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International Journal of Current Research
Vol. 9, Issue, 07, pp.53864-53869, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

CONSTRUCTION OF SELECTION INDEX USING SIMPLE CORRELATION COEFFICIENTS AND PATH COEFFICIENTS (DIRECT EFFECTS) AS A WEIGHT IN RICE (*ORYZA SATIVA* L.)

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ARTICLE INFO

Article History:
Received 12th April, 2017
Received in revised form
09th May, 2017
Accepted 28th June, 2017
Published online 26th July, 2017

Key words:

Selection index, Rice,
Yield contributing characters,
Per cent relative efficiency,
Simple correlation coefficients,
Path coefficients,
Score value,
Spearman's rank correlation.

ABSTRACT

The present study was conducted with sixty three diverse genotypes of rice (*Oryza sativa* L.) at Main Rice Research Station (MRRS), Nawagam, Gujarat during *kharif* season of 2011 to assess the relationship and selection index among yield and yield attributing characters. Total six characters were used for construction of selection indices i.e. Grain yield per plant, plant height, panicle length, number of productive tillers per plant, 1000 grain weight and harvest index. Two different weight methods were used for this study like simple correlation coefficients and path coefficients (Direct effects). The analysis of variance revealed that the presence of considerable amount of variation among the test of genotypes for all the characters. The simple correlation study revealed that harvest index, number of productive tillers per plant and 1000 grain weight had positive and highly significant correlation with grain yield per plant. The path analysis results showed that number of productive tillers per plant had the highest direct effect on grain yield per plant followed by 1000 grain weight, harvest index, panicle length and plant height. Results of selection indices showed that a progressive increase in the efficiency of selection was observed with the inclusion of additional character in the selection index. Selection index (I_{123456}) which was combinations of grain yield per plant, plant height, panicle length, number of productive tillers per plant, 1000 grain weight and harvest index had highest per cent relative efficiency (PRE) among all the indices including rice grain yield per plant for simple correlation coefficients and path coefficients weight method. Looking to simplicity, selection index (I_{256}) which was combinations of plant height, 1000 grain weight and harvest index showed highest PRE and it was suggested to use for selection of genotypes for rice grain improvement without grain yield per plant.

Citation: Chaudhary, A. P., Parmar, D. J., Muniya, S. D. and Darji, V. B. 2017. "Construction of selection index using simple correlation coefficients and path coefficients (direct effects) as a weight in rice (*Oryza sativa* L.)", *International Journal of Current Research*, 9, (07), 53864-53869.

INTRODUCTION

The cultivated rice plant (*Oryza sativa* L.) is an important annual, self-pollinated, diploid (2n=2x=24) cereal crop species. It is the staple food for more than one half of the world's population. Rice is life and princess among the cereals and the staple food of 65 per cent of the total population in India. The total area under rice in India is about 45 m ha. (22 % of cropped area) with an annual production of 104.8 million tones and contributes 25 % to total Agricultural GDP. While in case of Gujarat, it occupies about 5 % of the gross cropped area and it is grown on about 7.8 lakh hectares. From these area nearly 55 to 60 % area comprised of lowland and 40 to 45 % of upland situation. The use of a selection index was first proposed by Smith (1937) based on the Fisher's (1936) concept of discriminant function. Hazel (1943) constructed selection index based on path coefficients. The aim of most breeding programmes is simultaneous improvement of several characters. It has been recognized that most rapid improvement in the economic value is expected from selection applied simultaneously to all the characters which determine the economic value of a plant, when appropriate weights are assigned to each character according to their relative economic importance. There is no standard procedure to assign weights to the biometrical characters in selection index. Therefore, an attempt has been made to construct selection index by taking simple correlation coefficients and path coefficients (Direct effects) as weight. The objectives of this study were to construct selection indices, compare different weights and test the efficiency of selection indices.

