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Impact of Bi-Parental Mating on Character Association in Barley (*Hordeum vulgare* L.)

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Authors' contributions

This work was carried out in collaboration between both authors. Author VP designed the study and made the cross after choosing the parent and developed the BIP's and the F3 population. The experiment was taken in the field. The statistical analysis was done, wrote the protocol and fist manuscript of the research paper. Author SRP help in taking observation of the experiment and also help in typing of the paper. Both authors read and approved the final manuscript.

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ABSTRACT

Correlation between grain yield and contributing characters in 100 biparental progenies (BIPs) developed from a barley cross RD-2035 x RD-2552 and corresponding F_3 progenies were compared. The correlation coefficients in BIPs were found generally of higher magnitude than F_3 progenies. Even, non-significant negative association in F3 between grain yield per plant and harvest index converted into significant and positive in BIP progenies. Higher degree of positive and significant correlation was observed in tillers per plant, spikelets per spike and grain per spike with grain yield per plant in BIPs as well as F_3 population.

Keywords: Barley; biparental mating (BIP); character association.

1. INTRODUCTION

Before initiating a breeding programme for improvement in a trait in any crop, the most essential requirement is the genetic variability present in the breeding material. It has been realised that the pace of crop improvement in the self-pollinated crops like barley is not of the same extent as it was in the past. The main reason for not achieving another breakthrough in the

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productivity of barley is lack of sufficient genetic variability. The presence of larger linkage blocks and inverse relations among the correlated characters are most common. Under such circumstances, conventional breeding methods like pedigree and bulk methods again impose restriction on the chance of better recombination and are also associated with the weakness of causing rapid homozygosity and low genetic variability [1]. Bi-parental mating, on the other hand, is expected to break larger linkage blocks and provide more chances for recombination than the selfing series of generation advancement [2,3]. Keeping this in mind, the present investigation was carried out to analyze and compare the nature and magnitude of correlations among various characters in bi-parental progenies (BIPs) and the corresponding F_3 generation in a barley cross.

2. MATERIALS AND METHODS

Two barley genotypes, RD 2035 and RD 2552 having peculiar contrasting characters related to productivity were crossed to get F_2 generation. Inter mating of selected plants in F2 of RD 2035 X RD2552 cross was attempted and progenies involved in the crosses were also allowed to be self pollinated simultaneously to obtain F_3 progenies. One hundred F_2 plants selected on the visual basis keeping in view the vigour, plant type and earliness were used for selective inter mating. The BIPs and F3 families were evaluated in randomized block design with three replications. The BIP population and its corresponding F_3 population were sown in 10 rows of 5 meters row length with a spacing of 30 cm x 15 cm. The data were recorded on the plants in BIP (250 plants) and F_3 (200 plants) for grain yield and contributing characters viz., days to heading, days to maturity, plant height, ear length, tillers per plant, spikelets per spike, grains per spike, 100-grain weight, grain yield per plant and harvest index. The plot means were used for statistical analyses. Simple correlation coefficients were calculated for biparental as well as selfed progenies.

3. RESULTS AND DISCUSSION

A comparison of correlation coefficients among different characters in BIP and F_3 populations (Table 1) revealed that, association between traits in BIPs were of higher magnitude in general than in F_3 population. The increase in magnitude of correlation coefficient would be expected if linkages were in repulsion phase [4]. However, in both populations, the correlation coefficients of yield contributing traits like tillers per plant, spikelets per spike and grains per spike with grain yield per plant were high and positively significant. This clearly indicates that selection based on these traits is expected to improve the grain yield.

