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USE OF SEMI-GRAPHICAL TECHNIQUE FOR CLASSIFICATION OF *ISABGOL* GERMPLASM

A.K. Chhabra, J.S. Hooda and G.D. Sharma

Department of Plant Breeding,
Haryana Agricultural University, Hisar - 125 004

Sixty-one accessions of Isabgol (Plantago ovata Forsk.) *including five exotic ones received through the National Bureau of Plant Genetic Resources, New Delhi were classified based on semi-graphical technique. Genetic diversity proved to be more important than geographical diversity. On the basis of index score values and ray patterns of different traits, promising genotypes which could be utilized in heterosis breeding programme included P 96, P 33, HI 8, HI 4, S 11, P 1 and MS for high seed yield; HI 5, Mutant S, EC 41181-37 T (high-yielding, high number of spikes group) and G 1 (medium-yielding medium number of spikes group) for husk percentage. LYHS (low yield high number of spikes), HYLS (high yield, low number of spikes, and HYMS (high yield, medium number of spikes) groups did not contain any genotype.*

Isabgol belongs to the family Plantaginaceae and the genus *Plantago* comprises about 200 species, of which 10 occur in India (Anon., 1969). However, *Plantago ovata* is the main source of *isabgol* seed and husk for use in medicine. Sixty-one accessions of this crop were introduced through National Bureau of Plant Genetic Resources (NBPGR), New Delhi. This paper deals with the grouping of *isabgol* germplasm lines from different geographical regions by using a simple semi-graphical technique.

MATERIALS AND METHODS

A collection of 61 *isabgol* accessions, including 5 exotics, were raised in replicated plots during November, 1988-89. The plots comprised two rows, each 3 m long, with 25 cm inter-row and 5 cm inter-plant spacing. The data on five plants from each plot were recorded for plant height (cm), number of spikes per plant, spike length (cm) and seed yield per five plants (g). Husk percentage was analysed in the laboratory by simple milling process using 100 g sample of each strain. Husk yield of five plants was calculated by the formula :

$$\text{Husk yield (HY)/five plants (g)} = \frac{\text{Husk percentage (HP) x seed yield of five plants (g)}}{100}$$

The mean values were used to construct metroglyph diagram following the semi-graphical method (Anderson, 1957). In the metroglyph diagram, each accession was represented by small circle (empty circle for indigenous and filled circle for exotic strains), the x-ordinate being seed yield and y-ordinate being the number of spikes per plant. These two traits were chosen to represent x, y-axis because of their wide genetic variability. The other characters were represented as rays on the

circles. The index values determined the length of rays : no ray, short ray or long ray. These index values were obtained by alloting numerical values (0, 1 or 2) to three grades of expression recognised for each character; while index score for each strain was estimated by summing up the index values of all the characters.

RESULTS AND DISCUSSION

The variability pattern of the present *isabgol* collection as indicated by metroglyph diagram (Fig. 1), seemed to be quite interesting. Supe-rimposed on the metroglyph depiction were the groups obtained, primarily on the basis of yield and spike producing ability. On the basis of seed yield potential, the lines were grouped into three broad categories, viz., Low, medium and high yielding groups. The seed yield per 5 plants of lines in low yielding group ranged from 3 to 6 g, in medium yielding group 6.1 to 10 g and in high yielding group 10.1. to 13 g (Table 1). The strains in each group had mostly similar characters.

The low-yielding group included 3 exotic and 18 indigenous strains. Index score of low yielding lines varied from 7 to 12 (Fig. 2). Overall mean performance (Table 2) revealed that the low yielding group was characterized by dwarf plants, short and less number of spikes.

The cultivars included in medium-yielding group were indigenous except one. Majority of strains (35) belonged to this category and the index score of this group ranged between 9 to 15. However, few genotypes of low yielding and high yielding groups inter-mixed with respect to their index scores. All the traits observed in this group depicted intermediate expression as compared to low and high yielding group.

