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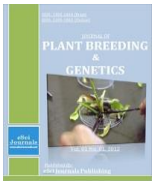

CLASSICAL SELECTION INDICES IN INDIAN GENOTYPES OF ITALIAN MILLET [*SETARIA ITALICA* (L.) BEAUV]

Pola L. Prasanna*, Jandhyala S. V. S. Murthy, Puranam V. R. Kumar, Vatluri S. Rao
Department of Genetics and Plant Breeding, Agricultural College, Bapatla, Andhra Pradesh, India.

A B S T R A C T

Selection indices are useful in understanding the extent of improvement that can be effected in yield by combination of characters. It forms the basis in considering the correlated characters for higher efficiency in selection for yield. Classical selection indices study was carried out in 18 Indian genotypes of Italian millet for 13 characters during *rainy* and *spring* seasons. The results of classical selection indices indicated that in Indian genotypes GS 448, GS 444, GS 442, and GS 449 for *rainy* and GS 440, GS 450, GS 451 and GS 448 for *spring* are to be preferred. In general, the indices, which include more than one character, gave high genetic advance suggesting the utility of selection index for simultaneous improvement of several characters. A selection index of eight characters combination i.e., grain yield per plant, days to 50% flowering , plant height, number of productive tillers per plant, ear length, ear weight, crude protein content and calcium content had recorded high genetic advance and relative efficiency over grain yield per plant alone during *rainy* whereas selection index of nine characters combination i.e., grain yield per plant, days to 50% flowering , plant height, number of productive tillers per plant, ear length, ear weight, 1000 grain weight, crude protein content and calcium content had recorded high genetic advance and relative efficiency over grain yield per plant alone during *spring.* These classical selection indices may be given due weightage for simultaneous improvement in the respective groups.

Keywords: Italian millet, selection indices, *Seteria italica*, classical selection.

INTRODUCTION

Foxtail millet is generally raised as rain fed crop in India. It is cultivated in Andhra Pradesh, Karnataka, Maharashtra and Hilly Areas of Northern India. This crop is grown for human food in North Africa, southeastern Europe, Japan and India. It is usually cooked whole or made into meal or into beer. It can also make useful hay or silage. In addition foxtail millet is consumed as stiff porridge called sargati, or as leavened bread known as roti, after the dehulled grain has been milled into flour. Foxtail millet with a short growing period is grown extensively in diverse agro- climatic regions for grain and fodder. It is known for its drought tolerance and is an indispensable crop of vast rain fed areas in semi-arid regions in India. It is also grown in nutrient deficient soils and possesses tolerance to pests and diseases. The grain is a good source of protein and contains β-carotene. Italian millet grain possesses 12.3% protein, 4.7% fat, 60.6% carbohydrates and 3.2% ash.

Selection of plants indiscriminately from a field on the basis of phenotypic expressions might lead to disappointing results. It is not the phenotypic character but the genotypic value that should be accounted to form the basis for selecting plants. Thus, index based on economic characters should give weightage to the phenotypic expression in terms of genotype by eliminating environmental variation (Panse, 1949). Study of classical selection indices helps in identifying and developing high yielding genotypes for different seasons. In classical selection indices several useful characters are selected simultaneously for the improvement of yield. Selection indices are useful in understanding the extent of improvement that can be effected in yield by combination of characters. It forms the basis in considering the correlated characters for higher efficiency in selection for yield. Classical selection indices study was carried out in 18 Indian genotypes of

* Corresponding Author:
Email: ananya_7jl@yahoo.com

Italian millet for 13 characters during *rainy* and *spring* seasons.

MATERIAL AND METHODS

The present investigation was undertaken at Agricultural College Farm, Bapatla, Guntur (Dt.), Andhra Pradesh with the 18 Indian genotypes of Italian millet [*Setaria italica* (L.) Beauv] procured from collections maintained at All India Co-ordinated Small Millets Improvement Project (AICSMIP), Bengaluru. The studies were carried out separately during *rainy*2008 and *spring* 2009. The genotypes are sown separately in randomized block design with four replications. Each genotype was sown in four rows of 5mts length spaced at 25 X 10 cm apart.

Data were collected on 10 randomly tagged competitive plants per genotype per replication for number of productive tillers per plant, plant height, flag leaf area, ear length, ear weight, straw weight, grain yield. However data on days to 50 %flowering, days to maturity, grain protein%, calcium content and grain β-carotene were recorded on plot basis. Genetic worth (H) of genotypes was calculated as defined by Smith (1936). The expected genetic advance, by constructing different discriminant functions was calculated and relative efficiency of each discriminant function was estimated as per Brim *et al.* (1959).