Table 1. Correlation coefficient among different characters in BIP and F3 populations of a barley cross RD 2035 X RD 2552

Correlation coefficients	Days to maturity		Plant height	Ear Length	Tillers per Plant	Spikelets per spike	Grains per spike	100-grain weight	Grain yield per plant	Harvest index
Days to maturity	BIP	0.72**	0.36**	0.64**	0.06	0.39**	-0.04	0.11	0.02	-0.02
	F_3	0.66**	0.24**	0.63**	-0.01	0.22**	-0.07	0.04	0.04	-0.12
Days to maturity	BIP		0.04	0.42**	-0.08	0.27**	0.16*	0.17	0.29**	-0.10
	F_3		0.07	0.35**	-0.09	0.24**	0.10	-0.11	0.22**	-0.22**
Plant height	BIP			0.55**	0.05	0.50**	0.27**	0.12	0.26**	-0.45**
	F_3			0.66**	0.03	0.58**	0.25**	0.02	0.27**	-0.24**
Ear Length	BIP				-0.02	0.72**	0.19**	-0.12	0.37**	-0.29**
	F_3				0.01	0.61**	0.11	-0.11	0.34**	0.01
Tillers per plant	BIP					-0.17	0.21**	-0.24**	0.88**	0.31**
	F_3					0.19	0.23**	-0.17*	0.74**	0.29**
Spikelets per Spike	BIP						0.57**	0.12	0.72**	0.22**
	F_3						0.50**	0.09	0.66**	0.17*
Grains per Spike	BIP							-o.46**	0.68**	0.28**
	F_3							-0.24**	0.67**	0.24**
100-Grain Weight	BIP								0.14	0.11
	F_3								0.08	0.10
Grain yield per Plant	BIP									0.16*
	F_3									-0.02

, Significant at 5 % and 1% Levels, respectively*

It was also observed that the non-significant negative association between harvest index and grain yield per plant in F_3 changed to positive and significant in BIP population. The altered correlations from F_3 to BIPs were due to breakage of undesirable linkages and release of desirable variability through biparental mating [5]. These results indicated that inter mating in F_2 was quite effective to break undesirable linkages. It was thus evident that the reshuffling of the genes responsible for associations among some traits resulted in new recombinants, which presumably were due to change from a coupling phase to repulsion phase linkage. Nanda et al. [6], Mahalingam et al. [7] have also observed such shifts in correlations between different characters in wheat. Intermating reduces the genetic drift and unfavourable correlated responses by maintaining genetic variability in the population.

4. CONCLUSION

It was evident from the present study that there was a significant impact of bi-parental mating on association pattern between important yield components in barley. Biparental mating was more effective in breakage of linkages, generating tremendous desirable genetic variability and dissipating negative correlation between yield and other parameters thereby increasing the efficiency of selection for improving productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Clegg MT, Allard RW, Kahlaer AL. Is the gene the unit of selection? Evidence from two experimental plant populations, Proceedings of Sciences of the United States of America. 1972;69:2474-2478. Available:https://doi.org/10.1073/pnas.69.9.2474
2. Gill KS, Bains SS, Singh G, Bains KS. Partial diallel test crossing for yield and its components in *Triticum aestivum* L. In: Proc. 4th International Wheat Genetics Symposium, (eds. Sears, E.R.; Sears, L.M.S.), Missouri, Columbia. 1973;29-33.
3. Parameshwarappa KG, Kulkarni MS, Gulganji GG, Kubsad VS, Mallapuf CP. An assessment of genetic variability created through biparental mating in safflower (*Carthamus tinctorius* L.). 4th International Safflower Conference, 2-7 June, BARI, Italy. 1997;238-239.
4. Nanda GS, Singh Gurdev, Gill KS. Efficiency of intermating in F2 generation of an intervarietal cross in bread wheat. The Indian Journal of Genetics and Plant Breeding. 1990b;50:(4)364-368.
5. Kishor C, Paroda RI, Jatasra DS. Generation of favorable association through biparental mating in Oats. The Indian Journal of Genetics and Plant Breeding. 1989;49(1):43-46.
6. Nanda GS, Afzali AB, Singh Gurdev. Genetic analysis of the role of intermating in an intervarietal cross of bread wheat. The Indian Journal of Genetics and Plant Breeding. 1990a;50(3):210-215.
7. Mahalingam A, Robin S, Pushpam R. Impact of intermating and linkage relationship among the grain quality traits in early segregating generations of rice. Oryza. 2012;49(3):163-170.

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