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Overcoming styler incompatibility studies of bread wheat (*Triticum aestivum*)

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ABSTRACT

A study was made on the incompatibility mechanism of pollen for boron resistant genotype and on the stylar tissues of boron susceptible genotypes and its method of overcoming in bread wheat (Triticum aestivum). The results indicated that pollen of boron resistant genotype germinated on the stigmata of boron susceptible genotype, the pollen tube came across the stigmatic pathway but did not proceed further and thus its growth was restricted to the stigma. When boron was sprayed on the florets of susceptible one at 48 hours before pollination and pollinated by the pollen of boron resistant one there was no problem of tube growth of resistant one through the style and so on and ultimately grain formation took place by successful over fertilization. Thus boron is the medium for successful way of overcoming the stylar incompatibility of boron susceptible genotypes.

Key words : Boron resistant, boron susceptible, incompatibility, incomplete grain filling.

In terai zone of West Bengal, India, due to deficiency of boron partial or almost incomplete grain filling of Mexican semi dwarf wheat varieties has been reported by various workers (Chatterjee *et al.*, 1980; Ganguli, 1979; Mondal and Das, 1988, Mandal and Ghosal (1985). Mandal and Chakraborty (1988) studied the pollen grains of several varieties of bread wheat growing in this region and reported normal germination of pollen grains on artificial medium. Jost and Durman (1976) reported the effect of boron in increasing fertility in wheat. Jalani and Moss (1981) studied that penetration of stylar and ovary wall by pollen tubes was severely reduced due to presence of dominant allele of Kr locus. During the present study boron status of the soil has been analysed. The available boron status of this soil was 0.31 ppm which is highly deficient. The pH of this soil is 5.6. With a view to the above facts, a study was made to investigate the cytological cause of incomplete grain filling and its method of overcoming in bread wheat varieties.

MATERIALS AND METHODS

Two boron susceptible varieties namely HP 1209 and Janak and Sonalika, more or less a boron resistant variety were selected for the present study. Ten spikes were taken for each treatment and emasculation was made on the side florets only. Twenty ppm of borax (sodium borate) solution was sprayed on half of the emasculated spikes in Janak at 48 hours before pollination. Fresh pollen from Sonalika was dusted on the stigmata of HP 1209 and Janak. After pollination florets of each spike were collected from the middle portion of the spike and fixed in aceto-alcohol (1:3) at 3, 6, 9, 15, 24 and 48th hour in ♀ HP 1209 X ♂ Sonalika and in ♀ Janak X ♂ Sonalika the florets from sprayed and unsprayed spike were fixed separately in the same at 24 and 48th hour after pollination.0.1% cotton-blue stain in lacto phenol was used for studying pollen germination and tube growth by squash technique. Styles from each ovary was detected and stained in cotton blue. Twenty five pistils for each treatment were taken for recording observation.

RESULTS AND DISCUSSION

Results of the experiment showed that pollen grains germination increased upto 24 hours after pollination in the cross ♀ HP 1209 X ♂ Sonalika. However, in Janak X ♂ Sonalika the germination percentage of pollen increased upto 48 hours. It was seen that pollen tube growth for ♀ HP 1209 X ♂ Sonalika is being limited after 6th hour. However, the tube growth was not significant between 24 and 48th hour. In ♀ Janak X ♂ Sonalika hybrid, pollen tube growth is significant at 24 and 48th hour at untreated condition (B_0) but under treated condition (B_1) there was significant difference of pollen tube length at 24 and 48th hour.

There was a marked difference in stylar tissue receiving pollen tubes between treated and untreated condition. When boron was sprayed on the florets of Janak 48 hours before pollination and followed by pollination pollens germinated, tubes passed through the stylar tissues and ultimately

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reached the ovule. As a result at 24th hour 12 out of 25 received germinating pollen tube on the stylar tissues. At 48th hour 40.9% ovaries were transformed into seeds. However, a few numbers of ovaries were yet in the stage of unfertilized condition. 12 out of 25 had germinating pollen tube on the stigmatic tissues and 6 of them crossed the stylar tissues.

The results indicated that pollen tubes of resistant genotype for boron deficiency can not penetrate the stylar tissues except for a very limited number, thus pollen tube growth is being restricted only to the stigmata. But when borax was sprayed on the florets of susceptible genotype (Janak) the pollen tubes of resistant genotype can successfully and as quickly as possible penetrate the stylar tissues of susceptible genotype. The penetration of pollen tubes in the styles of Janak at 24th hour revealed the possibility of success of fertilization since double fertilization in wheat takes place in between 24 and 48th hours. The formation of seeds at 48th hour at boron supplemented condition confirm the pollen tube penetration through the style and ovary and ultimately fertilization. Therefore, it may be concluded that pollens are not sterile but incompatible on susceptible back ground genotype. At the same time the incompatibility system is not present in the stigmatic tissues as most of the germinated pollens pass through the stigmatic tissue but are arrested at the stylar tissues. On the other hand the incompatibility barriers at the style can be broken by means of borax spraying at lower concentration. Korol'kova (1976) also reported the effect of boron in increasing fertility in wheat. The present study also indicated that the boron not only induces pollen tube growth but also growth rate. In the present study, it will not be out of place to suggest that inhibition of pollen tube penetration through the susceptible stylar tissue may be due to defect in carbohydrate metabolism pathway via myo-inositol synthesis mediated by boron (Gauch and Dugger, 1953).

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