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MATERIALS AND METHODS

The investigation was conducted at Main Rice Research station (MRRS), Nawagam, Anand Agricultural University, Anand during *kharif* season of the year 2011. A set of 63 diverse genotypes of rice was laid out in randomized complete block design with three replications. The observations on grain yield and its component character were recorded from five randomly selected competitive plants for each treatment in each replication and the average values per plant were computed. Six characters were studied for this investigation i.e. grain yield (g/plant), plant height (cm), panicle length (cm), number of productive tillers per plant, 1000 grain weight (g) and harvest index. Two different weight methods were used for this study like simple correlation coefficients and path coefficients (Direct effects). A total of 63 selection indices were constructed by discriminant function techniques. The genetic gain for grain yield per plant with equal weight method was considered as base in all single as well as combination of characters. Relative to this, the per cent relative efficiency (PRE) was worked out for all the indices.

RESULTS AND DISCUSSION

The analysis of variance results are presented in Table 1. The results presented in ANOVA indicated that variation among different genotypes for six different characters was found highly significant. Highly significant differences of genotypes observed in respect of all the six characters were also reported by Mustufa & Elsheikh (2007) and Tuwar *et al.* (2013) in rice.

The simple correlation coefficients between grain yield per plant and its component characters among themselves were estimated and presented in Table 2.The simple correlation coefficients revealed that the grain yield had positive and highly significant correlation with harvest index number of productive tillers per plant and 1000 grain weight. Plant height had positive and highly significant association with 1000 grain weight. Rest of the correlation coefficients were non-significant. Positive and significant correlation between grain yield and number of productive tillers per plant as observed in this study was also reported by Oad *et al.* (2002), Chandra *et al.* (2009) and Rao *et al.* (2011). The positive and significant correlation between grain yield and 1000 grain weight observed in this study was also reported by Oad *et al.* (2002) and Mustafa & Elsheikh (2007).

Grain yield per plant is the result of direct effect of a particular causal variable and indirect effect via other yield related characters. Path coefficient analysis is used to know the

Table 1. ANOVA for yield and its component characters in rice

Characters	Sources of variation	Degree of freedom	Sum of square (SS)	Mean sum of square (MS)	Cal F
Grain yield per plant	Replications	2	2.52	1.26	0.31
	Genotypes	62	2433.67	39.25	9.68**
	Error	124	502.49	4.05	-
	Total	188	2938.68	-	-
Plant height	Replications	2	39.34	19.67	0.61
	Genotypes	62	77679.77	1252.89	39.43**
	Error	124	3939.40	31.77	-
	Total	188	81658.52	-	-
Panicle length	Replications	2	1.61	0.81	0.61
	Genotypes	62	938.17	15.13	11.44**
	Error	124	163.94	1.32	-
	Total	188	1103.73	-	-
No. of productive tillers per plant	Replications	2	0.57	0.29	0.85
	Genotypes	62	198.26	3.19	9.45**
	Error	124	41.96	0.34	-
	Total	188	240.79	-	-
1000 grain weight	Replications	2	3.32	1.66	1.69
	Genotypes	62	1866.90	30.11	30.60**
	Error	124	121.98	0.98	-
	Total	188	1992.21	-	-
Harvest index	Replications	2	41.20	20.60	1.63
	Genotypes	62	5641.43	90.99	7.22**
	Error	124	1561.01	12.59	-
	Total	188	7243.64	-	-

** Significant at p<0.01

Table 2. Simple correlation coefficients between different characters ofrice genotypes

Characters	GY	PLH	PL	NOPT	TW	HI
GY	1.0000	0.1237	0.2287	0.4468**	0.4410**	0.5302**
PLH		1.0000	0.1492	0.0051	0.3503**	-0.2103
PL			1.0000	0.0536	0.1235	-0.0283
NOPT				1.0000	-0.1914	0.1799
TW					1.0000	0.1960
HI						1.0000

** Significant at p<0.01 level; n = 63

Where, **GY**: Grain yield per plant, **PLH**: Plant height, **PL**: Panicle length, **NOPT**: Number of productive tillers per plant, **TW**: 1000 grain weight, **HI**: Harvest index

