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# Genotypic Association, Heritability and Path Analysis in Ragi (*Eleusine coracana* Gaertn.)

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ABSTRACT

Twenty varieties of *Eleusine coracana* (Gaertn.) were subjected to correlation studies and path analysis and the results are presented. The results indicated that plant height influenced the grain yield indirectly through tillering. Number of earbearing tillers is the most important yield contributing factor in ragi. The contribution towards grain yield by days to flowering and number of fingers per panicle was found to be negligible in the material studied.

## INTRODUCTION

A detailed study of the extent of variability in metric traits associated with yield and a knowledge of their heritability in relation to their contribution towards yield are the prime requisites for an efficient plant breeding programme. The present paper reports the results of an investigation carried out in ragi (*Eleusine coracana* Gaertn.) bringing out useful relationships among the different traits associated with yield.

## MATERIALS AND METHODS

Sixteen brown ragi and four white ragi varieties exhibiting wide variability were raised in a randomized block design with four replications. Twentyfive plants were selected at random from the middle rows of each plot and observations on characters mentioned in the Tables I and II were recorded. The mean values were taken for statistical analysis. Heritability (broad-sense), genetic advance, path analyses and, genetic coefficient of variability were estimated by using accepted procedures. The finger length was not considered for path analysis because of the possible errors that may occur in measuring the fisty and incurved earheads.

## RESULTS AND DISCUSSION

The mean, phenotypic and genotypic variances, heritability and genetic advance and genetic coefficient of variation for all the characters are presented in Table I.

Significant differences were observed between varieties for all the characters studied. Relatively low genotypic coefficient of variability for

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TABLE I

| Characters | Mean | Phenotypic Variance | Genotypic Variance | Genotypic coefficient of variability | Heritability % | Genetic advance | Genetic advance as percentage on mean |
|---|---|---|---|---|---|---|---|
| Plant height (cm) | 80.29 | 170.36 | 63.50 | 9.80 | 37.20 | 10.00 | 12.40 |
| Number of productive tillers | 3.79 | 2.08 | 1.07 | 27.10 | 51.40 | 1.55 | 40.80 |
| Number of leaves on main stem | 13.49 | 6.39 | 5.11 | 16.70 | 80.00 | 4.15 | 30.70 |
| Number of fingers per panicle | 7.79 | 0.84 | 0.52 | 6.60 | 61.27 | 1.12 | 14.30 |
| Length of finger (cm) | 6.06 | 0.89 | 0.68 | 13.59 | 77.10 | 1.51 | 24.88 |
| Grain weight (gm) | 11.31 | 25.50 | 14.50 | 33.60 | 56.80 | 5.91 | 32.20 |
| Straw weight (gm) | 46.86 | 590.82 | 428.66 | 44.10 | 72.50 | 36.29 | 77.40 |
| Days to 50% bloom | 79.56 | 81.90 | 80.65 | 10.10 | 98.40 | 18.45 | 23.10 |

number of fingers and length of fingers were observed as compared to that for number of tillers and straw weight. Heritability estimates differed largely for the various characters studied. Days to 50 percent bloom showed the highest heritability. Patnaik and Jana (1973) also found a high heritable value for days to 50 per cent flowering. Number of leaves on main stem, length of finger and straw weight also showed fairly high heritable values. Plant height showed the least heritable value. This was in contrast to the findings of Mahudeswaran and Murugesan (1973) who observed a very high heritability of over 90 per cent for plant height.

Estimated genetic gain was the highest for straw weight followed by the number of productive tillers, grain weight and number of leaves on main stem. The least genetic gain was observed in plant height.

The genotypic and phenotypic correlations are presented in the Table II. The grain weight was found to have high positive genotypic correlation with straw weight and number of tillers but showed negative correlation with number of fingers per panicle and length of fingers. A high finger number per panicle tends to be associated with a short finger length as could be seen from the high degree of negative correlation between the two characters. Plant height is positively correlated with finger length. Early flowering types have long fingers in their panicles since there seems to be a negative correlation between these two characters. Number of leaves on the main culm was found to be positively correlated with number of fingers, but negatively correlated with finger length, grain weight and straw weight. There is a very strong negative phenotypic correlation between finger length and straw weight.

