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Selection Indices for Yield and Attributing Characters Improvement in Pigeon pea (*Cajanus cajan* L. Millspugh)

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ABSTRACT- Twenty-two selection indices involving seed yield and six yield components were constructed using the discriminant function technique. The efficiency of selection increased with the inclusion of more number of the characters in the index. Selection indices were constructed adapting the discriminant function, which indicated that the maximum genetic advance and relative efficiency can be obtained when seed yield was included as one of the characters in combination with all other characters *viz.,* plant height, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, number of pods per plant and test weight. However, higher relative efficiency was obtained when a function yield was included as one of the component characters in combination with the number of pods per plant, number of secondary branches per plant and test weight than to a function with all the character in combination with yield.

Key-Words- Pigeonpea, Genetic advance, Relative efficiency, Genotype

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INTRODUCTION

Pigeonpea is the second important pulse crop of India grown in around 4.5 m. ha with an average productivity of 700 kg per ha which is below world productivity of one tonne per ha. Yield is a complex character and governed by poly genes. The yield is subjected to environmental fluctuations and the performance of individual plant is consequently is not a reliable index of the genotype [1]. Study of discriminant function for yield alone does not result in expected yield. Success of selection would be enhanced by use of selection techniques as it facilitates simultaneous improvement of number of characters [2]. Selection index is most widely used selection method which can be used for more than one character. The superiority of index increases with increasing number of traits under selection, but decreases with increasing differences in relative importance. The superiority of selection index is maximum, when the traits considered are equally important.

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MATERIAL AND METHODS

Twenty two genotypes received from all over India were utilized for the study to formulate selection indices. The material was raised in randomized block design during July 2014 at Regional Agricultural Research Station, Lam, Guntur. A total 693.9 mm rainfall was received during the entire period of crop season. Crop was sown in the month of July and harvesting was completed in the month of February, 2015. The observations were recorded on five competitive plants from each replication for plant height, days to 50% flowering, number of primary branches, number of secondary branches, number of pods per plant, test weight and yield. The mean data was subjected to analysis of variance and selection indices were formulated. The expected genetic advance from different selection indices at 5% selection intensity and relative efficiency of each selected function over straight selection was also calculated. The reciprocals of means of each character were used as relative weights of corresponding character by Rama *et al.* [3].

The expected genetic advance, by constructing different discriminant functions was calculated and relative efficiency of each discriminant function was estimated [4]. The relative efficiency of discriminant function which includes yield per plant alone was taken as 100% and the relative efficiency of other functions were estimated.

RESULTS AND DISCUSSION

The data on weighing coefficients and genetic advance for each character was estimated to assess extent contribution of each character towards yield. Among the characters days to 50% flowering recorded the highest weightage of (9.720) followed by number of pods per plant (0.604) and the least weightage was recorded by test weight (-84.452). The weightage coefficients (β_1) for seven characters were given in the table 1. Discriminant function with index of genetic advance as well as relative efficiency over grain yield was computed for seven characters viz., plant height (cm), days to 50% flowering, number of primary branches per plant , number of secondary branches of plant, number pods per plant, test weight (g) and yield (Kg/ha) (Table 2).

Table 1: Weighing coefficients (b1), economic weight and genetic advance for different characters in Pigeonpea

S. No	Character	Economic weight	Weighing coefficient (β_1)	Variance phenotypical	Genetic advance
1	Plant height (cm)	1.000	-2.935	-362.468	-1.031
2	Days to 50% flower	1.000	9.720	142.080	0.404
3	Primary branches/plant	1.000	-6.557	6.983	0.019
4	Secondary branches/plant	1.000	-20.804	45.000	0.128
5	Pods/plant	1.000	0.604	5406.4618	15.387
6	Test weight (g)	1.000	-84.452	-162.0741	-0.4613
7	Yield (kg/ha)	1.000	0.566	118381.743	336.919

Table 2: Selection indices along with their genetic advance and relative efficiency in Pigeonpea

Code	Yield	Plant height (cm)	Days to 50% flower	Primary branches /plant	Secondary branches /plant	Pods/ plant	Test weight (g)	Genetic advancement	Seletion intensity 5%	Gain over 1st variable (%)
1	0.624	–	–	–	–	–	–	328.49	676.70	100.0
2		0.346						5.76	11.86	1.75
3			0.979					6.08	12.52	1.85
4				0.532				0.19	0.40	0.06
5					0.598			0.95	1.97	0.29
6						0.349		31.86	65.63	9.7
7							0.799	0.93	1.92	0.28
12	0.623	– 2.314	–	–	–	–	–	329.43	678.63	100.2
16	0.632	–	–	–	–	0.457	–	340.64	701.72	103.7
126	0.628	– 2.356	–	–	–	0.546	–	341.72	703.94	104.0
167	0.592	–	–	–	–	0.444	– 48.113	344.20	709.04	104.7
1267	0.585	– 2.558	–	–	–	0.538	– 58.652	345.85	712.45	105.2

1367	0.576	–	7.631	–	–	0.449	– 65.983	346.44	713.68	105.4
1567	0.596	–	–	–	– 25.8362	0.500	- 58.187	346.58	713.96	105.5
12367	0.561	– 3.200	10.255	–	–	0.565	– 77.157	349.77	720.52	106.4
123467	0.561	– 3.160	10.276	-7.1564	–	0.567	– 78.009	349.80	720.58	106.4
123567	0.567	– 2.971	9.699	–	-20.818	0.602	– 83.671	351.34	723.76	106.9
1234567	0.566	– 2.935	9.720	-6.557	-20.804	0.604	– 84.452	351.37	723.81	106.9
Economic weights	1.0	1.0	1.0	1.0	1.0	1.0	1.0			

The superiority of selection based on selection index increased with increase in number of characters under selection. In the present study the relative efficiencies of selection indices based on single character were lower than selection index comprising a combination of two or more characters. Inclusion of characters one by one in the function resulted in the increased efficiency of selection [5].

Among the characters studied number of pods per plant had contributed maximum extent (9.7%) towards yield than other characters studied which was followed by days with 50% flowering and plant height (Table 2). Grain yield with other character combinations were studied for relative efficiency over grain yield pep plant. Character number of pods per plant contributed maximum efficiency than other characters in yield improvement. The relative efficiency is increased with addition of one by one yield component characters to yield (Table 2).

A function involving characters like yield, number of secondary branches per plant, number of pods per plant and test weight recorded higher relative efficiency than yield and most appropriate combination in terms of relative efficiency than other combinations. Hence, the index of these characters might be useful for simultaneous improvement of these characters and the discriminate function might be useful for simultaneous improvement of character [6].

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