Table 3. The direct (diagonal) and indirect (off diagonal) effects of causal characters of rice genotypes on ricegrain yield

Sr. No.	Characters	PLH	PL	NOPT	TW	HI	Correlation with GY
1	PLH	0.0323	0.0236	0.0023	0.1480	-0.0826	0.1237
2	PL	0.0048	0.1582	0.0242	0.0522	-0.0107	0.2287
3	NOPT	0.0002	0.0085	0.4511	-0.0809	0.0680	0.4468**
4	TW	0.0113	0.0195	-0.0864	0.4225	0.0740	0.4410**
5	HI	-0.0071	-0.0045	0.0812	0.0828	0.3778	0.5302**

** Significant at p<0.01 level

contribution of several characters towards grain yield. The path analysis will provide better valuable information for the selection of important characters in grain yield improving programs. The direct and indirect effects of five causal variables on the rice grain yield per plant are given in the Table 3.The results of path analysis revealed that among different characters, number of productive tillers per plant had the highest direct effect followed by 1000 grain weight, harvest index and panicle length. Plant height had negligible direct-effect on rice grain yield. The character having high direct effect are having higher influence in yield. Most of the indirect effects via other characters were more or less very small indicating least indirect influence in rice grain yield. Positive and highest direct effect of number of productive tillers per plant, 1000 grain weight and harvest index on grain yield of rice in present study were also reported by Chandra *et al.* (2009), Hasan *et al.* (2010) and Jha *et al.* (2016).

Table 4. Selection indices with their genetic gain and per cent relative efficiency (PRE) with simple correlation coefficients weight method (W_1)