A path coefficient analysis revealing the relative influence of the different characters on yield and their

TABLE II. Genotypic and Phenotypic Correlation Coefficients

| Characters | Productive tillers | Days to 50% bloom | Number of leaves per culm | Number of fingers per panicle | Length of finger | Straw weight | Grain weight |
|---|---|---|---|---|---|---|---|
| Plant height | 0.1890<br>0.5317* | 0.1061<br>0.4677* | -0.1392<br>-0.0656 | -0.2000<br>-0.1410 | 0.2117<br>0.0808 | 0.3877<br>0.5642* | 0.1761<br>0.0260 |
| Productive tillers | | 0.2879<br>0.2746 | -0.2095<br>0.3464 | 0.0697<br>0.2526 | -0.1515<br>-0.5000* | 0.2879<br>1.0030** | 0.7197**<br>0.6581* |
| Days to 50% bloom | | | -0.0157<br>-0.2564 | 0.1148<br>0.0241 | -0.4009<br>0.5877* | 0.0062<br>0.3348 | 0.1900<br>0.2024 |
| Number of leaves per culm | | | | 0.4035<br>0.4505* | -0.2033<br>-0.4550* | -0.3446<br>-0.8346** | -0.2482<br>-0.5497* |
| Number of fingers per panicle | | | | | -0.5238*<br>-0.8503** | -0.1420<br>-0.1950 | -0.2685<br>-0.4252* |
| Length of finger | | | | | | -0.0944<br>-0.9253** | -0.6847*<br>-0.8677** |
| Straw weight | | | | | | | 0.3302<br>1.0410** |

Top row — phenotypic correlation
Bottom row — genotypic correlation

genotypic interdependence are discussed below.

1. Plant height and yield:

| | | |
|---|---|---|
| Direct effect | ... | —0.9602 |
| Indirect effects | | |
| (Via) Tillers per plant | ... | 0.7053 |
| Days to 50% bloom | ... | 0.1452 |
| Fingers per panicle | ... | 0.1357 |
| Total correlation | ... | 0.0260 |

The total correlation between plant height and yield was found to be negligible. However, plant height had a very large negative direct effect on yield which had been made up by a large positive indirect effect through tillers per plant. From this it appears that though individual tillers of a tall plant may be less productive, high tillering in such plants appear to compensate the loss. It may be observed in this connection that the total straw yield which is the product of height and number of tillers has the maximum correlation with yield.

2. Tillers per plant and yield

| | | |
|---|---|---|
| Direct effect | ... | 1.3265 |
| Indirect effects | | |
| (Via) Plant height | ... | —0.5005 |
| Days to 50% bloom | ... | 0.0852 |
| Fingers per panicle | ... | —0.2432 |
| Total correlation | ... | 0.6581 |

Yield was highly correlated with the number of productive tillers. There appears to be a very large direct effect on yield. However, the

total positive relationship had been reduced to a certain extent because of the indirect negative effect through plant height and number of fingers per panicle.

3. Days to 50% bloom and yield

| | | |
|---|---|---|
| Direct effect | ... | 0.3105 |
| Indirect effects | | |
| (Via) Plant height | ... | —0.4490 |
| Tillers per plant | ... | 0.3642 |
| Fingers per panicle | ... | —0.0232 |
| Total correlation | ... | 9.2024 |

The degree of association between days to 50% bloom and yield was found to be not significant. Days to 50% bloom had a small direct positive effect on yield. The indirect effect through plant height was negative while that through tillers was positive.

4. Fingers per panicle and yield

| | | |
|---|---|---|
| Direct effect | ... | —0.9628 |
| Indirect effects | | |
| (Via) Plant height | ... | 0.1353 |
| Tillers per plant | ... | 0.3350 |
| Days to 50% bloom | ... | 0.0074 |
| Total correlation | ... | —0.4852 |

A very high negative estimate of direct effect was found to be responsible for the negative correlation of yield with number of fingers per panicle. This curious result appears to be due to the fact that certain high tillering types in the material under study possessed less number of fingers and the low tillering verieties possessed larger number of fingers. By a suitable crossing programme it is potentially possible to increase the yield by bringing together the two factors, high tillering and larger number of fingers.

5. The residual effect was 0.1945.

From the above discussion, it is evident that selection for yield improvement in the material under study can be efficient if it is based on the number of earbearing tillers since it seems to be the most important yield contributing factor. This finding is in accordance with that of Chaudhari and Acharya (1969) and Mahudeswaran and Murugesan (1973). The plant height in the present investigation appears to be of no importance in selection for yield which finding is at variance from that reported by Mahudeswaran and Murugesan (1973).

REFERENCES

CHAUDHARI, L. B. and R. C. ACHARYA. 1969. Genetic variability and path coefficient analysis of components of ragi, *Eleusine coracana*. *Expt. Agric.* 5 : 295-300.

MAHUDESWARAN, K. and M. MURUGESAN. 1973. Correlation and path analysis in *Eleusine coracana* Gaertn. *Madras agric. J.* 60 : 1287-91.

PATNAIK, H.B. and M. JANA. 1973. Genetic variability in *Eleusine coracana* Gaertn. *Madras agric. J.* 60 : 1283-86.