RESULTS AND DISCUSSION:

The economic weights (a_i) and weighing coefficient (b_i) values given for different characters embodied in Table 1. Selection criterion values for the both seasons are presented in Table 2. Selection indices for different character combinations during *rainy*2008 and during *spring* 2009 are presented in Table 3 & 4 respectively. The quality trait carotene (5.82) recorded highest a_i value followed by 1000 grain weight(0.59) and number of productive tillers per plant(0.31) during *rainy* whereas in *spring* carotene(4.77) followed by 1000 grain weight(0.31) and calcium content(o.23). Plant height and days to maturity showed least ai value (0.01) during *rainy* whereas in *spring* least a_i value of 0.01 exhibited by plant height, days to maturity and flag leaf area. Carotene (4.0748) recorded highest bi value followed by number of productive tillers per plant(1.0041) and ear weight (0.4881)during *rainy* whereas in *spring* carotene(2.3997) followed by 1000 grain weight(0.5375) and calcium content(0.3263). Days to maturity (-0.0036) and Grain yield per plant (-0.0298) noted least bi values during *rainy*where as in *spring* flag leaf area (0.0030) and days to 50% flowering (-0.0277).

Table 1: Economic weights (ai) and weighing coefficients (bi) for different characters in Indian genotypes during rainy 2008 and spring 2009 in Italian millet [*Setaria italica* (L.) Beauv].

Character	Economic weights (a_i)		Weighing coefficients (b_i)	
	rainy 2008	***spring 2009***	***rainy 2008***	***spring 2009***
Days to 50% flowering	0.02	0.02	0.0385	-0.0277
Plant height(cm)	0.01	0.01	0.0141	0.0096
Days to maturity	0.01	0.01	-0.0036	0.1301
Number of productive tillers/ plant	0.31	0.10	1.0041	0.1291
Flag leaf area(cm^2)	0.04	0.01	0.0391	0.0030
Ear length(cm)	0.09	0.06	0.0742	0.0561
Ear weight (g)	0.30	0.19	0.4881	0.2363
Straw weight (g)	0.04	0.02	0.0458	0.0221
1000 grain weight(g)	0.59	0.31	0.4012	0.5375
Carotene (mg/100g)	5.82	4.77	4.0748	2.3997
Crude protein (%)	0.14	0.12	0.0740	0.2050
Calcium content (mg/100g)	0.30	0.23	0.3330	0.3263
Grain yield/ plant (g)	0.10	0.03	-0.0298	0.0107

Among Indian genotypes high value of selection criterion was observed for GS 448(17.51) followed by GS 444(15.65), GS 442(15.6) and GS 449(14.65) during *rainy*2008 while in case of *spring* 2009, the high value was observed in Indian genotypes GS 440(22.51) followed by GS 450(22.16), GS 451(21.47) and GS 448(21.32). When several traits influence the net worth of an organism it is essential to know the proportionate contribution of the characters, if maximum progress under selection is made (Hazel and Lush, 1942). It

might sometimes be possible to get more rapid progress under selection for a correlated response than for selection for the desired character itself (Lerner, 1950).

Table 2: Selection criterion values for Indian genotypes in Italian millet [*Setaria italica* (L.)Beauv] in classical selection indices.

S.No	Genotypes	*rainy 2008*	*spring 2009*	S.No	Genotypes	*rainy 2008*	*spring 2009*
1	GS 436	13.72	18.40	10	GS 445	11.19	21.124
2	GS 437	13.12	18.69	11	GS 446	12.07	20.59
3	GS 438	12.10	19.79	12	GS 447	12.47	20.59
4	GS 439	10.93	18.69	13	GS 448	17.51	21.32
5	GS 440	11.93	22.51	14	GS 449	14.65	20.06
6	GS 441	13.82	20.22	15	GS 450	11.64	22.16
7	GS 442	15.6	16.80	16	GS 451	13.89	21.47
8	GS 443	13.31	19.77	17	GS 452	13.05	20.77
9	GS 444	15.65	20.72	18	GS 453	12.16	19.24

Table 3: Selection indices for different character combinations in Indian genotypes of Italian millet [*Setaria italica* (L.) Beauv] during rainy 2008.

