International Journal of Agricultural Sciences
Volume 8 |Issue 2| June, 2012 | 357-359

RESEARCH PAPER

Selction indices studies in greengram [*Vigna radiata* (L.) Wilczek]

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Abstract : Fifty-eight diverse genotypes of greegram were evaluated in a Randomized Block Design with three replications for the study of selection indices under rainfed conditions during *Kharif* 2010. Thirty-one selection indicates involving seed yield and four yield components were constructed using the discriminant function technique. Among the single character indices, number of pods per plant exhibited higher genetic advance and relative efficiency over straight selection for seed yield. The efficiency of selection increased with the inclustion of more number of characters in the index. The index based on four characters *viz.*, seed yield per plant, number of pods per plant, number of clusters per plant and number of pods per cluster recorded the highest genetic advance and relative efficiency.

Key Words : Discriminant function, Greengram, Relative efficiency, Selection indices

View Point Article : Khanpara, M.D., Vachhani, J.H., Jivani, L.L., Kachhadia, V.H. and Shekhat, H.G. (2012). Selction indices studies in greengram [*Vigna radiata* (L.) Wilczek]. *Internat. J. agric. Sci.*, **8**(2): 357-359.

Article History : Received : 19.12.2011**; Revised :** 14.03.2012**; Accepted :** 20.04.2012

INTRODUCTION

In India, greengram is grown on an area of about 30.41 lakh ha with production of 11.73 lakh tones and with a productivity of 389 kg/ha. In Gujarat, greegram is grown in about 1.62 lakh ha with total production of 0.7 lakh tones and a productivity of 432 kg/ha. (Anonymous, 2009). Thus, the productivity of greengram is low at the state as well as national level. Therefore, there is urgent need to improve the productivity of greengram by proper breeding tools. Yield is governed by a polygenic system and is highly influenced by the fluctuations in the environment. Hence, selection of superior genotype based directly on yield would not be very rewarding in many cases. The effectiveness of component approach to selection breeding is well appreciated. An application of discriminant function developed by Smith (1936) helps to idenfity important combination of yield components useful for selection by formulating suitable selection indices. Therefore, keeping above said facts in mind, the present investigation was planned with thirty-one selection indices were constructed in all possible combinations of the four yield contributing characters and seed yield per plant to calculate discriminant functions for constructing and identifying the most efficient selection indices.

MATERIALS AND METHODS

Fifty-eight diverse genotypes of greengram were sown in a randomized block design with three replications at the Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh, during *Kharif* 2010 under rainfed conditions. Each entry was accommodated in a single row of 3.0 m length spaced at 45 cm between row and 10 cm between plants within the row. The genotypes were randomly allotted to the plot in each replication. The experiment was surrounded by guard row to avoid damage and border effects. All the recommended packages of practices were followed for raising healthy crop. Data were recorded on randomly selected five plants from each genotype and average value was used for the statistical analysis for twelve characters *viz.*, days to

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50 per cent flowering, days to maturity, plant height, number of primary branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length, number of seeds per pod, 100-seeds weight, seed yield per plant and protein content. The model suggested by Robinson *et al.*(1951) was used for the construction of selection indices and development of a required discriminant function using five characters alongwith seed yield per plant.

RESULTS AND DISCUSSION

For the construction of selection indices, the characters, which had high direct effect on seed yield, were considered. In this context, the seed yield per plant (X_1) along with its four components *viz.*, number of clusters per plant (X_2), number of pods per cluster (X_3), number of pods per plant (X_4) and days to maturity (X_5) were identified and considered for the construction of selection indices. Thirty-one selection indices were constructed in all possible combinations of the four yield contributing and relative efficiency of different discriminant functions in relation to the straight selection for seed yield was compared. The data on selection indices, discriminant functions, genetic gain and relative efficiency are given in Table 1, assuming the efficiency of straight selection for seed yield as 100 per cent.

The plant breeder has certain desired plant characteristics in his mind while selecting for particular genotypes and for this he applies various weights to different traits for arriving on decisions. This suggests the use of selection index, which gives proper weight to each of the two or more characters to be considered. Hazel and Lush (1943)

Table 1 : Selection index, discriminant function, expected genetic advance in yield and relative efficiency from the use of different selection indices in greegram

