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# Correlation Analysis for Yield and Yield Contributing Characters Involving in Aerobic Rice

Agriculture

**KEYWORDS :** correlation, yield and aerobic rice

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## ABSTRACT

*This study performed to determine the association between yield and yield components in thirty hybrids under aerobic condition. Correlation studies showed that the traits productive tillers, grains per panicle and spikelet fertility were positively correlated with seed yield and the traits viz., plant height, panicle length, grains per panicle, 100 grain weight and root dry weight were inter correlated among themselves. Therefore, these traits are to be given priority during selection to increase the grain yield.*

**Introduction:**

Rice (Oryza sativa L.) is the prime food crop in the world. In India about 65 per cent of the population has rice as major constituent in the diet. Mainly because of a still growing population demand for rice is expected to keep increasing in the coming decades. About 75 per cent of the global rice volume is produced in the irrigated low lands. Decreasing water availability for agriculture threatens the productivity of the irrigated rice ecosystem and a way must be sought to save water and increase the productivity of rice. Savings in irrigation water and increase in water utility for high production would be possible, if rice is grown under aerobic soil condition. However, a key component for the success of aerobic systems is developing appropriate cultivars with high yield potential and drought tolerance under aerobic condition. Drought tolerance is expressed through several plant characters like deep root length, root dry weight, root: shoot ratio, stomatal closure, days to 70 per cent relative water content, chlorophyll stability index, spikelet fertility and cuticular resistance.

The studies on correlation values indicated the intensity and direction of character association in a crop. Hence, the knowledge on inter relationship of plant characters with seed yield and among themselves is of paramount importance to the breeder for making importance in complex characters like seed yield, for which direct selection is not much effective. Hence, the association analysis was undertaken to determine the direction of selection and number of characters to be considered in improving the seed yield.

Grain yield in rice is a complex quantitative trait influenced by several component traits. Knowledge on association among different yield components under aerobic condition is a prerequisite in developing appropriate breeding strategy that would bring about the simultaneous improvement of these traits. A positive association between traits warrants the simultaneous improvement of both the traits while restricting selection to any one of the associated traits. On the other hand, a negative relationship between two traits necessitates equal weight to be given on both the traits during selection process. Relative importance of drought tolerant attributes may be decided based on highly correlated trait with grain yield. The objective of this study was to find out the interrelationship of yield and yield contributing characters in aerobic rice. The information thus obtained will be used to define the suitable criteria for yield improvement under drought stress conditions.

**Materials and methods:**

The study was carried out at the research farm of Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Madurai. The experimental materials consisted of five lines (ADT 47, ADT 45, ADT 43, ASD 16, ADT 36) were were crossed with six testers (Nootripathu, Chithiraikar, PMK 4, Poongar, N 22 and Moroberekan) were used as 'testers'. All the thirty hybrids, along with parents of five lines and six testers were sown in non-puddled and non flooded aerobic soil, during Rabi. The experiment was laid out in Randomized Block Design (RBD) with three replications and fourty one treatments (30 hybrids + 11 parents). Each treatment was accommodated in two rows of 1m length with a spacing of 30 x 30 cm in each replication. A uniform population of 20 hills per treatment with single seedling was maintained in each replication. Normal agronomical practices and plant protection measures with external inputs such as supplementary irrigation and fertilizers were given at appropriate time.

**Results:**

**Correlation between grain yield and its components**

Grain yield per plant had significant and positive association with productive tillers per plant (0.595), grains per panicle (0.420) and spikelet fertility (0.388). Days to 50 per cent flowering (0.244), Panicle length (0.167), root length (0.140), chlorophyll stability index (0.178) and relative water content (0.208) had positive but not significant association with single plant yield. Root: Shoot ratio (-0.397) alone showed negative and significant association whereas plant height (0.170), 100 grain weight (-0.124) and root dry weight (-0.094) had negative but non significant association with single plant yield.

The genotypic correlation coefficients between grain yield and its component characters and inter correlation among different traits are presented in Table 1.

**Table 1. Genotypic correlation coefficients between single plant yield and component characters**

Table 1. Genotypic correlation coefficients between single plant yield and component characters

| Characters | DFL | PH | PT | PL | GP | SF | HW | RL | RDW | R : S | CSI | RWC | YLD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DFL | 1.000 | -0.217 | 0.221 | -0.031 | -0.011 | -0.059 | -0.073 | -0.078 | -0.195 | -0.048 | -0.030 | -0.013 | 0.244 |
| PH | | 1.000 | 0.015 | 0.297* | -0.261* | -0.165 | 0.397** | 0.275* | 0.086 | 0.028 | 0.157 | 0.422** | -0.170 |
| PT | | | 1.000 | -0.272* | -0.040 | -0.054 | -0.109 | 0.145 | -0.158 | -0.159 | -0.075 | 0.199 | 0.595** |
| PL | | | | 1.000 | 0.336* | 0.344* | -0.164 | 0.029 | 0.101 | 0.066 | 0.344** | 0.290* | 0.167 |
| GP | | | | | 1.000 | 0.959** | -0.103 | 0.150 | 0.077 | 0.042 | -0.101 | -0.186 | 0.420 ** |
| SF | | | | | | 1.000 | -0.054 | 0.215 | 0.121 | -0.050 | -0.017 | -0.170 | 0.388 ** |
| HW | | | | | | | 1.000 | 0.339* | 0.015 | 0.041 | 0.099 | -0.038 | -0.124 |
| RL | | | | | | | | 1.000 | 0.068 | -0.239 | 0.240 | -0.080 | 0.140 |
| RDW | | | | | | | | | 1.000 | -0.105 | 0.321* | -0.199 | -0.094 |
| R : S | | | | | | | | | | 1.000 | -0.182 | -0.066 | -0.397 ** |
| CSI | | | | | | | | | | | 1.000 | 0.050 | 0.178 |
| RWC | | | | | | | | | | | | 1.000 | 0.208 |

