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SHORT COMMUNICATION

Variation and character association studies in Isabgol

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Isabgol is a wonder plant with immense laxative utility. It is herb loaded with beneficial soluble fiber. The seed coat known as husk, has medicinal properties and is used as laxative in traditional system of medicine and has been proved beneficial in habitual constipation, chronic diarrhea and dysentery and irritation of digestive tract (Vigar Zaman etal.2002). The progress of any breeding programme depends upon the extent of genetic variability present in the population. The genetic variability along with the heritability gives a reliable picture of the genetic advance to be expected from selection (Burton,1952) while the heritability coupled with genetic advance aids in predicting the valuable conclusion for effective selection based on phenotypic performance. Correlation studies provide an opportunity to study the magnitude and direction of association of yield with its components and also among various components. To accumulate optimum combination of yield contributing characters in a single genotype, it is essential to know the implication of the interrelationships of various characters along with path coefficients. It was therefore proposed to study the Variation and character association of grain yield and its component characters in isabgol (Plantago ovata L.)

Experimental material comprised of 36 genotypes of isabgol, were planted in randomized block design with three replications at Research Farm, College of Agriculture, Bikaner during rabi 2008-09. Each entry was spaced apart at 30 x 10 cm in a plot of 2 x 4m size. The observations were recorded on five randomly selected plants from each replication for characters viz ;days to 50 per cent flowering, days to maturity., plant height, number of effective tillers per plant, spike length, number of seeds per spike, 1000-seed weight, swelling percentage ,biological yield per plant ,harvest index and seed yield per plant on individual plant basis were recorded on plot basis. Genetic variability was calculated as per the formula suggested by Johanson et al. (1955). The correlation coefficients and path coefficient analysis were based on Dewey and Lu (1959).

Significant differences were observed among the genotypes for all the characters studied indicating presence of adequate variability. High estimates of PCV and GCV were observed in seed yield per plant, number of effective tillers per plant and biological yield per plant (Table1), indicating the scope of exploiting variability for further improvement of these traits. High GCV and PCV for one or more above mentioned traits have also been reported by Godawat and Sharma (1994). High estimates of heritability were observed for almost all the traits ranging from 68.20 for plant height to 98.00 for test weight indicating high merit value of these characters for any selection programme. Thus these characters will aid in a selection programme owing to their high heritability value. Genetic advance is also expressed as the shift in gene frequency towards superior side on exercising selection pressure. The expected genetic advance showed wide range from 1.25 for swelling percentage to 40.73 for number of effective tillers per plant. Heritability estimates along with genetic advance are normally more helpful in predicting the gain under selection than heritability estimates alone (Lush,1940). The high heritability coupled with high genetic advance per cent were recorded for 1000-seed weight, seed yield per plant and spike length indicated the major role of additive gene action in inheritance of these characters. These results are in agreement to the earlier findings of Bhagat (1980) and Godawat and Sharma)1994.

The phenotypic correlation between important yield attributing characters and seed yield per plant revealed that seed yield and biological yield showed highly significant positive correlation. Similarly seed yield with number of effective tillers per plant, spike length, number of seeds per spike, 1000-seed weight and harvest index also showed highly positive significant correlation (Table 2). Other character pairs which showed positive and significant association were number of effective tillers per plant with spike length, number of seeds per spike, 1000-seed weight, biological yield per plant and harvest index; spike length with number of seeds per spike, 1000-seed weight, biological yield per plant and harvest index; number of seeds per spike with 1000-seed weight, biological yield per plant and harvest index; 1000-seed weight with biological yield per plant and harvest index; biological yield per plant with harvest index. These findings suggest that selection for these characters is likely to contribute towards highly yield. It can be concluded that by making selection for grain yield, the maximum weight age should be given for number of effective tillers followed by spike length, number of seeds per spike and 1000-seed weight. These results were also suggested the findings of Bhagat (1980); Sharma and Kothari (1997)) and Sharma and Garg (2002).

Path analysis was carried out using phenotypic correlations to estimate the direct and indirect contribution of individual characters on grain yield. Harvest index had

Table 1. Estimates of mean, range, coefficient of variance, heritability and genetic advance of 11 characters in isabgol