Sr. No.	Selection index	Discriminant function	Expected genetic advance	Relative efficiency (%)
1.	X_1 Seed yield per plant	X_1	2.309	100.000
2.	X_2 Number of cluster per plant	X_2	0.636	27.544
3.	X_3 Number of pods per cluster	X_3	0.625	27.068
4.	X_4 Number of pods per plant	X_4	2.415	104.591
5.	X_5 Days to maturity	X_5	2.276	98.571
6.	X_1. X_2	$0.824X_1+0.767X_2$	2.839	122.954
7.	X_1. X_3	$0.892X_1+0.471X_3$	2.929	126.851
8.	X_1. X_4	$0.141X_1+1.525X_4$	4.767	206.453
9.	X_1. X_5	$0.578X_1+0.422X_5$	2.353	101.906
10.	X_2. X_3	$0.945X_2+0.799X_3$	1.122	48.592
11.	X_2. X_4	$0.811X_2+0.868X_4$	2.967	128.497
12.	X_2. X_5	$0.738X_2+0.499X_5$	2.397	103.811
13.	X_3. X_4	$0.165X_3+1.012X_4$	3.033	131.356
14.	X_3. X_5	$-0.019X_3+0.443X_5$	2.038	88.263
15.	X_4. X_5	$0.638X_4+0.435X_5$	2.498	108.185
16.	X_1. X_2.X_3	$0.319X_1+2.141X_2+1.876X_3$	3.469	150.238
17.	X_1. X_2.X_4	$-0.127X_1+1.073X_2+1.767X_4$	5.314	230.143
18.	X_1. X_2.X_5	$0.482X_1+1.403X_2+0.416X_5$	2.932	126.981
19.	X_1. X_3.X_4	$0.097X_1+-0.01X_3+1.786X_4$	5.382	233.088
20.	X_1. X_3.X_5	$0.757X_1+0.075X_3+0.391X_5$	2.638	114.249
21.	X_1. X_4.X_5	$-0.081X_1+1.512X_4+0.381X_5$	4.233	183.326
22.	X_2. X_3.X_4	$1.810X_2+1.467X_3+0.512X_4$	3.548	153.660
23.	X_2. X_3.X_5	$0.874X_2+0.211X_3+0.455X_5$	2.209	95.669
24.	X_2. X_4.X_5	$1.351X_2+0.570X_4+0.432X_5$	3.080	133.391
25.	X_3. X_4.X_5	$-0.285X_3+0.921X_4+0.398X_5$	2.827	122.434
26.	X_1. X_2.X_3.X_4	$0.055X_1+2.409X_2+1.867X_2+1.066X_4$	5.906	255.782
27.	X_1. X_2.X_3.X_5	$-0.263X_1+3.310X_2+2.438X_3+0.392X_5$	3.322	143.872
28.	X_1. X_2.X_4.X_5	$-0.726X_1+1.746X_2+2.014X_4+0.369X_5$	4.928	213.426
29.	X_1. X_3.X_4.X_5	$-0.527X_1+-0.631X_3+2.334X_4+0.338X_5$	4.797	207.752
30.	X_2. X_3.X_4.X_5	$3.269X_2+2.454X_3+-0.220X_4+0.405X_5$	3.406	147.510
31.	X_1. X_2.X_3.X_4.X_5	$-0.502X_1+3.712X_2+2.548X_3+0.972X_4+0.344X_5$	5.407	234.171

showed that the selection based on such an index is more efficient than selecting individually for the various characters. Hazel and Lush (1943) stated that the superiority of selection based on index increases with an increase in the number of characters under selection. In the present study also the genetic advance and relative efficiency assessed for different indices increased considerably when selection was based on two or more characters. The maximum genetic advance (GA) and relative efficiency (RI) in single character discriminant function was 2.415 and 104.591 per cent, respectively which however, increased to 4.767 and 206.453 per cent, respectively in two character combinations and 5.382 and 233.088 per cent, respectively, in three character combinations. Thus, there was an increase in the genetic gain as well as relative efficiency with inclusion of an additional trait in the character combinations. While, the maximum genetic advance and relative efficiency in case of our character combinations were 5.906 and 255.782 per cent, respectively. Misra (1985), Nafade (1990), Khorgade *et al.* (1990), Sahu *et al.* (1998) and Patel *et al.* (2007) were also with the same opinion that an increase in characters results in an increase in genetic gain and that the selection indices improve the efficiency of selection than the straight selection for yield alone.

It was also observed that the straight selection for yield was not that much rewarding (GA=2.309, RI=100.0%) as it was through its components like number of clusters per plant (GA=0.636, RI=27.544%), number of pods per cluster (GA=0.625, RI=27.068%), number of pods per plant (GA=2.415, RI=104.591%) and days to maturity (GA=2.276, RI=98.571%) or in their combinations. The maximum efficiency in selection for seed yield was exhibited by a discriminant function involving seed yield per plant, number of clusters per plant, number of pods per cluster and number of pods per plant, which had a genetic advance and relative efficiency of 5.906 and 255.782 per cent, respectively.

Further, in the present study, there was a consistent increase in the relative efficiency of the succeeding index with simultaneous inclusion of each character. However, in practice, the plant breeder might be interested in maximum gain with minimum number of characters. In such a case, selection index consisting of seed yield per plant, number of clusters per plant, number of pods per cluster and number of pods per plant could be advantageously exploited in the greengram breeding programmes. The results of the present study also revealed that the discriminant function method of making selection in plants appeared to be the most useful than the straight selection for seed yield alone and hence, due weightage should be given to the important selection indices while making selection for yield advancement in greengram.

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