Sr. No.	Indices	Equations	Genetic Gain	PRE
1	I_1	$I=0.743X_1$	6.0836	100.00
2	I_2	$I=0.115X_2$	4.963	81.39
3	I_3	$I=0.178X_3$	0.892	14.64
4	I_4	$I=0.33X_4$	0.772	12.69
5	I_5	$I=0.4X_5$	2.697	44.34
6	I_6	$I=0.358X_6$	4.585	75.40
7	I_{12}	$I=0.741X_1+0.119X_2$	8.381	137.78
8	I_{13}	$I=0.74X_1+0.285X_3$	6.465	106.28
9	I_{14}	$I=0.738X_1+0.391X_4$	6.489	106.67
10	I_{15}	$I=0.712X_1+0.531X_5$	7.945	130.61
11	I_{16}	$I=0.801X_1+0.372X_6$	9.770	160.61
12	I_{23}	$I=0.115X_2+0.176X_3$	5.175	85.08
13	I_{24}	$I=0.115X_2+0.307X_4$	5.004	82.26
14	I_{25}	$I=0.116X_2+0.417X_5$	6.501	106.86
15	I_{26}	$I=0.102X_2+0.338X_6$	5.603	92.11
16	I_{34}	$I=0.182X_3+0.338X_4$	1.229	20.21
17	I_{35}	$I=0.181X_3+0.404X_5$	2.963	48.71
18	I_{36}	$I=0.149X_3+0.356X_6$	4.615	75.86
19	I_{45}	$I=0.289X_4+0.39X_5$	2.603	42.80
20	I_{46}	$I=0.38X_4+0.357X_6$	4.805	78.99
21	I_{56}	$I=0.444X_5+0.354X_6$	5.862	96.37
22	I_{123}	$I=0.739X_1+0.118X_2+0.281X_3$	8.747	143.78
23	I_{124}	$I=0.739X_1+0.119X_2+0.366X_4$	8.676	142.61
24	I_{125}	$I=0.705X_1+0.114X_2+0.556X_5$	10.347	170.07
25	I_{126}	$I=0.826X_1+0.105X_2+0.346X_6$	10.694	175.78
26	I_{134}	$I=0.733X_1+0.289X_3+0.397X_4$	6.859	112.75
27	I_{135}	$I=0.711X_1+0.278X_3+0.527X_5$	8.283	136.16
28	I_{136}	$I=0.805X_1+0.238X_3+0.37X_6$	9.979	164.02
29	I_{145}	$I=0.691X_1+0.491X_4+0.541X_5$	8.192	134.65
30	I_{146}	$I=0.804X_1+0.327X_4+0.372X_6$	10.100	166.02
31	I_{156}	$I=0.769X_1+0.542X_5+0.369X_6$	11.304	185.81
32	I_{234}	$I=0.115X_2+0.181X_3+0.316X_4$	5.238	86.10
33	I_{235}	$I=0.116X_2+0.176X_3+0.42X_5$	6.727	110.58
34	I_{236}	$I=0.103X_2+0.162X_3+0.337X_6$	5.754	94.58
35	I_{245}	$I=0.117X_2+0.273X_4+0.404X_5$	6.457	106.13
36	I_{246}	$I=0.102X_2+0.379X_4+0.337X_6$	5.778	94.98
37	I_{256}	$I=0.098X_2+0.509X_5+0.326X_6$	7.446	122.40
38	I_{345}	$I=0.187X_3+0.298X_4+0.393X_5$	2.898	47.64
39	I_{346}	$I=0.152X_3+0.393X_4+0.354X_6$	4.845	79.64
40	I_{356}	$I=0.145X_3+0.451X_5+0.351X_6$	5.947	97.76
41	I_{456}	$I=0.364X_4+0.437X_5+0.354X_6$	5.940	97.64
42	I_{1234}	$I=0.735X_1+0.118X_2+0.285X_3+0.371X_4$	9.037	148.54
43	I_{1235}	$I=0.703X_1+0.113X_2+0.278X_3+0.554X_5$	10.677	175.51
44	I_{1236}	$I=0.83X_1+0.104X_2+0.242X_3+0.343X_6$	10.953	180.04
45	I_{1245}	$I=0.683X_1+0.113X_2+0.492X_4+0.567X_5$	10.532	173.13
46	I_{1246}	$I=0.835X_1+0.104X_2+0.284X_4+0.345X_6$	10.993	180.70
47	I_{1256}	$I=0.785X_1+0.097X_2+0.604X_5+0.335X_6$	12.559	206.44
48	I_{1345}	$I=0.689X_1+0.284X_3+0.492X_4+0.537X_5$	8.528	140.18
49	I_{1346}	$I=0.807X_1+0.241X_3+0.328X_4+0.37X_6$	10.308	169.44
50	I_{1356}	$I=0.774X_1+0.229X_3+0.54X_5+0.366X_6$	11.514	189.27
51	I_{1456}	$I=0.757X_1+0.431X_4+0.545X_5+0.369X_6$	11.539	189.67
52	I_{2345}	$I=0.117X_2+0.182X_3+0.283X_4+0.407X_5$	6.693	110.01
53	I_{2346}	$I=0.102X_2+0.166X_3+0.39X_4+0.335X_6$	5.934	97.55
54	I_{2356}	$I=0.099X_2+0.154X_3+0.514X_5+0.324X_6$	7.610	125.09
55	I_{2456}	$I=0.098X_2+0.404X_4+0.505X_5+0.324X_6$	7.501	123.30
56	I_{3456}	$I=0.149X_3+0.382X_4+0.446X_5+0.351X_6$	6.033	99.16
57	I_{12345}	$I=0.681X_1+0.112X_2+0.284X_3+0.495X_4+0.566X_5$	10.864	178.58
58	I_{12346}	$I=0.839X_1+0.104X_2+0.244X_3+0.284X_4+0.342X_6$	11.252	184.95
59	I_{12356}	$I=0.79X_1+0.096X_2+0.236X_3+0.603X_5+0.332X_6$	12.808	210.53
60	I_{12456}	$I=0.769X_1+0.097X_2+0.455X_4+0.61X_5+0.336X_6$	12.767	209.86
61	I_{13456}	$I=0.762X_1+0.235X_3+0.428X_4+0.542X_5+0.367X_6$	11.751	193.15
62	I_{23456}	$I=0.098X_2+0.157X_3+0.42X_4+0.511X_5+0.321X_6$	7.672	126.10
63	I_{123456}	$I=0.774X_1+0.096X_2+0.242X_3+0.454X_4+0.608X_5+ 0.333X_6$	13.017	213.98