Characters	Mean ± S.Em.	Range	Coefficient of variance		Heritability (%)	Genetic Advance	G.A. as % of mean
			Phenotypic	Genotypic			
Days to 50% flowering	71.14±0.57	58.00-61.67	9.80	9.50	93.90	13.48	5.16
Days to maturity (No.)	114.92 ± 1.03	100.00-132.67	9.14	8.73	91.40	19.76	3.87
Plant height (cm)	30.76 ±0.67	22.33-36.91	11.64	9.62	68.20	5.03	7.29
Number of effective tillers per plant	53.10 ± 1.33	18.33-101.67	38.7	37.96	96.20	40.73	12.02
Spike length (cm)	4.68 ±0.07	2.70-6.40	21.14	20.60	95.00	1.94	29.73
Number of seeds per spike	84.93 ± 1.80	57.33-107.67	16.20	14.90	84.60	23.98	5.77
1000-seed weight (g)	1.58 ± 0.007	1.30-1.91	9.51	9.41	98.00	30.30	34.85
Swelling percentage	9.69 ± 0.17	8.26-11.22	9.23	7.65	68.70	1.27	11.61
Biological yield per plant (g)	22.14 ± 0.49	9.33-38.27	35.82	35.19	96.60	15.77	17.94
Harvest index (%)	24.89 ± 0.96	13.34-33.52	24.36	21.44	77.50	9.68	12.50
Seed yield per plant (g)	5.87 ±0.21	1.47-12.80	52.99	51.93	96.00	6.15	42.27

Table 2. Direct and indirect phenotypic and genotypic path coefficients effects of 11 characters on seed yield per plant in isabgol

Character		Days to 50% flowering	Days to maturity	Plant height (cm)	Number of effective tillers per plant	Spike length (cm)	Number of seeds per spike	1000-seed weight (g)	Swelling percentage	Biological yield per plant (g)	Harvest index (%)	Correlation with Seed yield per plant
Days to 50% flowering	G	-0.222	0.159	0.027	-0.044	-0.165	-0.086	-0.024	0.028	0.165	0.004	-0.141
Days to maturity (No.)	P	0.002	0.015	0.000	0.004	-0.001	0.007	0.001	0.001	-0.007	0.039	0.061
	G	-0.118	0.299	0.027	0.029	-0.007	-0.036	0.036	-0.058	-0.014	-0.053	0.070
Plant height (cm)	P	-0.001	-0.001	0.005	0.010	-0.012	-0.006	0.002	0.000	0.098	0.007	0.099
	G	0.048	-0.064	-0.127	0.035	0.184	0.071	0.035	-0.012	-0.115	0.011	0.092
Number of effective tillers per plant	P	-0.001	0.001	0.001	0.099	-0.108	-0.055	0.014	0.000	0.687	0.311	0.952**
	G	0.027	0.024	-0.012	0.356	1.171	0.502	0.237	-0.006	-0.752	-0.610	0.973**
Spike length (cm)	P	-0.001	0.000	0.001	0.090	-0.118	-0.057	0.014	0.000	0.700	0.309	0.941**
	G	0.030	-0.002	-0.019	0.339	1.229	0.520	0.233	-0.007	-0.785	-0.597	0.977**
Number of seeds per spike	P	-0.001	-0.002	0.001	0.086	-0.105	-0.063	0.013	0.001	0.652	0.294	0.876**
	G	0.036	-0.020	-0.017	0.342	1.222	0.523	0.234	-0.010	-0.775	-0.609	0.966**
1000-seed weight (g)	P	-0.001	0.001	0.001	0.091	-0.106	-0.054	0.016	0.001	0.673	0.302	0.922**
	G	0.022	0.043	-0.018	0.338	1.147	0.491	0.249	-0.015	-0.744	-0.595	0.951**
Swelling percentage	P	0.001	-0.002	0.000	-0.003	0.004	0.004	-0.001	-0.010	-0.029	-0.018	-0.053
	G	-0.037	-0.105	0.009	-0.014	-0.054	-0.031	-0.023	0.166	0.058	-0.007	-0.052
Biological yield per plant (g)	P	0.001	-0.001	0.002	0.000	-0.003	0.004	-0.001	-0.010	-0.029	-0.018	0.964**
	G	0.046	0.005	-0.018	0.338	1.218	0.511	0.234	-0.012	-0.792	-0.580	0.989**
Harvest index (%)	P	0.000	0.002	0.000	0.083	-0.098	-0.051	0.013	0.001	0.567	0.370	0.885**
	G	0.002	0.025	0.002	0.343	1.159	0.504	0.235	0.002	-0.727	-0.632	0.941**

*, ** Significant at 5% and 1% level of significance, respectively
Residual effect 0.0230 (genotypic), 0.0149 (phenotypic)

the highest positive direct effect on seed yield followed by number of tillers per plant, 1000-seed weight, days to maturity, days to 50 per cent flowering and plant height (Table2). This suggests that seed yield might increase if other variables remain constant. Similar results were also obtained for high direct effect on seed yield by Mittal et al. (1975) . Negative direct effect on seed yield was found with, spike length, number of seeds per spike, swelling percentage and biological yield per plant. Further indirect effect for spike length via biological yield followed by number of tillers per plant via biological yield, 1000-seed weight via biological yield, harvest index via biological yield were high and positive, hence these characters may be useful as selection criteria to isolate superior lines for higher seed yield in isabgol. The residual effect observed in path analysis was low indicating that the characters included in the present study were able to explain the most effects on seed yield in isabgol.

In conclusion, seed yield can be improved by direct selection of harvest index, number of effective tillers per plant and number of seeds per spike.

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