The Pharma Innovation Journal 2023; 12(6): 4927-4929

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 4927-4929

www.thepharmajournal.com
Received: 16-03-2023
Accepted: 27-04-2023

Dr. Savankumar N Patel
Assistant Professor (GPB), School of Agriculture, PP Savani University, Surat, Gujarat, India

Dr. Shveta G Sakriya
Assistant Professor, School of Agriculture, PP Savani University, Surat, Gujarat, India

Dr. Sonal Vaja
Assistant Professor, School of Agriculture, PP Savani University, Surat, Gujarat, India

Dr. VP Patel
Associate Research Scientist, Regional Rice Research Station, Navsari Agricultural University, Vyara, Gujarat, India

Corresponding Author:
Dr. Savankumar N Patel
Assistant Professor, Department of Genetics and Plant Breeding, School of Agriculture, PP Savani University, Surat, Gujarat, India

Correlation analysis in F_2 segregating generation of rice (*Oryza sativa* L. *var. indica*)

Dr. Savankumar N Patel, Dr. Shveta G Sakriya, Dr. Sonal Vaja and Dr. VP Patel

Abstract
Association study was conducted using 100 F_2 population of rice (*Oryza sativa* L.) for twelve different yield and it's components traits. This study revealed that, grain yield per plant showed significant and positive correlation with plant height, productive tillers par plant, panicle length, grains per panicle and straw yield per plant. Thus, selection practiced for the improvement in one trait will automatically result in improvement of other trait even through direct selection.

Keywords: Rice, correlation, F_2 segregating population

Introduction
Rice (*Oryza sativa* L.) is one of the world's most important staple crops, providing a significant portion of the global population with a primary source of nutrition and livelihood. Except Antarctica it is grown in all the continents, occupying 159 million hectare area and producing 683 million tones (equivalent to 456 million tones of milled rice) (FAO, 2009) [5]. In India it accounts for more than 40% of food grain production. It is grown in 44.6 million hectare under 4 major ecosystems: irrigated (21 mha), rainfed lowland (14 mha), rainfed upland (6 mha) and flood – prone (3 mha) with average annual production of 96.4 million tones (NABARD, 2008) [7]. Since consumer preferences in Asia and all over the world are diverse due to varied demographics and culture, defining uniform attributes to capture regional grain quality preferences becomes more challenging (Butardo *et al*., 2019) [3]. It serves as a pillar for food security in many developing countries. Thus, production of rice has to be improved and maintained for global food security. It was anticipated that by 2030 world should produce 60 per cent more rice than what it produced in 1995. Plateauing shift in the yield of HYVs, decreasing and degrading natural resources and acute labour shortage make the mission of increasing rice production quite challenging. As such, understanding the various factors that influence rice production, quality, and yield is crucial for agricultural scientists, policymakers, and farmers alike.
Correlation measure degree of interrelationship among the yield traits (Dewey and Lu, 1959).Yield is a complex character and dependent on many component traits. Hence, it is necessary to have knowledge on the extent of association between yield and yield contributing characters. Therefore, correlation studies are of considerable importance in any selection programmes as they provide relationship between two or more component characters. Hence, the present experiment was conducted to study the association between yield and it's attributing traits.

Materials and Methods
To study correlation among yield and it's attributes crossing program was conducted at Main Rice Research Station, Navsari Agricultural University, Navsari in summer, 2019 to get F_1s for development of F_2 population. The crossing work was started, when the crop commenced flowering, emasculation was done during evening hours followed by pollination on next day morning. The female parent naming NVSR 2179 is crossed with a male parent NVSR 2803 to develop F_1 seeds during summer 2019. The F_1 seeds of individual parental lines were harvested separately and were labeled accordingly. Total 50 F_1 seeds of a cross NVSR 2179 × NVSR 2803 were grown along with the parents in lowland condition at Main Rice Research Station, Navsari Agricultural University, Navsari in Kharif, 2019. The F_1 plants were confirmed for heterozygosity by phenotypic observation and 4 off type plants are rouge out.