The selection indices with their expected genetic advance and per cent relative efficiency are presented in Table 4 and 5 with simple correlation coefficients (W_1) and path coefficients (Direct effects) as a weight (W_2), respectively. The genetic gain for rice grain yield per plant (6.0836) with W_1 method was considered as a base in all single as well as combinations of characters. Relative to this, the efficiency was worked out for selection of single character for different methods. The results revealed that a progressive increase in the efficiency of selection was observed with the inclusion of additional character in the selection index.

Grain yield per plant had a highest PRE (100) for both the weight methods among all the single characters. Index (I_{16}), which was combinations of grain yield per plant and harvest index had the highest PRE (160.61 and 141.72, respectively for W_1 and W_2) for two characters combinations. Index (I_{156}) which was combinations of grain yield per plant, 1000 grain weight and harvest index showed highest PRE (185.81 and 167.08, respectively for W_1 and W_2) among all the indices of combinations of three characters. When plant height added to the index (I_{156}), it showed the highest PRE (206.44 and 171.72, respectively for W_1 and W_2) among all the indices of four characters combinations.

Table 5. Selection indices with their genetic gain and per cent relative efficiency (PRE) with path coefficients (Direct effects) weight method (W_2)

Sr. No.	Indices	Equations	Genetic Gain	PRE
1	I_1	$I=0.743X_1$	6.083	100.00
2	I_2	$I=0.03X_2$	1.292	21.25
3	I_3	$I=0.123X_3$	0.616	10.13
4	I_4	$I=0.333X_4$	0.779	12.81
5	I_5	$I=0.384X_5$	2.584	42.48
6	I_6	$I=0.255X_6$	3.268	53.73
7	I_{12}	$I=0.741X_1+0.034X_2$	6.401	105.23
8	I_{13}	$I=0.737X_1+0.231X_3$	6.343	104.28
9	I_{14}	$I=0.738X_1+0.394X_4$	6.493	106.74
10	I_{15}	$I=0.712X_1+0.514X_5$	7.859	129.20
11	I_{16}	$I=0.776X_1+0.277X_6$	8.621	141.72
12	I_{23}	$I=0.03X_2+0.122X_3$	1.522	25.03
13	I_{24}	$I=0.03X_2+0.327X_4$	1.503	24.71
14	I_{25}	$I=0.032X_2+0.384X_5$	3.312	54.45
15	I_{26}	$I=0.021X_2+0.247X_6$	3.130	51.46
16	I_{34}	$I=0.127X_3+0.339X_4$	1.035	17.02
17	I_{35}	$I=0.126X_3+0.386X_5$	2.744	45.11
18	I_{36}	$I=0.103X_3+0.254X_6$	3.286	54.02
19	I_{45}	$I=0.294X_4+0.373X_5$	2.495	41.02
20	I_{46}	$I=0.369X_4+0.254X_6$	3.512	57.74
21	I_{56}	$I=0.415X_5+0.252X_6$	4.634	76.19
22	I_{123}	$I=0.736X_1+0.033X_2+0.227X_3$	6.668	109.61
23	I_{124}	$I=0.736X_1+0.034X_2+0.39X_4$	6.791	111.62
