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Short Communication

Inheritance of wide compatability in rice (*Oryza sativa* L.)

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The inter sub-specific sterility in rice has been the subject of numerous investigations in the past [1, 2, 3]. Ever since the possibility of overcoming hybrid sterility for *indica-japonica* hybrids was reported, many scientists have studied the F_1 sterility of *indica-japonica* crosses to understand the cause of sterility and the nature of its inheritance. These findings led to the identification of some compatible types in both the groups, which produced fertile F_1s when crossed to the other lines. These compatible types were designated as wide compatible varieties (WCVs) by Ikehashi and Araki [4].

A knowledge of the inheritance of WC trait is most important for the development of WCVs, for utilization in the inter sub-specific hybridization. Therefore, an attempt was made in the present investigation to study the inheritance of WC trait by using segregating population of six crosses obtained by crossing three different sub-species in rice *viz.*. *indica, japonica* and tropical *japonica*. Three tropical *japonica* genotypes with WCG were crossed with an *indica* variety IR 50 which is a non-WCV. Further, three *indica* genotypes with WCG were crossed with a *japonica* variety Langi which is also a non-WCV. Thus six hybrids were obtained and raised separately. The seeds harvested from F_1 plants of the above six crosses were raised with a spacing of 20 × 15 cm. The F_2 population of 300 plants of each cross were grown in separate blocks. All cultural operations were followed to ensure a healthy crop. Data were recorded on individual F_2 plants for spikelet fertility. Three hundred plants per cross were observed individually and the data were recorded on them. The genetics of wide compatibility was analyzed based on the pattern of F_2 segregation. The scale adopted to divide the plants into different fertility groups based on spikelet fertility, as per IRRI guidelines was 70% sterile and 70% fertile. The F_2 plants classified into fertile and sterile, were subjected to chi-square analysis.

Though many of the earlier workers [4, 5] reported the monogenic nature of the WC trait, in the current situation the scientific community believes that its nature of inheritance is not as simple as thought earlier. The studies of Zhang *et al.* [6], on the basis of molecular marker polymorphism and *indica-japonica* hybrid fertility, revealed that the genetic basis of *indica-japonica* hybrid fertility is very complex and it is highly difficult to concede the monogenic nature of its inheritance. Similarly, Wang *et al.* [7] also reported the complex nature of genetic basis in the well known WCV, Dular. In the present investigation, the F_2 plants showed varied levels of spikelet fertility (Table 1). The data on spikelet fertility for all the six crosses was subjected to chi-square test for 3:1 probable ratio, based on the previous reports. However, the present data do not fit into the 3:1 ratio. This shows the complex nature of inheritance of fertility in these six hybrids. Whereas after trying various combinations for goodness of fit in the above six crosses, F_2 segregation for spikelet fertility and semi-sterility were in agreement with trigenic complementary ratio (45:19). The results are in consonance with that of Wu *et al.* [8] and Kumar and Chakrabarti [9] who suggested involvement of non-allelic interaction in the expression of WC trait. Based on the results on inheritance of WC trait, it may be suggested that in all the above six crosses, WC trait is controlled by three genes rather than single gene. Involvement of one basic dominant gene and two complementary genes in the expression of WC trait, has been reported

Table 1. Segregation for spikelet fertility in F_2 generation of six crosses in rice

S. No.	Crosses	F_2 segregation		χ^2 45:19
		Fertile	Sterile	
1.	IR 66154-48-1-3-1 × IR 50	202	98	1.29^{ns}
2.	IR 66158-38-3-2-1 × IR 50	196	104	3.54^{ns}
3.	IR 65600-32-4-6-1 × IR 50	196	104	3.54^{ns}
4.	ASD 16 × Langi	197	103	3.13^{ns}
5.	N 22 × Langi	200	100	1.93^{ns}
6.	Dular × Langi	197	103	3.13^{ns}

ns = Non-significant

by several authors [10, 11]. Recently, through RFLP analysis, three loci (one major and two minor) conferring significant effects on hybrid sterility have been identified [12]. We can conclude that the genetic basis of inter sub-specific sterility of cultivated rice is complex. Further studies are necessary to fully characterize the genetic basis of WC genes in order to device an efficient strategy for exploitation of the strong heterosis between *indica* and *japonica* or tropical *japonica* and *indica* varieties in hybrid rice breeding programme.

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