The leaf samples are collected from parents and remaining 46 F_1s for DNA isolation for hybridity testing at molecular level. F_2 mapping population of 100 individuals developed from F_1s were used to for correlation study.

Results and Discussion

Correlation coefficient is a statistical measure which is used to find out the degree and direction of relationship between two or more variable. Thus correlation measures the natural relationship between two or more variable. Hence, association study worked out on yield and yield contributing characters in 100 genotypes of F_2 segregating generation.

Days to flowering have positive significant correlation with straw yield per plant (0.330**); negative significant correlation with grain length (-0.247**) and harvest index (-0.602**); negative non-significant correlation with plant height (-0.163^{NS}), panicle length (-0.177 ^{NS}), grains per panicle (-0.189 ^{NS}), 100 grain weight (-0.091 ^{NS}), grain breadth (-0.170 ^{NS}), grain yield per plant (-0.179^{NS}); positive non-significant correlation with productive tillers par plant (0.086^{NS}), length and breadth ratio (0.062^{NS}). Similar results were reported by Abhilash *et al*. (2018) [1] for plant height, productive tillers per plant, 100 grain weight, panicle length and grain yield per plant; Priyanka *et al*. (2019) [9] for 100 grain weight and grain yield per plant; Singh *et al*. (2020) [11] for productive tillers per plant; Bhargava *et al*. (2021) [2] for productive tillers per plant and grains per panicle. Farhad Kahani and Shailaja Hittalmani (2015) [4] for grain length; Hitaishi *et al*. (2020) [6] for productive tillers per plant and harvest index.

Plant height have positive significant correlation with productive tillers (0.302**), panicle length (0.585**), grains per panicle (0.354**), grain yield per plant (0.619**), straw yield per plant (0.643**); negative non- significant correlation with 100 grain weight (-0.139^{NS}), grain length (-0.120^{NS}), grain breadth (-0.157^{NS}), harvest index (-0.160^{NS}). Comparative findings reported by Abhilash *et al*. (2018) [1] for grain weight; Seneega *et al*. (2019) [10] for productive tillers per plant, panicle length, grain breadth, length and breadth ratio, grain yield per plant; Priyanka *et al*. (2019) [9] for productive tillers per plant, panicle length and grain per panicle; Singh *et al*. (2020) [11] for productive tillers per plant, panicle length, grains per panicle and grain length; Bhargava *et al*. (2021) [2] for productive tillers per plant, panicle length and grain yield per plant.

Productive tillers per plant have positive significant correlation with grain yield per plant (0.722**) and straw yield per plant (0.627**); negative non-significant correlation with 100 grain weight (-0.059^{NS}), grain length (-0.098^{NS}), grain breadth (-0.130^{NS}), harvest index (-0.111^{NS}); positive non-significant correlation with productive tillers per plant (0.021 ^{NS}), grains per panicle (0.155 ^{NS}), length and breadth ratio (0.034 ^{NS}). Comparative findings reported by Abhilash *et al*. (2018) [1] for panicle length and grain yield per plant; Seneega *et al*. (2019) [10] for panicle length; Priyanka *et al*. (2019) [9] for grain yield per plant. Bhargava *et al*. (2021) [2] for panicle length, grains per panicle and grain yield per plant; Farhad Kahani and Shailaja Hittalmani (2015) [4] for grain yield per plant plus straw yield per plant.

Panicle length have positive significant correlation with grains per panicle (0.301**), length and breadth ratio (0.220*), grain yield per plant (0.408**), straw yield per plant (0.319*); negative non-significant correlation with 100 grain weight (-0.043^{NS}) and grain breadth (-0.154^{NS}); positive significant correlation with grain length (192^{NS}) and harvest index (0.005^{NS}). Similar results were observed by Abhilash *et al*. (2018) [1] with grain yield per plant; Seneega *et al*. (2019) [10] for grain per panicle, 100 grain weight, grain length, grain breadth and grain yield per plant; Priyanka *et al*. (2019) [9] for grain per panicle and grain yield per plant. Singh *et al*. (2020) [11] for grains per panicle, grain length and grain yield per plant. Bhargava *et al*. (2021) [2] for grains per panicle and grain yield per plant.