24	I_{125}	$I=0.71X_1+0.03X_2+0.521X_5$	8.270	135.94
25	I_{126}	$I=0.785X_1+0.026X_2+0.268X_6$	8.695	142.92
26	I_{134}	$I=0.73X_1+0.235X_3+0.402X_4$	6.746	110.89
27	I_{135}	$I=0.707X_1+0.224X_3+0.51X_5$	8.090	132.98
28	I_{136}	$I=0.773X_1+0.201X_3+0.277X_6$	8.785	144.40
29	I_{145}	$I=0.69X_1+0.497X_4+0.525X_5$	8.114	133.38
30	I_{146}	$I=0.776X_1+0.351X_4+0.277X_6$	8.974	147.50
31	I_{156}	$I=0.744X_1+0.523X_5+0.274X_6$	10.164	167.08
32	I_{234}	$I=0.03X_2+0.127X_3+0.333X_4$	1.730	28.43
33	I_{235}	$I=0.032X_2+0.123X_3+0.386X_5$	3.478	57.16
34	I_{236}	$I=0.022X_2+0.112X_3+0.246X_6$	3.189	52.42
35	I_{245}	$I=0.032X_2+0.287X_4+0.372X_5$	3.241	53.28
36	I_{246}	$I=0.021X_2+0.373X_4+0.246X_6$	3.383	55.60
37	I_{256}	$I=0.02X_2+0.446X_5+0.24X_6$	4.823	79.27
38	I_{345}	$I=0.133X_3+0.3X_4+0.375X_5$	2.676	43.99
39	I_{346}	$I=0.106X_3+0.378X_4+0.253X_6$	3.541	58.20
40	I_{356}	$I=0.101X_3+0.42X_5+0.25X_6$	4.699	77.24
41	I_{456}	$I=0.346X_4+0.407X_5+0.253X_6$	4.695	77.17
42	I_{1234}	$I=0.73X_1+0.033X_2+0.232X_3+0.397X_4$	7.050	115.89
43	I_{1235}	$I=0.705X_1+0.029X_2+0.225X_3+0.519X_5$	8.505	139.80
44	I_{1236}	$I=0.783X_1+0.025X_2+0.204X_3+0.268X_6$	8.872	145.84
45	I_{1245}	$I=0.688X_1+0.029X_2+0.498X_4+0.533X_5$	8.511	139.90
46	I_{1246}	$I=0.787X_1+0.025X_2+0.338X_4+0.268X_6$	9.043	148.64
47	I_{1256}	$I=0.752X_1+0.019X_2+0.552X_5+0.259X_6$	10.364	170.36
48	I_{1345}	$I=0.685X_1+0.23X_3+0.501X_4+0.521X_5$	8.344	137.16
49	I_{1346}	$I=0.771X_1+0.205X_3+0.357X_4+0.277X_6$	9.136	150.17
50	I_{1356}	$I=0.743X_1+0.192X_3+0.52X_5+0.273X_6$	10.325	169.72
51	I_{1456}	$I=0.728X_1+0.458X_4+0.528X_5+0.275X_6$	10.410	171.12
52	I_{2345}	$I=0.033X_2+0.129X_3+0.293X_4+0.374X_5$	3.421	56.24
53	I_{2346}	$I=0.021X_2+0.116X_3+0.38X_4+0.245X_6$	3.449	56.69
54	I_{2356}	$I=0.02X_2+0.108X_3+0.449X_5+0.239X_6$	4.911	80.72
55	I_{2456}	$I=0.02X_2+0.369X_4+0.439X_5+0.24X_6$	4.877	80.16
56	I_{3456}	$I=0.106X_3+0.358X_4+0.412X_5+0.251X_6$	4.766	78.34
57	I_{12345}	$I=0.682X_1+0.028X_2+0.231X_3+0.504X_4+0.532X_5$	8.746	143.76
58	I_{12346}	$I=0.784X_1+0.024X_2+0.208X_3+0.342X_4+0.267X_6$	9.219	151.54
59	I_{12356}	$I=0.751X_1+0.018X_2+0.199X_3+0.551X_5+0.258X_6$	10.535	173.17
60	I_{12456}	$I=0.733X_1+0.019X_2+0.475X_4+0.56X_5+0.26X_6$	10.604	174.31
61	I_{13456}	$I=0.726X_1+0.198X_3+0.459X_4+0.525X_5+0.274X_6$	10.572	173.78
62	I_{23456}	$I=0.02X_2+0.112X_3+0.38X_4+0.443X_5+0.238X_6$	4.972	81.73
63	I_{123456}	$I=0.731X_1+0.018X_2+0.205X_3+0.478X_4+0.559X_5+ 0.259X_6$	10.7769	177.15