The high yielding group was represented by 9 indigenous and one exotic strain. In addition to the highest expression exhibited by all the traits, number of spikes depicted the maximum increase in this group. The performance of 10 high yielding genotypes for various traits has been given (Table 3), Among them, four strains, viz., HI 5 (12), S 11 (22), P 1 (26) and Mutant S (49) obtained an index score of 17. HI 4 (18) though had an index score of 15, produced maximum seed yield (Table 3). This was due to less husk percentage of HI-4 as compared to above mentioned four genotypes. Husk percentage was the maximum in HI 5 (34.0%) followed by exotic strain EC 41181-37 T (32.9%) and Mutant S (32.5%).

On the basis of number of spikes per plant, the collections were classified into three groups, viz., low (LS), medium (MS) and high number of spikes per plant (HS). Most of the strains included in LS group were poor yielders. The MS group consisted of 18 medium yielding and 7 low yielding accessions. Ten high and 8 medium yielding cultivars formed the HS group. Apparently, the grouping of lines based on spike producing ability was more or less similar to that based on yielding ability.

The metroglyph analysis proved effective in classifying the present *isabgol* germplasm collection into distinct groups. It was demonstrated in wheat that precise classification by metroglyph analysis can be obtained when the maximum variability exists for two characters selected to represent x and y ordinates (Jain *et al.*, 1978). Additional information gained from the metroglyph analysis in

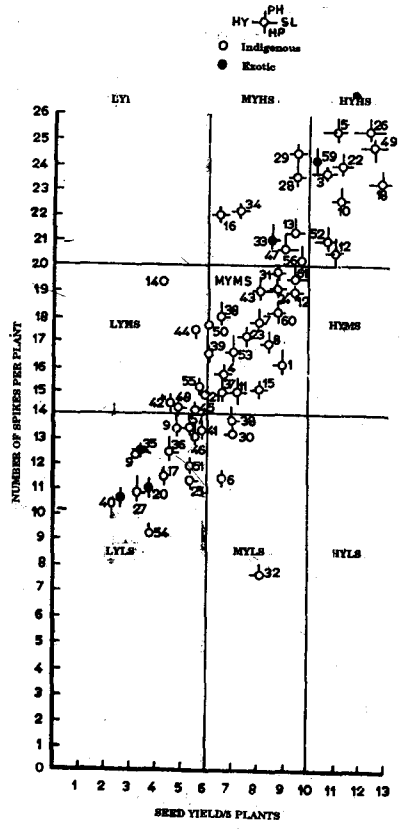

Fig. 1. Metroglyph diagram showing the distribution of the characters among *isabgol* strains.

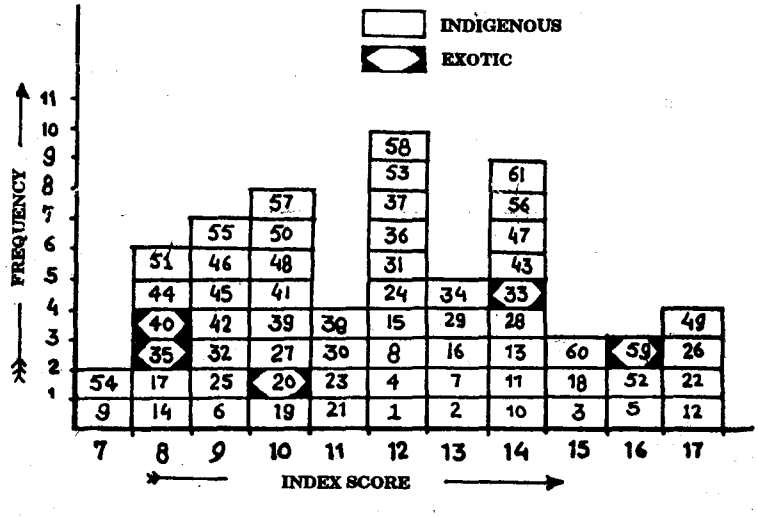

Fig. 2. Frequency distribution of index score values of *isabgol* accessions

Table 1. Range of variability and class intervals of morphological traits in *Isabgol*

