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EVALUATION OF SOME SELECTION CRITERIA IN RAGI

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ABSTRACT

Four selection criteria for yield were evaluated in ragi (*Eleusine coracana* Gaertn). In an initial trial, 42 lines were evaluated for yield and its components. Moderate to high heritability and predicted advance for most characters indicated ample scope for selection. Fifteen lines were selected based on four criteria, i.e., selection index (SC-I), rank total of different characters (SC-II), single-plant yield (SC-III), and plot yield (SC-IV). The selected lines were evaluated in the test trial and the relative efficiency of the selection criteria assessed by comparison of group mean yield and rank correlation. Both the methods brought out the same order of superiority of the selection criteria, which was SC-I > SC-III > SC-II > SC-IV. But the differences in efficiency were marginal and none of the criteria was wholly satisfactory. Selection index and direct selection on yield could be used concurrently to achieve the desired result.

Key words: *Eleusine coracana*, ragi, selection criteria, selection index.

Most plant breeding programmes involve selection of high yielding genotypes. But selection on the basis of yield per se in the initial stages of evaluation, is often not effective owing to the low heritability of the character. Smith [1] suggested the use of selection index which provides a means for making use of correlated characters for higher efficiency in selection for yield. Mahadevappa and Ponnaiya [2] constructed a selection index for yield in ragi, but its efficiency was not assessed. Mishra and Patnaik [3] observed no significant difference in the efficiency of the selection index and direct selection for yield in this crop. The present study aims to assess the relative efficiency of some selection criteria, including selection index for yield in ragi.

MATERIALS AND METHODS

The material consisted of 42 mutant lines developed from a white ragi variety, Co 9. Two trials were conducted, one with all the 42 lines, and the other with 15 selected lines.

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The former, called here as the initial evaluation trial (IET), was conducted in the rainy season of 1987, and the latter, termed as the test trial (TT), was conducted in winter, 1987–88. The trials were laid out in RBD with three replications. The IET plot consisted of 3 rows and the TT plot of 6 rows, each of 3.5 m length. Both trials were transplanted at 25 cm x 10 cm spacing, fertilized @ 40 kg N and 20 kg each of P_2O_5 and K_2O per hectare, irrigated as per need, and protected against diseases and insect pests. In the IET, observations were recorded on plant height, tillers/plant, fingers/ear, finger length, 500-grain weight and single-plant yield from 10 random plants/plot, and on days to heading and maturity on plot basis, besides the net plot yield. In the TT, only the net plot yield was recorded. Analysis of variance and covariance of the IET data was carried out on plot means and selection indices with different character combinations constructed as per Smith [1]. Out of the 42 lines tested in IET, 10 were selected based on four different criteria: 1) indirect selection on the basis of the selection index showing the highest predicted genetic advance for yield (SC-I), 2) indirect selection on the basis of rank total with equal weightage to each of the characters, including yield (SC-II), 3) direct selection on the basis of single-plant yield (SC-III), and 4) direct selection on the basis of net plot yield (SC-IV). With some lines getting selected by more than one criterion, altogether 15 lines were selected which constituted the entries of the test trial.

The relative efficiency of the selection criteria was assessed by comparison of the mean yields of the groups of lines selected by different criteria and also through rank correlation between criterion ranks in IET and yield ranks in TT of each group of selected lines. The rank correlations were estimated following Snedecor and Cochran [4] and their significance tested by t test.

RESULTS AND DISCUSSION

Significant differences among the lines were observed for all the characters except tillers/plant in the IET. Heritability estimates ranged from 3.9% for tiller number to 95.3% for days to heading, and predicted genetic advance (expressed as percentage of population mean) at 5% selection intensity, ranged from 0.59% for tiller number to 20.51% for single-plant yield. Heritability and predicted genetic advance were moderate to high for most of the characters, indicating substantial variability among the lines and ample scope for selection.

A comparative evaluation of the lines selected on different criteria would provide a means for assessing the relative efficiency of the selection criteria. This was the rationale behind the test trial. Analysis of variance and F test revealed significant differences among the lines for yield in TT. The coefficient of error variation for yield in TT was 5.09%, indicating good degree of precision in yield evaluation. Mean yields of the lines in TT ranged from 1.15 to 1.49 kg/plot (Table 1). The highest-yielding line (Co.9-1-1) was derived from SC-I and SC-III, and the lowest-yielding line (Co-9-C-2) from SC-IV.

Relative efficiency of the selection criteria, as judged by group means for yield in TT, showed selection index (SC-I) to be the best, followed by single-plant yield (SC-III), rank total (SC-II) and plot yield (SC-IV) in that order (Table 2). The first three (SC-I, SC-III, SC-II) were statistically at par with each other, but SC-I and SC-III were significantly superior to SC-IV. Rank correlation coefficients between the criterion ranks in IET and yield ranks in TT of the groups of lines selected on different criteria, ranged from 0.04 to 0.39. None of the rank correlations was statistically significant. However, relative to SC-I, which gave the highest rank correlation, the efficiency levels of SC-II, SC-III and SC-IV in terms of rank correlation were 35.3, 43.6 and 11.3%, respectively, compared to 100% of SC-I. Both rank correlations and group mean yield in TT brought out the same order of superiority of the selection criteria, i.e., SC-I > SC-III > SC-II > SC-IV. But, rank correlations reflected larger differences in efficiency of the selection criteria. In a comparison of five methods of selection for yield in oats, Eagles and Frey [5] found index selection to be most efficient, whereas Mishra and Patnaik [3] observed no significant difference in efficiency of index and direct selection for yield in ragi. The present results indicated superiority of index selection over other methods, though the difference appeared to be marginal. It would be worthwhile to use a selection index based on several characters including yield as a complement to direct selection on yield per se at the initial stages of evaluation.

Table 1. Mean yields (kg/plot) in the test trial of the lines selected by different criteria in ragi

Line	Yield under different selection criteria			
	SC-I	SC-II	SC-III	SC-IV
Co. 9-C-2	—	—	—	1.15
Co. 9-1-1	1.49	—	1.49	—
Co. 9-5-2	1.27	1.27	1.27	—
Mut. 16-C-1	1.25	1.25	—	1.25
Mut. 16-1-1	1.20	1.20	1.20	1.20
Mut. 16-2-1	1.30	1.30	1.30	—
Mut. 16-2-2	—	—	—	1.19
Mut. 16-3-2	—	1.28	1.28	1.28
Mut. 16-4-1	1.38	1.38	—	1.38
Mut. 16-4-2	1.19	1.19	1.19	1.19
Mut. 16-6-2	—	—	1.20	—
Mut. 18-C-2	1.19	1.19	1.19	1.19
Mut. 18-1-2	1.25	1.25	1.25	1.25
Mut. 18-4-1	1.22	1.22	1.22	—
Mut. 18-4-2	—	—	—	1.33

Plot size 3.3 m^2; CD at 5% 0.091 kg.

Table 2. Group mean yield of selected lines, rank correlation between ranks in IET and TT, and relative efficiency of four selection criteria in ragi

Selection criterion	Group mean yield in TT (kg/plot)	Relative efficiency (%)	Rank correlation	Relative efficiency (%)
Selection index (SC-I)	1.27	100.0	0.39NS	100.0
Rank total (SC-II)	1.25	98.3	0.14NS	35.3
Single plant yield (SC-III)	1.27	99.6	0.17NS	43.6
Plot yield (SC-IV)	1.24	97.3	0.04NS	11.3

CD at 5% for group means =0.03 kg; NS—nonsignificant at 5% level.

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