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Short Communication

VARIABILITY AMONG HALF-SIB PROGENIES OF A COMPOSITE VARIETY IN FODDER BAJRA

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In natural populations where the variability is limited, it can be generated by half sib matings and improvement can be brought about by following half sib family selection. The primary difference between mass selection and family selection is based on some type of progeny test. This method is quicker for improvement of a population, particularly to exploit residual variability. With this background, the present investigation has been carried out in bajra variety UUJ-2.

During kharif, 350 single plants were isolated on the basis of plant height, number of tillers, extrusion of internode, leaf length and width from an isolation field of composite UUJ-2 variety. Each selected plant was maintained separately and during the succeeding summer, 84 single plants forming the half-sib families were evaluated in randomized complete block design with three replications. Each family was sown in a plot of 3 × 0.8 m accommodating two rows of 3 m each spaced 40 cm apart. Five competitive plants were taken at random from each plot before initiation of earing for recording observations on early growth vigour, days to heading, plant height (cm), tillers per plant, stem thickness (cm), leaves per plant, leaf to stem ratio, leaf area (cm^2), green fodder yield per plant and per plot. After the first cutting (cutting was done when earing appeared in 50% plants in a plot), the stubbles were left as such to regenerate and grow. Again, when 50% plants in a plot came to cutting stage (cutting was done when earing appeared in 50% plants in a plot), all the observations which were recorded in first cutting except early growth vigour were recorded at the second cutting in the same manner as was done in the first cutting. The analysis of variance was done as per Hallauer and Miranda [1].

The analysis of variance (Table 1) indicated existence of significant differences between families for fresh weight and dry weights per plant, plant height, leaf to

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stem ratio and leaf area in cutting 1 whereas significant between family mean squares was found for only plant height in cutting-II. The variation for different characters was less in II cutting compared to I cutting. Jain [2] showed that the variations for different characters reduced in subsequent (II and III cuttings) in comparison to I cutting.

Table 1. Analysis of variance of half-sib families

Character	Cutting	Mean Squares			
		Replications [2]	Families	Error	Within Families
			[83]	[166]	[1008]
			M_1	M_2	M_3
Early growth vigour					
i. Fresh weight per plant	I	64.5**	85.8**	4.8	8.2
ii. Dry weight per plant	I	4.7**	7.3**	0.2	0.5
Plant height	I	39047.0**	1958.7**	294.0	511.5
	II	6216.0**	2937.6**	795.0	379.5
Tillers per plant	I	15.6**	6.9	5.3	2.2
	II	11.8*	1.2	3.1	1.2
Leaves per plant	I	3448.3**	222.8	342.4	151.0
	II	375.3	72.6	182.3	69.3
Stem thickness	I	14.2**	0.3	0.2	0.2
	II	2.9	1.1	1.5	0.6
Leaf to stem ratio	I	0.1	0.1**	0.0	0.1
	II	0.1	0.1	0.1	0.1
Leaf area	I	36881.0**	1518.6**	155.6	444.0
	II	747.8	564.6	444.8	199.8
Green fodder yield per plant	I	17051.0**	916.2	1337.9	619.0
	II	871.0	428.8	502.5	202.6

*Significant at p = 0.01

The mean squares due to families of these characters were significant when tested against"within mean squares" indicating that inter family variance was higher than intra family variance. The analysis of variance based on family means for days to 50% heading and green fodder yield per plot also indicated existence of significant differences between families for both characters. In open pollinated progenies significant differences between families are expected if the original population is highly

Table 2. Estimates of additive and phenotypic variance, heritability (narrow sense), and genetic advance and yield traits in bajra (based on individual plant data)

Character	Cutting	σ^2_{HS}	σ^2_A	h^2(NS) as % of mean	GA as % of mean among families	GA as % of mean within families	GA as % of mean among + GA within
Early growth vigour							
i. Fresh weight per plant	I	4.82	21.60	72.45	12.14	21.39	33.52
ii. Dry weight per plant	I	0.39	1.90	78.68	58.37	133.99	192.36
Plant height	I	72.59	443.92	46.47	1.24	0.53	1.77
	II	306.65	571.37	60.90	0.30	0.72	1.02
Tillers per plant	I	1.29	0.41	15.72	2.26	3.96	6.22
	II	0.58					
Leaves per plant	I	65.91					
	II	34.99					
Stem thickness	I	0.02	0.01	2.70	2.25	0.86	3.11
	II	0.31					70.84
Leaf to stem ratio	I	0.00	0.00	22.12	31.64	39.20	
	II	0.01					
Leaf area	I	24.34	363.45	45.01	5.58	0.92	6.50
	II	102.97	31.94	13.78	0.10	0.15	0.25
Green fodder yield per plant	I	25.78					
	II	108.57					

*where the σ^2_F and σ^2_{HS} estimates were negative, other parameters were not estimated.

From the mean squares of M_1, M_2 and M_3 of Table 1, σ^2_A, σ^2_P, σ^2_{HS}, h^2_{NS}, were estimated as per (Hallaeur and Miranda, [1] and given below :

$$\sigma^2_A = 4\,\sigma^2_1 = \frac{M_1 - M_2}{nr}., \quad \sigma^2_P = \sigma^2_A + M_3$$

GA when selection is done among families is determined by $= \left[\left(k\frac{1}{8}\cdot\frac{\sigma^2_A}{\sigma^2_{HS}}\right) + \overline{X}\right] \times 100$

GA when selection is done within families was estimated by $= \left[\frac{k\left[\frac{3/8\sigma^2_A}{M_3}\right]}{\overline{X}}\right] \times 100$

GA (among + within) is estimated by $= \frac{\text{GA (among families + within families)}}{\overline{X}} \times 100$

where $\overline{X}$, the general mean of the character, n = number of plants per family, r = umber of replications.

heterogeneous. Significant differences between half-sib families has been reported by Sastry et. al [3] in bajra.

The differences between σ_A^2 and σ_P^2 estimates of fresh weight per plant, dry weight per plant, stem thickness, leaf to stem ratio and leaf area in cutting I was very low indicating the importance of additive variance in the inheritance of these characters. Hallauer and Miranda [1] report that estimates of σ_A^2 are slightly over estimated in half-sib analysis, it may thus be a reason for such low difference.

The heritability was very high for dry weight per plant and fresh weight per plant in cutting I and plant height in cutting II indicating that selection for these traits should be effective. For the rest of characters the heritability was low or low to medium in both cuttings. The expected selection gain because of the "selection among families" was low in comparison to the expected gain from "selection with in the families" for most of the characters in both cuttings in cutting I and for plant height and leaf area in cutting II.

Although, family variance was not significant for green fodder yield in both the cuttings, it was significant for days to heading, plant height and green fodder yield per plot in both cuttings; fresh weight per plant, dry weight per plant, leaf to stem ratio and leaf area in first cutting. This is indicative of the existence of still some hidden variability which can be exploited for further improving the performance of UUJ-2 particularly for early growth vigour, days to heading, plant height and green fodder yield per plant.

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