Grains per panicle have positive significant correlation with grain yield per plant (0.482**) and harvest index (0.276**); negative significant correlation with 100 grain weight (-0.629**), grain length (-0.485**) and grain breadth (-0.321**); positive non-significant correlation with length breadth ratio (0.028^{NS}) and straw yield (0.189^{NS}). Comparative results reported by Seneega *et al*. (2019) [10] for 100 grain weight, grain length, grain breadth, length and breadth ratio, grain yield per plant; Priyanka *et al*. (2019) [9] for grain yield per plant; Singh *et al*. (2020) [11] for grain length, grain breadth and grain yield per plant. Bhargava *et al*. (2021) [2] for grain yield per plant.

100 grain weight have grain length (0.432**) and grain breadth (0.697**); negative significant correlation with length and breadth ratio (-0.403**); negative non-significant correlation with grain yield per plant (-0.084^{NS}) and straw yield per plant (-0.109^{NS}); positive non-significant correlation with harvest index (0.111 ^{NS}). Similar results were reported by Abhilash *et al*. (2018) [1] for grain yield per plant; Seneega *et al*. (2019) [10] for grain length, grain breadth, length and breadth ratio, grain yield per plant.

Grain length have positive significant correlation with length and breadth ratio (0.441**); negative significant correlation with straw yield per plant (-0.222*); negative non-significant correlation with grain yield per plant (-0.173^{NS}); positive non-significant correlation with grain breadth (0.028 ^{NS}) and harvest index (0.076 ^{NS}). Comparative findings reported by Seneega *et al*. (2019) [10] for grain breadth and grain yield per plant.

Grain breadth have positive significant correlation with harvest index (0.253*); negative significant correlation with length and breadth ratio (-0.854**), straw yield per plant (-0.199**); negative non-significant correlation with grain yield per plant (-0.050^{NS}). The results are in accordance with Seneega *et al*. (2019) [10] for length and breadth ratio.

Length and breadth ratio have negative significant correlation harvest index (-0.220*); negative non-significant correlation with grain yield per plant (-0.083^{NS}); positive non-significant correlation with straw yield per plant (0.069^{NS}).

Grain yield have positive significant correlation with straw yield per plant (0.638**); positive non-significant correlation with harvest index (0.192^{NS}). Similar results observed by Farhad Kahani and Shailaja Hittalmani (2015) [4] for straw yield per plant.

Straw yield per plant have negative significant correlation with harvest index (-0.566**) thus improvement in one trait can affect other trait in the negative direction.

Grains per panicle showed significant and positive correlation with plant height, panicle length, grains per panicle and harvest index can be improved through direct selection. Likewise, grain yield per plant showed significant and positive correlation with plant height, productive tillers par plant, panicle length, grains per panicle and straw yield per plant the improvement in grain yield per plant trait can be achieve by improvement of it's positively associated traits followed by direct selection which is major breeding objective of the present study.

Table 1: Correlation studies for twelve traits in hundred genotypes of F2 population of rice

