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Short communication

RECIPROCAL HYBRIDIZATION BETWEEN A NATURAL FLORAL ORGAN MUTANT AND NORMAL RICE SHOWED INTER-VARIETAL BARRIERS

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Jugal is a natural floral organ mutant of rice (*Oryza sativa* cv. Jugal) that naturally produces multiple seeds per grain, possess more than one carpel in most of its flowers. However, the underneath mechanism of multiple carpel is yet not clearly understood. To understand the genetic basis of the multiple carpels of Jugal plants, a reciprocal cross was performed between this mutant line with a normal rice. Crosses between male Jugal and female IR36 produced viable seeds, whereas, crosses between female Jugal plants and male IR36 plants did not produce any seeds in F_1 progeny indicating that Jugal carpels possess incompatibility barriers.

(Key words:Rice, floral organ mutant, reciprocal cross, carpel, incompatibility barriers)

Natural mutants are rich source of genetic variations and mutational studies are indispensable method for understanding of the underlying mechanism of mutant trait (Nagasawa *et al.,* 1996; Takahashi *et al.,* 1998; Sunohara *et al.,* 2003). So far, several mutants which led to abnormal development of floral organs have been reported (Yamaguchi *et al.,* 2004; Jiang *et al.,* 2005; Zhang *et al.,* 2015). Jugal is a natural mutant of rice (*Oryza sativa* cv. Jugal) that naturally produces multiple seeds grain^{-1}, possess more than one carpel in most of its flowers (Prain 1903; Pandian *et al.,* 2004; Priya *et al.,* 2015). From morphological study we found that, Jugal plants have enlarged floral meristem; whereas, molecular study showed that a point mutation in Jugal *FON1* gene has caused premature translational termination (unpublished data). However, the exact mechanism of increased number of carpels in Jugal flowers which leads to multiple seeded grains is yet to be explained. Floral organ development in plant is a multi-genic pathway, where many genes possess syntenic as well as redundant activity and being a natural mutant, genetic characterization of Jugal will advance the present understanding of flower development. Therefore, in this present study, genetic approaches were taken to correlate the outcome of morphological and molecular study to unveil the underneath mechanism of development of multiple carpels. For genetic study, Jugal, a natural mutant (*O. sativa* cv. Jugal, NBPGR IC No. 567987) was crossed with IR36 a normal variety in two combinations. In one combination, Jugal male plants were crossed with female IR36 plants; in other combination Jugal female plants were crossed with male IR36 plants. Since, IR36 produce flowers in 63-65 days and Jugal flowers in 108-110 days, at first floral synchronization were done followed by emasculation and pollination; the resulted F_1seeds were collected from the parents after 25 days of pollination. All the hybridizations were done in the field of Department of Biotechnology, Visva-Bharati, within March to August 2017.

The reciprocal crosses between Jugal and IR36 produce F_1 progeny only in the crosses where Jugal were selected as male parents donating pollens and IR36 were recipient of those pollens and act as female parents (Fig.1); interestingly, there were no F_1 seeds produced on crosses between Jugal as female parents and IR36 as male parents. However, Jugal female plants produce seeds when they were self-pollinated which clearly indicates that they are not female sterile. After collecting the mature seeds (Fig.1. a), they were stored in room temperature for three months to overcome the post fertilization dormancy period. After three months of dormancy periods, rice grains were germinated with moist cotton within four to five days (Fig.1. b).

It has been reported that in some mutant rice lines carpel, the female reproductive unit, in addition of protecting the ovules and the developing seeds, also prevents pollination by functioning as self as well as interspecific incompatibility barriers (Ferra´ ndiz *et al.,* 2010). While the self incompatibility mechanism prevents close inbreeding, the interspecific incompatibility prevents hybridization between two different species (Silva and Goring, 2001). In this present investigation, all the female Jugal parents showed self incompatibility, as it did not produce seeds while crossed with IR36 plants. Therefore, the presence of multiple carpels not only responsible for production of multiple seeded rice, it also confers incompatibility barriers in Jugal plants. Although, finding of this study did not explained any genetic mechanism of the presence of multiple carpels in Jugal flowers, the information of this investigation will enrich our present understanding of importance of carpel in plants and can be utilized in future rice improvement program.

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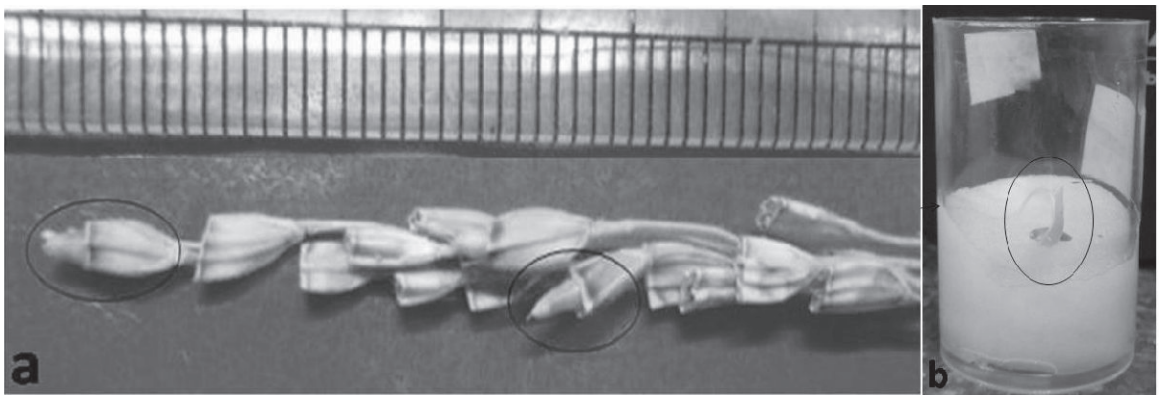

Fig.1. a) Seeds of F_1 generation in cross between male Jugal and female IR36; b) a viable germinating seed of F_1 generation

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