Selection index (I_{12356}) which was combinations of grain yield per plant, plant height, panicle length, 1000 grain weight and harvest index showed highest PRE for W_1, method while, index (I_{12456}) showed highest PRE for W_2 methods which was combinations of grain yield per plant, plant height, number of productive tillers per plant, 1000 grain weight and harvest index five characters combinations.

Table 6. Selection score values and ranks of rice genotypes based on best selection index for respective weight methods including grain yield per plant

Sr. No.	Genotypes	Score value	
		Corr. Wt.	PathWt.
1.	Baska-1	60.15(40)	42.93(39)
2.	Choria Chettari	71.55(4)	48.68(13)
3.	Dabhoda local	63.18(28)	45.79(25)
4.	Dang futia local	66.65(12)	46.87(21)
5.	Dang hario local	68.00(7)	49.98(6)
6.	HB-1	55.51(52)	41.33(47)
7.	Kada local	63.82(21)	47.03(20)
8.	Kalo vanklo	63.96(20)	45.59(27)
9.	Kolorado	59.12(44)	41.36(46)
10.	Lal vanklo	61.68(34)	43.95 (35)
11.	Lal fotari local	60.59(39)	45.37(29)
12.	Mane deshi utavari	61.53(35)	43.77(36)
13.	Mehsana sutarsal	57.01(50)	40.23(51)
14.	IET-18940	58.70(45)	40.33(50)
15.	Mehsana vani	65.35(17)	48.31(16)
16.	Nawagam-5	53.36(59)	34.89(63)
17.	Niriya-5	54.77(56)	39.62(53)
18.	Panchmahal dabhoda	56.94(51)	40.04(52)
19.	Pataniu	63.79(22)	47.13(19)
20.	Saria	61.96(33)	43.10(38)
21.	SKL-5-11-1-62	62.87(29)	44.80(32)
22.	Surat bhadaravi	57.85(48)	40.53(49)
23.	Surat futia	63.57(26)	45.59(26)
24.	Tapkhira	63.68(25)	44.25(34)
25.	Tuljapur-1	59.43(43)	41.23(48)
26.	Vadodara ankali	65.07(18)	47.20(18)
27.	Vankvel	67.57(9)	49.07(10)
28.	ARC-5752	66.41(13)	48.53(14)
29.	ARC-10239	67.53(10)	48.12(17)
30.	BTS-24	63.28(27)	44.87(31)
31.	LST-77	60.85(38)	42.58(42)
32.	Mudgo	76.70(2)	54.89(1)
33.	Pokali	77.10(1)	53.64(5)
34.	Setail	52.24(62)	38.25(58)
35.	IET-21224	52.90(61)	36.48(60)
36.	IET-21617	57.74(49)	42.53(43)
37.	IET-22094	53.18(60)	35.25(62)
38.	IET-22127	61.02(36)	41.48(45)
39.	IET-22128	67.19(11)	48.96(12)
40.	IET-22129	54.80(54)	38.24(59)
41.	IET-22130	55.29(53)	39.32(54)
42.	IET-22131	61.00(37)	45.20(30)
43.	IR 68652-3B-81	63.72(24)	46.15(23)
44.	IR 68652-3B-11-2	59.89(41)	43.41(37)
45.	IR 68652-3B-22-3	58.38(47)	42.71(41)
46.	IR 68652-3B-10-3	63.76(23)	45.80(24)
47.	IR 68654-3B-1-2	65.86(16)	49.34(8)
48.	IR 68654-3B-2-3	62.81(30)	45.39(28)
49.	IR 68654-3B-6-1	70.14(6)	54.03(4)
50.	IR 68654-3B-9-1	73.30(3)	54.43(3)
51.	IR 68657-3B-15-2	58.57(46)	42.84(40)
52.	IR 70868-B-P-14-1	54.01(57)	39.14(56)
53.	IR 70868-B-P-19-2	53.52(58)	38.70(57)
54.	IR 70868-B-P-30-3	66.11(14)	49.17(9)
55.	IR 70869-B-P-10-2	64.43(19)	48.99(11)
56.	IR 70869-B-P-16-2	62.40(31)	44.62(33)
57.	IR 70869-B-P-18-2	59.55(42)	41.63(44)
58.	IR 70870-B-P-3-2	67.67(8)	49.74(7)
59.	IR 81429-B-31	65.98(15)	48.48(15)
60.	GR-7 (White)	62.17(32)	46.16(22)
61.	GR-12 (White)	54.80(55)	39.26(55)
62.	GAR-13 (White)	48.77(63)	35.43(61)
63.	Gurjari (White)	71.00(5)	54.76(2)

