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# Interpretations on Association of Certain Quantitative Traits on Yield of Rice (*Oryza sativa* L.) Under Saline Environment

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**Abstract:** The associations among yield components, and their direct and indirect influences on the grain yield of rice were investigated. According to the magnitude of the direct effects on grain yield, the order of yield components was the number of productive tillers per square metre (0.954) > number of filled grain per panicle (0.0467) > 1000-grain weight (0.0051). The improvement in grain yield will be efficient, if the selection is based on the biological yield, the number of productive tillers per square metre and the number of filled grains per panicle under tropical conditions. Correlation studies indicated that intensive selection on the positive selection for number of productive tillers, number of filled grains and 1000 grain weight will improve the seed yield in rice. Path coefficient analysis further revealed that the number of productive tillers plays a major role in determining the yield per plant of rice cultivars.

**Key words:** Rice accession, Saline environment, path coefficient analysis and grain yield

## INTRODUCTION

Rice is usually grown on soils flooded by water obtained from rainfall, surface streams or wells. Soil salinity affects 2 of the 15 million km$^2$ of land under cultivation and between 30 percent 50 per cent of irrigation agriculture. If rice production per capita is to remain close to present levels as the population rises, then an increase in salinity resistance is necessary because good agricultural land is a limited resource. Rice is one of the most suitable crops for saline soils although it is usually considered moderately sensitive to salinity [1]. Yield is a complex polygenic quantitative greatly affected by salinity. The advantage of path analysis is that it permits the partitioning of the correlation coefficient into its components, one component being the path coefficient that measures the direct effect of a predictor variable upon its response variable; the second component being the indirect effect(s) of a predictor variable on the response variable through another predictor variable [2]. In agriculture, path analysis has been used by plant breeders to assist in identifying traits that are useful as selection criteria to improve crop yield. The association yield or quantitative traits and yield itself that assumes special importance in formulation of a basis of selection of derived strains.

## MATERIALS AND METHODS

The study was conducted during 2000-2001 in the faculty of agriculture, Department of Agronomy, Annamalai University, Annamalai Nagar, Tamil Nadu, INDIA to investigate the growth and yield attributes contributing to salinity tolerance of different rice accessions. A consensus selection from a subset of IRRI germplasm collection was chosen to include accession of various reputation with regard to salt resistance (Table 1). The experiment was laid out in randomized block design with three replications. Path co efficient analysis was utilized to partition the genotypic correlation coefficient into direct and indirect effects.

Collected data were analysed by means of Path Coefficient analysis as outlined by Duarte and Adams [3]. In this method, the linear correlation coefficient between the yield components (A = No. of panicles hill$^{-1}$, B = No. of seeds per panicle and C = Test weight) as defined and the Grain yield (G) is partitioned into direct (p) and indirect (rxp) effect according to the model.

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**Table 1:** The experimental details of the treatments

| Accession No. | Designation | Cross | Origin |
|---|---|---|---|
| 1 | NC 493 | Pureline selection | India |
| 2 | IR 40931-33-1-3-2 | BKNFR76106-16-0-1-0/ IR 19661-131-1-23 | IRRI |
| 3 | IR 63731-1-1-4-3-2 | IR8/NONA BOKRA | IRRI |
| 4 | IR 45427-2B-2-B-1-2 | Cheriviruppu/IR10205-37-1-3 | IRRI |
| 5 | IR 26916-Es | Cheriviruppu/IR5657-33-2 //IR42 | IRRI |
| 6 | IR52717-B-B-4-B-B-1-3 | IR32429-47-3-2-2// IR9884-54-3/NONO BOKRA8 | IRRI |
| 7 | IR63731-1-1-4-2-3 | IR8/NONA BOKRA | IRRI |
| 8 | B6996D-MR-13-1 | CISADANE*4/FR 13A | Indonesia |
| 9 | IR63731-1-1-1-3-3 | IR8/NONA BOKRA | IRRI |
| 10 | TCCP266-1-3B-10-2-1 | -- | IRRI |
| 11 | IR55233-3B-23-3 | IR15324-117-3-2-2/ IR10167-129-3-414 | IRRI |
| 12 | IR60494-2B-18-3-2-3 | IR9884-54-3-1E-P1// IR33451-12-1-1-1-2/ POKKALI | IRRI |
| 13 | IR59932-2B-4-2 | IR 32429-47-3-2-2/BW297-2 | IRRI |
| 14 | IR 5217-B-B-4-B-B-1-3 | IR32429-47-3-2-2// NONA BOKRA / POKKALI | IRRI |
| 15 | CO 43 | Dasal x IR 20 | India |

