The Andhra Agric. J 63 (4): 819-822, 2016

Correlation Studies For Physical Quality Traits In Rice (*Oryza Sativa* L.)

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ABSTRACT

Four F_2 populations were studied in order to understand the character association among the grain quality characters and yield components in rice (*Oryza sativa* L.) in pursuit of developing highly potential rice genotypes with good grain quality. The results of simple correlation analysis in F_2 population revealed that milling traits *viz.,* hulling percent, milling percent and head rice recovery showed a positive significant correlation among themselves and with yield components. Therefore, from the present study it is inferred that selection for more test weight will simultaneously improve grain yield with good milling traits.

Key words : Character association, Correlation, Rice.

Rice (*Oryza sativa* L.) is world's second most important cereal after wheat and is staple food for more than half of the world's population. Most of the people in Asia, particularly in developing countries like India, meet their major calorific requirement through rice. In rice crop improvement programmes grain quality has become second important objective after grain yield. In rice, grain quality can be considered for physical, chemical, cooking and nutritional quality groups. Physical quality includes kernel length, kernel breadth, kernel L/B ratio, hulling percent, milling percent and head rice recovery. Correlation refers to the degree and direction of association between two or more variables (Johnson *et al*. 1955). Association analysis is the complete knowledge on interrelationship of plant character like grain yield with other characters. It is of paramount importance to the breeder for making improvement in complex quantitative character like grain yield for which direct selection is not much effective. Hence, association analysis was undertaken to determine the direction of selection and number of characters to be considered in improving grain yield.

MATERIAL AND METHODS

In the present investigation, Study on inheritance of physical quality traits in rice (*Oryza sativa* L.) was carried out during *kharif* 2014 at Andhra Pradesh Rice Research Institute (APRRI) and Regional Agricultural Research Station (RARS), Maruteru, Andhra Pradesh. Four different F_2 populations were raised and evaluated during *kharif* 2014. Seed from 200 randomly selected plants of each F_2 population were collected for recording data on kernel length (mm), kernel breadth (mm), kernel L/B ratio, hulling (%), milling (%), head rice recovery (%), test weight (g) and grain yield per plant (g). The data were statistically analyzed to estimate simple correlation coefficients (Pearson *et al*. 1901).

RESULTS AND DISCUSSION

Association analysis in all possible combinations of the characters was presented in Table 1, Table 2, Table 3 and Table 4.

1.Character association among physical quality traits and yield components

1.1Kernel length (mm)

Correlation studies revealed that kernel length was positively and significantly associated with L/B ratio in all crosses *viz.,* BPT 5204 x NLR 145, IR 50 x NLR 3042, JGL 17004 x MTU 3626 and MTU 1075 x BPT 5204. Hence, it can be inferred that increase in kernel length would lead to increase in L/B ratio and vice versa. These results were in conformity with the reports of Krishnaveni *et al*. (2013) and Nikam *et al.* (2014).

Significant negative association of kernel length was observed with kernel breadth, hulling per cent, milling per cent and head rice recovery in all F_2 populations. It indicates that increase in kernel length will leads to reduction in kernel

Table 1. Correlation coefficients of various physical quality traits and yield components in F_2 population of BPT 5204 x NLR 145.

Character	Kernel length	Kernel breadth	Kernel L/B ratio	Hulling per cent	Milling per cent	Head rice recovery	Test weight	Grain yield plant^{-1}
Kernel length	**1.0000**	-0.6851**	0.9860**	-0.7662**	-0.3852**	-0.4491**	-0.0852	**-0.0190**
Kernel breadth		**1.0000**	-0.8193**	0.3973**	0.5973**	0.5432**	0.0241	**0.0322**
Kernel L/B ratio			**1.0000**	-0.5641*	-0.2382*	-0.3264*	-0.0185	**-0.0121**
Hulling per cent				**1.0000**	0.9214**	0.5843**	0.0513*	**0.0426***
Milling per cent					**1.0000**	0.7834**	0.0256*	**0.0334***
Head rice recovery						**1.0000**	0.0234*	**0.0114***
Test weight							**1.0000**	**0.8461****
Grain yield plant^{-1}								**1.0000**

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

Table 2. Correlation coefficients of various physical quality traits and yield components in F_2 population of IR 50 x NLR 3042.

Character	Kernel length	Kernel breadth	Kernel L/B ratio	Hulling per cent	Milling per cent	Head rice recovery	Test weight	Grain yield plant^{-1}
Kernel length	**1.0000**	-0.4852**	0.7210**	-0.5142**	-0.2243**	-0.3157**	-0.0754	**-0.0133**
Kernel breadth		**1.0000**	-0.6241**	0.2412**	0.4672**	0.3493**	0.0172	**0.0281**
Kernel L/B ratio			**1.0000**	-0.4762*	-0.3411*	-0.3812*	-0.0022	**-0.0443**
Hulling per cent				**1.0000**	0.7645**	0.4278**	0.0245*	**0.0376***
Milling per cent					**1.0000**	0.8275**	0.0194*	**0.0435***
Head rice recovery						**1.0000**	0.0376*	**0.0115***
Test weight							**1.0000**	**0.7642****
Grain yield plant^{-1}								**1.0000**

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

breadth, hulling per cent, milling per cent and head rice recovery. Similar findings were earlier reported by Nayak *et al*. (2003) and Krishnaveni *et al*. (2013).