* Significant at 5% level, ** Significant at 1% level

DFL – Days to 50 per cent flowering
PH – Plant height
PT – Productive tillers per plant
PL – Panicle length
GP – Grains per panicle
SF – Spikelet fertility
HW – Hundred grain weight
RL – Root length
RDW – Root dry weight
R : S – Root : Shoot ratio
CSI – Chlorophyll stability index
RWC – Relative water content
YLD – Single plant yield

**Inter correlation among yield components**

**Days to 50 per cent flowering**

None of the traits showed significant and negative correlation. Negative and non significant correlation was registered by plant height (-0.217), panicle length (-0.031), grains per panicle (-0.011), spikelet fertility (-0.059), 100 grain weight (-0.073), root length (-0.078), root dry weight (-0.195), root : shoot ratio (-0.048), chlorophyll stability index (-0.030) and relative water content (-0.013).

**Plant height**

Plant height had significant and negative correlation alone with grains per panicle (-0.261) and negative and non signification correlation was registered with spikelet fertility (-0.165) and single plant yield (-0.170). But it had positive and significant association with panicle length (0.297), 100 grain weight (0.397), root length (0.275) and relative water content (0.422).

**Productive tillers per plant**

Productive tillers per plant had not registered any significant and positive correlation whereas non significant and positive association was with root length (0.145) and relative water content (0.199).

**Panicle length**

Panicle length exhibited highly significant and positive association with chlorophyll stability index (0.344). However, its association with Grains per panicle (0.336), spikelet fertility (0.344) and relative water content (0.290) was significant and positive, whereas root length (0.029), root dry weight (0.101) and root: shoot ratio (0.066) recorded positive but non significant association.

**Grains per panicle**

Grains per panicle recorded highly significant and positive association with spikelet fertility (0.959). But its association was positive and non significant with root length (0.150), root dry weight (0.077) and root: shoot ratio (0.042).

**Spikelet fertility**

None of the trait registered significant and positive association with spikelet fertility. However its association with root length (0.215) and root dry weight (0.121) was positive but non significant.

**Hundred grain weight**

Hundred grain weight registered significant and positive association with root length (0.339). But its association was positive and non significant with root dry weight (0.015), root : shoot ratio (0.041) and chlorophyll stability index (0.099).

**Root length**

None of the traits had showed significant and positive correlation with root length. However non significant and positive association was with root dry weight (0.068) and chlorophyll stability index (0.240).

**Root dry weight**

Root dry weight exhibited significant and positive correlation only with chlorophyll stability index (0.321).

**Root : Shoot ratio**

None of the trait exhibited positive and significant association with root: shoot ratio.

**Chlorophyll stability index.**

None of the trait exhibited positive and significant association with chlorophyll stability index. However non significant and positive correlation was with relative water content (0.050).

**Discussion:**

In this investigation Grain yield per plant had significant and positive association with productive tillers, grains per panicle and spikelet fertility. This was in conformity with the findings of Yogameenakshi *et al*. (2004) and Raju *et al*. (2004) for productive tillers per plant, Michael Gomez and Rangasamy (2002) and Bhattacharya and Ghosh (2004) for grains per panicle and Kumar *et al*. (2004) for spikelet fertility.

The inter correlation between yield contributing characters may affect the selection for component traits either in favourable or unfavourable direction. Hence, the knowledge on interrelationship between yield component traits may facilitate breeders to decide upon the intensity and direction of selection pressure to be given on related traits for the simultaneous improvement of these traits.

Plant height had significant and positive correlation with 100 grain weight, relative water content, panicle length and root length. This was supported by Yogameenakshi *et al.* (2004), Raju et *al.* (2004) and Kole et al. (2008) for 100 grain weight and Yogameenakshi *et al. (2004) and* Adnan Kanbar et *al.* (2004) for root length.

Panicle length had significantly positive correlation with chlorophyll stability index, grains per panicle, spikelet fertility and relative water content. This was earlier found by Deepa Sankar et al. (2006) for grains per panicle.

Grains per panicle had registered significant and positive association with spikelet fertility whereas 100 grain weight recorded significant positive correlation with root length and root dry weight with chlorophyll stability index. Similar findings were reported by Michael Gomez and Rangasamy (2002) and Yogameenakshi *et al.* (2004) for 100 grain weight with root length.

From the aforesaid facts, it is clear that all the yield component traits viz., plant height, panicle length, grains per panicle, 100 grain weight and root dry weight were inter correlated among themselves. Therefore, these traits are to be given priority during selection to increase the grain yield.

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