Parenthesis value indicates rank of genotypes

Combinations of all the six characters increased the PRE than five characters combinations. It was observed that simple correlation coefficients taken as a weight had more PRE than path coefficients (Direct effects) taken as a weight. From above study this may be observed that index (I_{123456}) had the highest per cent relative efficiency in two weight methods, which was combinations of grain yield per plant, plant height, panicle length, number of productive tillers per plant,1000 grain weight and harvest index. It was observed that selection of many characters create difficulty at many stage and it was not maintained properly. So, looking to the simplicity of assigning weight and to get higher genetic gain and PRE, Index (I_{256}) is suggested to select the genotypes for rice grain yield improvement which was combinations of plant height, 1000 grain weight and harvest index.

The score values of the genotypes were calculated with the best selection index of the respective weight methods (Table 6). In this study, index (I_{123456}) considered as best for the both weight methods and score value of individual genotypes were calculated and ranked them based on their score value. It was observed that rank of genotypes were more or less similar for W_1 and W_2 weight methods which was depicted in Fig. 1.

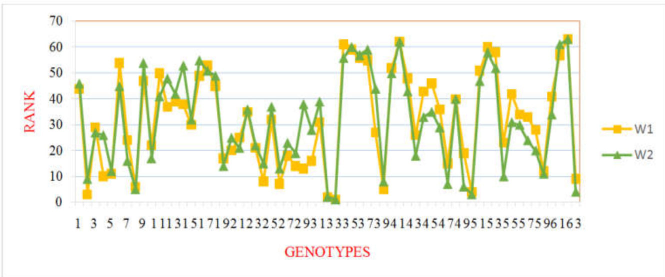

Fig.1. Comparison of ranking of genotypes with W_1 and W_2 methods for best selection index with rice grain yield per plant

Table 7. Rank correlations between different weight methods based on best selection index of respective weight methodsincluding rice grain yield per plant

Weight	Corr .Wt.	Path Wt.
Corr .Wt.	1.000	0.997**
Path Wt.		1.000

**Significant at p< 0.01; n = 63

The spearman's rank correlation was calculated for among the ranks of selection index score values of genotypes according to different weight methods. The correlation coefficients are given in Table 7.The spearman's rank correlation study revealed that both weight methods had nearly perfect positive correlation ($r_s \geq 0.997$) indicated that these two weight methods had more or less similar ranking of genotypes based on the best selection index.

Conclusion

It was observed that index having combinations of all the six characters gave the highest per cent relative efficiency (PRE) in two weight methods but, selection of many characters create difficulty at many stage and it was not maintained properly. So, looking to the simplicity of assigning weight and to get higher genetic gain and PRE, Index (I_{256}) is suggested to select the genotypes for rice grain yield improvement which was combinations of plant height, 1000 grain weight and harvest index.

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