	0.40	4.92*	-2.29	-5.67
	I.D.	-3.04	-0.90	-2.51	4.34	-2.77
Days to maturity						
	Heterosis	-1.77*	-1.79	-1.60	-1.88	-1.09
	I.D.	0.83	0.88	-1.01	-1.02	-0.99
Plant height						
	Heterosis	12.16*	5.65	39.65**	21.93**	-0.66
	I.D.	9.33*	2.38	17.29**	11.24**	-2.45
Primary branches/plant						
	Heterosis	19.21**	3.36	23.01**	18.69**	-0.99
	I.D.	21.97**	5.24	10.88**	11.98*	2.94
Pods/plant						
	Heterosis	49.92**	42.94**	21.09**	25.59**	26.54**
	I.D.	19.32*	22.31*	29.96**	18.94**	17.89*
Seeds/pod						
	Heterosis	-1.51	8.63*	-11.84	12.03*	7.58
	I.D.	4.97	10.27*	-11.69	9.91*	7.05
Seed yield/plant						
	Heterosis	55.14**	47.73**	21.31**	33.72**	11.84*
	I.D.	17.25*	28.25**	20.63*	40.43**	112.17*
100 seed weight						
	Heterosis	13.93**	-14.36**	-4.68	11.02*	-10.30*
	I.D.	9.34**	-8.08	-5.29	4.45	-9.65

*, ** Significant at P = 0.05 and P = 0.01 respectively.
I.D. = Inbreeding depression

combinations capable of producing the highest level of transgressive segregates.

The yield component characters like pods/plant, primary branches/plant, plant height and seeds/pod showed high heterotic effects. Importance of these characters were also emphasized by Pandey and Gritton (1976) and Singh and Joshi (1982). Correlation and path analysis studies in pea by Lonning (1985) revealed that pods/plant, primary branches/plant, plant height and seeds/pod were the main and direct contributors to grain yield.

There was considerable amount of inbreeding depression for most of the traits studied. The results were in confirmity with the findings of Kumar and Das (1975), Singh and Joshi(1982) and Singh et al. (1985). High inbreeding depression for seed yield was associated with high heterotic effect in component characters viz., pods/plant, primary branches/per plant, plant height and seeds/pod. In all the crosses significant positive heterosis for grain yield followed by significant inbreeding depression indicated that non- additive gene action played a major role in the inheritance of this character. Crosses like Bonneville x S-35 and Bonneville

x A.F. showing high heterosis for yield and its components and comparatively low inbreeding depression may be utilized for improvement of yield through selection in advanced generation.

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STUDIES ON REGROWTH RATE IN RELATION TO FODDER YIELD IN CUMBU-NAPIER HYBRIDS

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ABSTRACT

Field experiments conducted at the Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore during 1987 and 1988 with cumbu napier hybrids revealed that none of the hybrids tested was superior to Co 1. The yield components such as-tiller number and regrowth rate decreased towards the maturity of the crop. The regrowth rate and tiller number observed were not related to yield. Competition for nutrients and change in the microclimate may be the possible reasons for such a relationship.

KEY WORDS : Cumbu-Napier (CN), Regrowth rate, Green fodder yield

Cumbu-Napier hybrid, one of the principal fodder crops, holds considerable promise for cultivation in arid regions. Earlier work on cumbu-napier hybrids mainly concentrated on the fertilizer management and cutting interval on the forage yield (Mwakha, 1972). However studies on the regrowth rates in relation to the cuttings on the green fodder yield is limited. A simple means of comparing the regrowth rate with reference to green fodder yield is reported.

MATERIALS AND METHODS

Eleven perennial fodder hybrids viz., CN-2, CN-3, CN-6, CN-7, CN-8, CN-13, CN-18, CN-19, CN-24, CN-28 and Co. 1 were raised with an espacement of 50 x 50 cm and basal fertilizer dose of 50:50:40 NPK kg ha^{-1} in a factorial randomized block design replicated thrice at new area of Millet Breeding Station, Coimbatore. Harvesting was done at 60 days interval with a subsequent top dressing of N @ 100 kg ha^{-1}. Eight harvests were made. Observations on plant height (main tiller with panicle), number of tillers $clump^{-1}$, and green fodder yield were recorded from five randomly selected plants in each replication in each treatment. The regrowth rate was worked out as per Sheehy *et al* (1979).

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