S.No.	Character combination	Genetic advance	Relative efficiency over grain yield/plant
1	Grain Yield per plant (g) (X_1)	5.63	100.00
2	Days to 50% flowering (X_2)	1.45	25.70
3	Plant height (cm)(X_3)	10.33	183.34
4	Number of productive tillers per plant(X_4)	0.84	14.93
5	Ear length (cm)(X_5)	1.79	31.76
6	Ear weight (g)(X_6)	0.99	17.66
7	Carotene (mg/100g)(X_7)	0.40	7.16
8	1000 grain weight (g)(X_8)	0.04	0.71
9	Crude protein percent (mg/100g)(X_9)	0.84	14.95
10	Calcium content (mg/100g) (X_{10})	0.75	13.33
11	X_3X_4	15.77	279.92
12	$X_2X_5X_6$	16.80	298.20
13	$X_1X_2X_5X_6$	17.76	315.32
14	$X_1X_2X_4X_6X_7$	18.65	331.09
15	$X_1X_2X_3X_4X_6X_7$	19.50	346.22
16	$X_1X_2X_3X_4X_5X_9X_{10}$	19.72	350.12
17	$X_1X_2X_3X_4X_5X_6X_8X_{10}$	19.74	350.44
18	$X_1X_2X_3X_4X_5X_6X_7X_9X_{10}$	19.73	350.25
19	$X_1X_2X_3X_4X_5X_6X_7X_8X_9X_{10}$	19.48	344.86

A selection index of eight characters combination i.e., grain yield per plant, days to 50% flowering , plant height, number of productive tillers per plant, ear length, ear weight, crude protein content and calcium content had recorded high genetic advance and relative efficiency over grain yield per plant alone during *rainy* whereas selection index of nine characters combination i.e., grain yield per plant, days to 50% flowering , plant height, number of productive tillers per plant, ear length, ear weight, 1000 grain weight, crude protein content and calcium content had recorded high genetic advance and relative efficiency over grain yield per plant alone during *spring.* Classical selection indices may be given due weightage for simultaneous improvement in the respective groups. Robinson *et al.* (1951) reported in corn that when economic characters were considered the progress measured in terms of yield alone will be greater.

Table 4: Selection indices for different character combinations in Indian genotypes of Italian millet [*Setaria italica* (L.) Beauv] during rabi 2009.

S.No.	Character combination	Genetic advance	Relative efficiency over grain yield/plant
1	Grain Yield per plant (g) (X_1)	11.55	100.00
2	Days to 50% flowering (X_2)	2.35	20.31
3	Plant height (cm)(X_3)	10.34	89.56
4	Number of productive tillers per plant(X_4)	2.70	23.42
5	Ear length (cm)(X_5)	2.50	21.69
6	Ear weight (g)(X_6)	1.36	11.78
7	Carotene (mg/100g)(X_7)	0.34	2.90
8	1000 grain weight (g)(X_8)	0.05	0.47
9	Crude protein percent (mg/100g)(X_9)	0.77	6.67
10	Calcium content (mg/100g) (X_{10})	1.04	9.00
11	X_3X_4	17.47	151.21
12	$X_1X_3X_4$	19.46	108.50
13	$X_1X_2X_4X_5$	21.47	185.85
14	$X_1X_2X_3X_5X_6$	22.57	195.42
15	$X_1X_2X_3X_4X_6X_7$	23.38	202.46
16	$X_1X_2X_3X_4X_5X_7X_8$	23.42	202.81
17	$X_1X_2X_3X_4X_5X_6X_8X_9$	23.45	203.01
18	$X_1X_2X_3X_4X_5X_6X_8X_9X_{10}$	23.46	203.08
19	$X_1X_2X_3X_4X_5X_6X_7X_8X_9X_{10}$	23.36	202.28

In the present study inclusion of characters one by one in the function gave almost the similar changes in genetic advance in both groups. Similar results were earlier reported by Shankar *et al.*(1963), Mahadevappa *et al.* (1965), Gian Singh(1974), Dhagat *et al.* (1977), Mishra *et al.* (1983), Basavaraja and sheriff (1992) Bhat and Shariff (1994).

CONCLUSION:

The results of classical selection indices indicated that in Indian genotypes GS 448, GS 444, GS 442, and GS 449 for *rainy* and GS 440, GS 450, GS 451 and GS 448 for *spring* are to be preferred. In general, the indices, which include more than one character, gave high genetic advance suggesting the utility of selection index for simultaneous improvement of several characters. A selection index of eight characters combination had recorded high genetic advance and relative efficiency over grain yield per plant alone during *rainy* whereas selection index of nine characters combination had recorded high genetic advance and relative efficiency over grain yield per plant alone during *spring.* Classical selection indices may be used for simultaneous improvement in respective groups.

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