Character	Range of variability	Score 1		Score 2		Score 3	
		Range	Sign	Range	Sign	Range	Sigh
Plant height (cm)	26.1 - 36.3	≤ 28.0	0	28.1 - 32.0	0	≥ 32.1	0
Number of spikes per plant	9.3 - 25.4	≤ 14.0	-	14.1 - 20.0	-	≥ 20.1	-
Spike length (cm)•	2.4 - 4.1	≤ 3.0	0	3.1 - 3.7	0	≥ 3.8	0
Seed yield/five plants (g)	3.0 - 12.7	≤ 6.0	-	6.1- 10.0	-	≥ 10.1	-
Husk percentage	22.8 - 35.1	≤ 28.0	0	28.1 - 32.0	0	≥ 32.1	0
Husk yield/five plants (g)	0.82 - 4.06	≤ 2.0	0	2.1 - 3.0	0	≥ 3.1	0

Table 2. Group means for *Isabgol* collection classified on the basis of yielding potential and number of spikes per plant

Groups	Plant height (cm)	No. of spikes per plant	Spike length (cm)	Seed yield per five plants (g)	Husk percentage	Husk yield per five plants (g)
Low yielding	30.52	14.38	2.89	4.81	28.97	1.44
Medium yielding	32.61	17.01	3.17	7.83	29.74	2.33
High yielding	33.12	23.24	3.51	11.31	30.46	3.44
Low number of spikes per plant	31.67	12.08	2.84	5.71	28.32	1.67
Medium number of spikes per plant	31.40	16.83	3.14	6.55	30.23	1.98
High number of spikes per plant	32.92	22.60	3.42	9.93	30.46	3.44

Table 3. Index (in parentheses) and mean values of high-yielding lines for various characters

S. No.	Geno-types	Plant height (cm)	Spikes per plant	Spike length (cm)	Seed yield of five plants(g)	Husk percen-tage	Husk yield of five plants(g)	Index score
1.	P 96	31.5(2)	23.9(3)	3.49(2)	10.50(3)	29.70(2)	3.12(3)	15
2.	P 33	32.9(3)	25.4(3)	3.64(2)	11.00(3)	31.30(2)	3.34(3)	16
3.	HI 8	34.4(3)	22.7(3)	3.76(2)	11.00(3)	25.75(1)	2.83(2)	14
4.	HI 5	34.0(3)	20.7(3)	3.47(2)	10.85(3)	34.00(3)	3.69(3)	17
5.	HI 4	35.8(3)	23.3(3)	3.68(2)	12/75(3)	27.15(1)	3.46(3)	15
6.	S 11	33.2(3)	24.)(3)	3.75(3)	11/25(3)	31.70(2)	3.57(3)	17
7.	P 1	34.7(3)	25.4(3)	3.82(3)	12.25(3)	29.80(2)	3.65(3)	17
8.	Mutant S	29.5(2)	24.8(3)	3.90(3)	12.50(3)	32.50(3)	4.06(3)	17
9.	MS	32.5(3)	21.0(3)	3.33(2)	10.75(3)	29.80(2)	3.20(3)	16
10.	EC 41811 37 T	32.7(3)	24.2(3)	2.81(1)	10.25(3)	32.90(3)	3.37(3)	16
	Range	29.5-35.8 (2) (3)	20.7-25.4 (3) (3)	2.82-3.90 (1) (3)	10.25-12.75 (3) (3)	25.75-34.0 (1) (3)	2.83-4.06 (3) (3)	14-17

the present study was that the lines within medium and high yielding groups showed variation for important attributes such as husk percentage, spike length and husk yield. It was evident that the hybridization between lines within medium and high yielding groups could be useful. The index score reflected the mean performance of strains for seed yield. Generally, high index scorers were also the high yielders.

The results indicated that metroglyph and index score analysis could be effectively and efficiently utilized in the preliminary classification of germplasm. Such a classification aids in careful choice of parents with wide genetic bases for successful hybridization programme.

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