1.2 Kernel breadth (mm)

The kernel breadth manifested a high negative significant association with kernel L/B ratio indicating that increase in kernel breadth will leads to reduction in kernel L/B ratio in all crosses *viz.,* BPT 5204 x NLR 145,IR 50 x NLR 3042, JGL 17004 x MTU 3626 and MTU 1075 x BPT 5204. These results were in conformity with the reports of Krishnaveni *et al*. (2013) and Nikam *et al*. (2014).

Kernel breadth showed positive significant association with hulling per cent, milling per cent and head rice recovery in all crosses, indicating that bold grains possessed good milling traits. These results were in agreement with the earlier works of Nagaraju *et al*. (2013).

1.3 Kernel L/B ratio

Negative significant association of L/B ratio with kernel breadth, hulling per cent, milling per cent and head rice recovery was observed in all crosses, indicating that increase in L/B ratio leads to reduction in kernel breadth, hulling, milling and head rice recovery. These results were in agreement with the earlier works of Nayak *et al*. (2003) and Kumar *et al*. (2010).

1.4 Hulling (%)

This character exhibited positive significant association with milling per cent, head rice recovery, test

Table 3. Correlation coefficients of various physical quality traits and yield components in F_2 population of JGL 17004 x MTU 3626.

Character	Kernel length	Kernel breadth	Kernel L/B ratio	Hulling per cent	Milling per cent	Head rice recovery	Test weight	Grain yield plant^{-1}
Kernel length	**1.0000**	-0.9493**	0.6714**	-0.6725**	-0.4512**	-0.5173**	-0.0792	**-0.0112**
Kernel breadth		**1.0000**	-0.9423**	0.4955**	0.4670**	0.4824**	0.0134	**0.0283**
Kernel L/B ratio			**1.0000**	-0.7383*	-0.3493*	-0.3441*	-0.0282	**-0.0082**
Hulling per cent				**1.0000**	0.8462**	0.4974**	0.0493*	**0.0373***
Milling per cent					**1.0000**	0.6715**	0.0175*	**0.0294***
Head rice recovery						**1.0000**	0.0015*	**0.0092***
Test weight							**1.0000**	**0.7593****
Grain yield plant^{-1}								**1.0000**

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

Table 4. Correlation coefficients of various physical quality traits and yield components in F_2 population of MTU 1075 x BPT 5204.

Character	Kernel length	Kernel breadth	Kernel L/B ratio	Hulling per cent	Milling per cent	Head rice recovery	Test weight	Grain yield plant^{-1}
Kernel length	**1.0000**	-0.8673**	0.7645**	-0.6273**	-0.5495**	-0.5145**	-0.0712	**-0.0273**
Kernel breadth		**1.0000**	-0.9556**	0.2475**	0.6491**	0.3493**	0.0114	**0.0146**
Kernel L/B ratio			**1.0000**	-0.3492*	-0.2492*	-0.5614*	-0.0215	**-0.0242**
Hulling per cent				**1.0000**	0.8496**	0.6492**	0.0425*	**0.0415***
Milling per cent					**1.0000**	0.6756**	0.0193*	**0.0274***
Head rice recovery						**1.0000**	0.0165*	**0.0244***
Test weight							**1.0000**	**0.7691****
Grain yield plant^{-1}								**1.0000**

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

weight and grain yield per plant in all crosses. It is indicating that increase in one character leads to increase in other. Similar findings were earlier reported by Rao *et al*. (2014), Venkanna *et al*. (2014). (Table 1, 2, 3 and 4).

1.5 Milling (%)

Milling per cent exhibited significant positive correlation with head rice recovery, test weight and grain yield per plant in all crosses. It indicates that increase in one character leads to increase in other trait. Significant negative association of milling per cent was observed with kernel length and kernel L/B ratio in all F_2 populations, indicating that longer and slender grains results in lower milling recovery. These results were in accordance with earlier works of Nayak *et al*. (2003), Umadevi *et al.* (2010), Ruth *et al*. (2011), Nagaraju *et al.* (2013) and Venkanna *et al*. (2014) (Table 1,2,3 and 4).

1.6 Head rice recovery (%)

Head rice recovery exhibited positive significant correlation with test weight and grain yield per plant in all crosses. It is revealing that grains with more weight yields more head rice and less brokens. Further this trait had shown negative significant association with kernel length and kernel L/B ratio in all F_2 populations, indicating that longer and slender grains produce less head rice. These results were in accordance with the earlier works of and Nayak *et al*. (2003) and Venkanna *et al*. (2014) (Table 1, 2, 3 and 4).

1.7 Test weight (g)

This character showed positive significant association with grain yield per plant in all crosses, it indicates that increase in test weight increases yield. It had significant positive association with milling traits *viz.,* hulling, milling and head rice recovery and which revealed heavier grains will increase milling traits. These results were in conformity with the earlier works of Rajamadhan *et al.* (2011), Rao *et al.* (2014) and Venkanna *et al.* (2014) (Table 1,2,3 and 4).

2. A comparative study of various physical quality traits with grain yield per plant in different crosses

The study of character association revealed that the characters *viz.,* hulling per cent, milling per cent, head rice recovery and test weight showed significant positive association with grain yield per plant in all four F_2 populations indicating that increase in these traits will increase the yield.

According to above results bold grains with more test weight yield more hulling per cent, milling per cent, head rice recovery and also associated positively with grain yield per plant. The traits kernel length and kernel L/B ratio had less influence on grain yield per plant. Therefore, from the present study it is inferred that selection for more test weight will simultaneously improve grain yield with good milling traits.

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(Received on 30.07.2015 and revised on 05.12.2015)