**Table 2:** Path analysis of the direct and indirect influences of yield components on yield of rice

| Yield components | Effect | Symbol | Navarai |
|---|---|---|---|
| Productive tillers hill$^{-1}$ (A) | Direct | $P_{GA}$ | 0.954 |
| | Indirect via B | $r_{AB}P_{GB}$ | 0.040 |
| | Indirect via C | $r_{AC}P_{GC}$ | 0.0005 |
| | Total correlation | $r_{GA}$ | 0.99 |
| No. of filled grains panicle (B) | Direct | $P_{GB}$ | 0.0467 |
| | Indirect via A | $r_{AB}P_{GA}$ | 0.822 |
| | Indirect via C | $r_{BC}P_{GC}$ | 0.0022 |
| | Total correlation | $r_{GB}$ | 0.86 |
| Thousand grain weight (C) | Direct | $P_{GB}$ | 0.0051 |
| | Indirect via A | $r_{AC}P_{GA}$ | 0.101 |
| | Indirect via B | $r_{BC}P_{GB}$ | 0.0204 |
| | Total correlation | $r_{GC}$ | 0.11 |

$$r_{GA} = P_{GA} + r_{AB} P_{GB} + r_{AC} P_{GC}$$

$$r_{GB} = r_{AB} P_{GA} + P_{GB} + r_{BC} P_{GC}$$

$$r_{GC} = r_{AC} P_{GA} + r_{BC} P_{GC} + P_{GC}$$

where,
p = standard partial regression or path coefficient
r = correlation coefficient

Logarithmic transformation of the yield components were used since seed yield is the product of its components and the model is additive.

This analysis is carried out by following the method suggested by Dewey and Lu [2], to partition the correlation coefficients into direct effects through alternate pathways.

## RESULTS AND DISCUSSIONS

The correlation coefficients give the extent of correlation of yield contributing traits with yield while path coefficient analysis depicts nature and extent of correlation whether direct or indirect towards yield. The present study was undertaken with some of yield traits over saline environment. Yield is a polygenic quantitative trait greatly affected by saline condition. The relative importance of rice accessions tolerant to salinity and their yield components contributing to yield can be determined through path co-efficient analyses are presented in Table 2.

The path coefficient analyses also indicated that number of productive tillers hill$^{-1}$ had the largest direct effect on yield and emerged as the main components of rice grain yield under saline conditions. Other characters, such as number of grains panicle$^{-1}$ and 1,000-grain weight, did not show any direct effect on yield, but they influenced yield via plant height.

The traits like number of productive tillers hill$^{-1}$, Number of filled grains panicle$^{-1}$ and 1000 grain weight registered positive correlation to yield [4]. The correlation coefficient value of number of productive tillers hill$^{-1}$ was higher (r=0.954) than rest of traits. The direct and indirect effects of number of productive tillers hill$^{-1}$ was positive and highest upon yield while the traits, number of filled grains panicle$^{-1}$ and thousand grain weight had negligible direct and indirect effects on yield. The results were in concordance with Raseed *et al.* [5], and Yolanda and Das[6].

Hence, number of tillers per hill that had positive and highly direct effect on seed yield considered to play a major role on determining seed yield in rice under saline environment.

## REFERENCES


1. FAO, 2000. FAO Statistical Database, FAOSTAT Agriculture Data http://apps.fao.org/page/collections subset agriculture.
2. Dewey, O.R. and K.H. Lu, 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. J. Agron., 57: 515-518.0
3. Duarte, R.A. and M.W. Adams, 1972. A path coefficient analysis of some yield component interrelations in field beans (*Phaseolus vulgaris* L.). Crop Sci., 12: 579-587.
4. Yolanda, J.L. and L.D.V. Das, 1995. Correlation and path analysis in rice (*Oryza sativa* L.). Madras Agril. J., 82: 576-578.
5. Surek, H., Z.K. Korkut and O. Bilgin, 1998. Correlation and path analysis for yield and yield components in rice in a 8-parent half diallel set of crosses. Oryza 35(1): 15-18.
6. Muhammad Saif-ur-Rasheed, Hafeez Ahmad Sadaqat and Muhammad Babar. 2002. Inter-relationship Among Grain Quality Traits of Rice (Oryza sativa L.). Asian Journal of Plant Sciences. 1( 3) :245-247.