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Research Note

Selection indices for yield in rabi sorghum (*Sorghum bicolor* L. Moench) genotypes

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Abstract
Various selection indices were constructed for yield in *rabi* sorghum genotypes using 45 genotypes. Among various traits, plant height, 1000-seed weight and fodder yield had significant and positive genotypic correlation with the seed yield per plant. Among the selection indices, the expected genetic gain and relative efficiency had higher side whenever correlated traits are present together. Further increase in the genetic gain and efficiency with the addition of more traits are negligible. Hence the selection index based on seed yield, plant height, 1000-seed weight and fodder yield may be considered as appropriate selection index for seed yield improvement in *rabi* sorghum genotypes.

Key words
Sorghum, selection indices, yield.

Yield is a complex quantitative character influenced by environmental fluctuations. Therefore direct selection for yield as such will not be reliable and fruitful. Hence, selection criteria based on yield components would be helpful in selecting suitable plant types. The knowledge of interrelationship between yield components and the relative weightage that should be given to different yield components to obtain maximum gain is therefore most important. Thus, construction of selection indices will be highly helpful to discriminate desirable genotypes. The discriminant function provides an efficient method for simultaneous selection (Smith, 1936). On the basis of their phenotypic performance rabi sorghum genotypes representing medium maturity group were selected for the study.

The experimental material consisted of 45 *rabi* sorghum genotypes including standard check variety CSV 216R representing medium maturing group. These genotypes were planted during 2009-10 *rabi* season in a randomized block design with two replications. Five plants selected at random per plot were used for recording observations. The characters like seed yield (X1), Days to 50% flowering (X2), days to maturity (X3), plant height (cm) (X4), panicle length (cm) (X5), 1000-seed weight (g) (X6) and fodder yield (t/ha) (X7) were studied and used for construction of selection indices based on Fisher's discriminate function (Fisher, 1936) . The expected genetic advance and relative efficiency in percentage were computed according to Brim, *et.al,* (1959).

Various selection indices based on different character combinations including seed yield are presented in Table 1. The results revealed that a maximum gain of 127.61% was expected when six attributes *viz*., days to maturity, plant height, panicle length, 1000- seed weight and fodder yield along with seed yield were included in the function. Replacement of another trait *viz.*, days to maturity with days to 50% flowering also showed similar genetic gain (127.48%). However the other traits remained same along with other traits. Individually, days to 50% flowering, days to maturity and fodder yield showed negative expected genetic gain. Seed yield per plant showed a genetic advance of 110.11% while, plant height and 1000-seed weight recorded 14.88% and 1.73%, genetic advance respectively. When a combination of two attributes was made in the function there was no satisfactory gain. A combination of three characters *viz.*, seed yield per plant + plant height + 1000-seed weight indicated comparatively substantial gain of 97.42%. Furthermore, a combination of four attributes (X1 + X4 + X6 + X7) including seed yield and fodder yield in function, gave high expected genetic advance of 121.04.

Thus, when more characters were employed in the index construction, more relative efficiency is realized. This was in agreement with the findings of Sabitha (2007) and Sireesha *et al.,* (2010). The best combination of five attributes (X1+X2+X4+X6+X7) including days to 50% flowering resulted expected genetic advance of 125.5%. The function which included six characters *viz*., seed yield, days to maturity, plant height, panicle length, 1000-seed weight and fodder yield gave the highest genetic advance (127.61%) and highest relative efficiency (120.12%) over seed yield alone in *rabi* sorghum genotypes. However, all seven character index also gave genetic gain less than five character index.

From the above discussion, it may be noted that whenever the traits X4, X6 and X7 with seed yield had included in the selection indices, the expected

genetic advance and relative efficiency were on the higher side except when all the traits included. Further increase in the genetic gain and efficiency with the addition of more traits are negligible. The genotypic correlation also indicates that X4, X6 and X7 had significant correlation with seed yield. Hence those traits having significant correlation alone may be included to formulate selection indices for the improvement of seed yield. Inclusion of more traits may not be necessarily increase the expected genetic advance and relative efficiency and some times it may reduce the genetic gain and relative efficiency. More over, selection of limited characters is more efficient and practical approach in breeding programme than the inclusion of more characters. Hence the selection index based on seed yield, plant height, 1000-seed weight and fodder yield may be considered as appropriate selection index for seed yield improvement in *rabi* sorghum genotypes.

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Table 1. Selection indices and their relative theoretical efficiency in rabi sorghum lines

Best character combinations among group of characters		Index score	Expected genetic advance	Relative efficiency (%)	Grand mean (G.M)	r_g value with seed yield
Seed yield per plant (g)	X1	-1.57	110.1197	100	1187.64	1.0000
Days to flowering	X2	0.65	-0.3060	7.44	62.97	-0.1542
Days to maturity	X3	1.96	-0.1765	7.43	114.40	-0.1214
Plant height (cm)	X4	5.23	14.8831	23.81	192.48	0.3273*
Panicle length (cm)	X5	5.27	0.4618	1.86	11.20	0.1806
1000-seed weight (g)	X6	0.41	1.7332	3.93	34.76	0.3033*
Fodder yield (T/ha)	X7	21.73	-0.3468	0.92	6.28	0.3116*
X1+X4		3.66	41.4806	114.35		
X1+X3+X4		5.62	68.7621	114.62		
X1+X4+X5		8.93	72.301	115.12		
X1+X4+X6		4.07	97.4223	117.12		
X1+X3+X4+X6		6.03	104.6359	117.32		
X_1+X4 + X5 +X6		9.34	115.2184	117.87		
X1+X4+X6+X7		25.80	121.0388	118.65		
X_1+X2 + X4+X6+X7		26.45	125.5097	119.08		
X_1+X3+ X4+X6+X7		27.76	126.8252	119.38		
X_1+X2 +X4+X5+X6+X7		31.72	127.4854	120.00		
X_1+X3 +X4+X5+X6+X7		33.03	127.6117	120.12		
X2+X3 +X4+X5+X6+X7		35.25	15.1068	31.12		
X_1+X2+X3 +X4+X5+X6+X7		33.68	58.2323	119.94		