Traits	DF	PH	PT	PL	GPP	100 GW	GL	GB	LBR	GY	SY	HI
DF	1	-0.163^{NS}	0.086^{NS}	-0.177^{NS}	-0.189^{NS}	-0.091^{NS}	-0.247*	-0.170^{NS}	0.062^{NS}	-0.179^{NS}	0.330**	-0.602**
PH	-0.163^{NS}	1	0.302**	0.585**	0.354**	-0.139^{NS}	-0.120^{NS}	-0.157^{NS}	0.064^{NS}	0.619**	0.643**	-0.160^{NS}
PT	0.086^{NS}	0.302**	1	0.021^{NS}	0.155^{NS}	-0.059^{NS}	-0.098^{NS}	-0.130^{NS}	0.034^{NS}	0.722**	0.627**	-0.111^{NS}
PL	-0.177^{NS}	0.585**	0.021^{NS}	1	0.301**	-0.043^{NS}	0.192^{NS}	-0.154^{NS}	0.220*	0.408**	0.319**	0.005^{NS}
GPP	-0.189^{NS}	0.354**	0.155^{NS}	0.301**	1	-0.629**	-0.485**	-0.321**	0.028^{NS}	0.482**	0.189^{NS}	0.276**
100GW	-0.091^{NS}	-0.139^{NS}	-0.059^{NS}	-0.043^{NS}	-0.629**	1	0.432**	0.697**	-0.403**	-0.084^{NS}	-0.109^{NS}	0.111^{NS}
GL	-0.247*	-0.120^{NS}	-0.098^{NS}	0.192^{NS}	-0.485**	0.432**	1	0.028^{NS}	0.441**	-0.173^{NS}	-0.222*	0.076^{NS}
GB	-0.170^{NS}	-0.157^{NS}	-0.130^{NS}	-0.154^{NS}	-0.321**	0.697**	0.028^{NS}	1	-0.854**	-0.050^{NS}	-0.199*	0.253*
LBR	0.062^{NS}	0.064^{NS}	0.034^{NS}	0.220*	0.028^{NS}	-0.403**	0.441**	-0.854**	1	-0.083^{NS}	0.069^{NS}	-0.220*
GY	-0.179^{NS}	0.619**	0.722**	0.408**	0.482**	-0.084^{NS}	-0.173^{NS}	-0.050^{NS}	-0.083^{NS}	1	0.638**	0.192^{NS}
SY	0.330**	0.643**	0.627**	0.319**	0.189^{NS}	-0.109^{NS}	-0.222*	-0.199*	0.069^{NS}	0.638**	1	-0.566**
HI	-0.602**	-0.160^{NS}	-0.111^{NS}	0.005^{NS}	0.276**	0.111^{NS}	0.076^{NS}	0.253*	-0.220*	0.192^{NS}	-0.566**	1

References

1. Abhilash R, Thirumurugan T, Sassikumar D, and Chitra S. Genetic studies in F_2 for biometrical traits in Rice (*Oryza sativa*. L). Electronic Journal of Plant Breeding. 2018;9(3):1067-1076.
2. Bhargava K, Shivani D, Pushpavalli SNCVL, Sundaram RM, Beulah P, Senguttuvel P. Genetic variability, correlation and path coefficient analysis in segregating population of rice. Electronic Journal of Plant Breeding. 2021;12(2):549-555.
3. Butardo VM, Sreenivasulu N, Juliano BO. Rice Grain Quality: Methods and Protocols, Methods in Molecular Biology, Springer. 2019;12(2):549-555.
4. Farhad K, Hittalmani S. Genetic analysis and traits association in F_2 intervarietal populations in rice under aerobic condition. J Rice Res. 2015;3(152):2.
5. FAO, Rice market Monitor; c2009 Feb, XII(1).
6. Hitaishi SK, Vimal SC, Chaudhary AK. Association and path analysis of yield attributes and physiological parameters in rice (*Oryza sativa* L.) under problematic soil conditions. The Pharma Innovation Journal. 2020;9(9):347-353.
7. NABARD, Annual report, 2007-08. India
8. Patel SN, Patel VP, Modha KG, Parekh VB. Rice hybrid purity testing at molecular level for development of F_2 mapping population. The Pharma Innovation Journal. 2021;10(8):1358-1362.
9. Priyanka AR, Gnanamalar RP, Banumathy S, Senthil N, Hemalatha G. Genetic variability and frequency distribution studies in F_2 segregating generation of rice. Electronic Journal of Plant Breeding. 2019;10(3):988-994.
10. Seneega TA, Gnanamalar RP, Parameswari C, Vellaikumar S, Priyanka AR. Genetic variability and association studies in F_2 generation of rice (*Oryza sativa* L.). Electronic Journal of Plant Breeding. 2019;10(2):512-517.
11. Singh SK, Habde S, Singh DK, Khaire A, Mounika K, Majhi PK. Studies on character association and path analysis studies for yield, grain quality and nutritional traits in F_2 population of rice (*Oryza sativa* L.). Electronic Journal of Plant Breeding. 2020;11(3):969-975.