IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume **9** | Issue 1 | January, 2014 | 289-290

RESEARCH NOTE

Inheritance studies of grain dimension and chalkiness in rice (*Oryza sativa* L.)

■ **G.R. SAHU, A.K. SARAWGI, M. PARIKH AND B. SHARMA**

SUMMARY

Gene action governing the inheritance of grain dimension and chalkiness were studied in cross Dokra- Dokri/Keraghul. The study showed that the short bold grain was dominant over the long slender grain and segregating ratio in F_2 population revealed that the short bold grain in the variety Keraghul was governed by two complementary genes. Similiary translucent endosperm was found dominant over the white centre in endosperm and segregating pattern suggested that the above character was governed by inhibitory gene control with single major gene in the Dokara-dokari.

Key Words : Rice, Grain, Quality, Characters, Inheritance

How to cite this article : Sahu,G.R., Sarawgi, A.K., Parikh, M. and Sharma, B. (2014). Inheritance studies of grain dimension and chalkiness in rice (*Oryza sativa* L.). *Internat. J. Plant Sci.,* **9** (1): 289-290.

Article chronicle : Received : 17.05.2013; **Accepted :** 22.12.2013

Rice is the world's most important food crop and a primary source of food for more than half of the world's population and account for more than 50% of their daily calorie intake. During the course of organic evolution, rice (*Oryza sativa*) originated much earlier than most of the other cereal crops. As a result, vast genetic variability, not only in quantitative but also in qualitative traits has been created and accumulated in this crop leading to coming in to existence over hundred thousand genotypes possessing wide array of variation in almost all the traits. The grain dimension and chalkiness of rice are important characteristics, which determine the consumer preference as well as the commercial success of a variety. These greatly affect the head rice recovery and the milling quality (Veni and Shoba Rani, 2008). Hence improvement of these characters is foremost in any breeding programme. In the present investigation the nature of inheritance of important grain characters *viz.*, dimension and chalkiness were studied.

The material comprised of single cross *i.e.* Dokra-dokri/ Keraghul. The F_1 generation along with their parents were raised and advanced to F_2. The present investigation was carried out at the Rice Research Farm, in the Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur. The observations on the parents and F_1's were recorded on the row basis, while F_2 population on individual plant basis. The data were analyzed independently for each trait to determine the mode of inheritance by χ^2 (Chi-square) test as suggested by Fisher (1936).

The experimental findings obtained from the present study have been discussed in following heads:

Short bold grain :

Grain length and shape are the basic components of grain dimension hence genetical study of grain length and shape are of more importance in present day rice breeding programme. Grain dimensions have formed the basis of systems of classification (Sethi and Saxena, 1930).

The short bold grain character was studied in the cross of Dokara-dokari (long slender grain) with Keraghul (short

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
B. SHARMA, Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidhalaya, RAIPUR (C.G.) INDIA
Email: bhavana.s.pandey1980@gmail.com)

Address of the Co-authors:
G.R. SAHU, A.K. SARAWGI AND M. PARIKH, Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidhalaya, RAIPUR (C.G.) INDIA

Table 1 : Segregation for two qualitative characters in F_2 population in rice

Sr. No.	Plant characters / crosses	$P_1 \times P_2$	F_1 Phenotypes	F_2 observations		χ^2 ratio	χ^2_{Value}	P value
1.	Short bold grain			Short bold grain	Long slender grain			
	Dokra-dokari x Keraghul	Long slender grain × Short bold grain	Short bold grain	480	345	9:7	1.244	0.30-0.20
2.	White centre in endosperm			White centre in endosperm	translucent			
	Dokra-dokari x Keraghul	White centre in endosperm × translucent	translucent	148	673	3:13	0.283	0.70-0.50

bold grain). The F_1s were short bold grained plants, indicating dominant nature of short bold grain character over long grain (Table 1). The F_2 population agreed with the ratio of 9:7 (short bold grain:long slender grain), suggesting that the short bold grain trait in the variety Keraghul was due to two complementary genes (designated as *K-a* and *K-b*). While the earlier workers Mitra and Ganguli (1938) and Alam (1939) reported a dominant gene for expression of (short) round grain trait but that was monogenic. Contrary to the present findings Parnell *et al.* (1917) reported normal length of grain to be dominant over short grain. Ramiah and Parthasarthy (1933) reported that grain length was governed by the interaction of three factors.

White centre in endosperm:

Transparency and chalkiness area of milled rice are closely related to quality of rice. Consumers usually like rice with better transparency and little or no chalkiness area to improve the efficiency of breeding for rice quality, it is necessary to understand the variation in the expression of genes for controlling these traits (Shi *et al.*, 2002).

Inheritance pattern of the white centre in endosperm was studied in the cross of Dokara-dokari (white centre present in endosperm) with Keraghul (translucent endosperm). All F_1 plants were found to have translucent endosperm, indicating recessive nature of the trait (white centre in endosperm) (Table 1). The F_2 population segregated into ratio of 3:13 (white centre in endosperm:translucent endosperm), suggesting that above trait involved inhibitory gene control with single major gene (earlier designated as *Wc*) in the Dokara-dokari. The effect of gene *Wc* was suppressed by inhibitory gene (designated as *I-Wc*) when presented along with it, the resultant genotypes failed to express the white centre in endosperm trait. In contrast to the present results Nadaf *et al.* (1993) reported monogenic gene action for expression of the trait. Nagai (1959) also reported varying degrees of dominance for both core white and abdominal white traits.

The study showed that the short bold grain was dominant over the long slender grain and segregating ratio in F_2 population revealed that the short bold grain in the variety Keraghul was governed by two complementary genes. Similiary translucent endosperm was found dominant over the white centre in endosperm and segregating pattern suggested that the above character was governed by inhibitory gene control with single major gene in the Dokara-dokari.

Acknowledgement:

Part of the research work was done by the first author for his doctoral degree at Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.).

REFERENCES

Alam, M. (1939). Grain quality index of rice. Proc. 24th Indian Science Congress, (Agriculture) Abst. 148.

Fisher, R.A. (1936). The use of multiple measurements in taxonomic problems. *Ann. Eugen.,* **7**: 179-189.

Mitra, S.K. and Ganguli, P.M. (1935). Some observations on the characters of wild rice hybrids. *Indian J. Agric. Sci.,* **2** : 271-279.

Nadaf, S.K., Goud, J.V. and Parameshwarappa, R. (1993). Genetic studies in rice (*Oryza sativa* L.), Inheritance of white belly. *Karnataka J. Agric. Sci.,* **6** (1) : 243-247.

Nagai, I. (1959). *Japonica* rice, its breeding and culture. Tokyo, Yokendo Ltd. pp: 843.

Parnell, F.R., Rangaswamy, A.G.N. and Ramiah, K. (1917). Inheritance of characters in rice. I. *Mem. Dept. Agric. India, Bot. Ser*. **9** : 75-105.

Ramiah, K. and Parthasarthy, N. (1933). Inheritance of grain length in rice (*Oryza sativa* L.) *Indian J. Agric. Sci.,* **3** : 808-819.

Sethi, R.L. and Saxena, B.P. (1930). Classification and study of characters of cultivated rices in United Provinces. *Mem. Dept. Agri. India, Bot. Ser*., **18** : 149-210.

Shi, C.H., Wu, J.G., Lou, X.B., Zhu, J. and Wu, P. (2002). Genetic analysis of transperancy and chalkiness area at different filling stages of rice (*Oryza sativa* L.). *Field Crops Res.*, **76** : 1-9.

Veni, B.K. and Shobha Rani, N. (2008). Inheritance of grain size and shape in rice. *Oryza*, **45** (3): 242-244.