

Effects of Embryological Studies on the Seed Development in Interspecific Crosses of Buckwheat

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[Introduction]

Buckwheat proteins have one of the highest known biological values, especially because of the high lysine content. In spite of its high nutritional value, however, for a long time there has been a decline in buckwheat production in all countries. In order to meet the increasing demands of rapidly expanding populations in the coming century, efforts must be made to improve the productivity of buckwheat. The combinations with the possibility of fertilization were confirmed by observation of pollen tube growth with fluorescence microscope described as over. For those combinations, the early embryo development were investigated. The normal development of early embryo after legitimate pollination in species *F. esculentum* and self pollination in *F. tataricum* has been described. We investigated the frequency of the ovules with developing embryo, abnormalities occurring during the early stage of embryo development to identify the apposite combinations and most appropriate embryo growth stage for hybrid embryo rescue.

[Materials and Methods]

Five species of *Fagopyrum* were used in these studies. Both homomorphic self-compatible and dimorphic self-incompatible species were included in the materials. Common buckwheat (*F. esculentum* Moench.) is a widely cultivated species. Short-styled (thrum) and long-styled (pin) plants are found in approximately equal frequencies in population. The wild species resembles common buckwheat in morphology but it differs from common buckwheat in the presence of homomorphic flowers, fragile prematured seeds and self-compatibility. *F. esculentum*, *F. tataricum*, *F. homotropicum* and *F. cymosum* belong to a group of *F. esculentum* and its close relatives, whereas other species are classified into another group of species distantly related to *F. esculentum* in the genus *Fagopyrum*. Plants were grown in pots of a pollinator-free greenhouse and growth chamber.

[Results and Discussions]

The frequency of aborted seeds and the changes and abnormalities that occur during the embryo development in interspecific crosses of buckwheat were investigated in order to study the causes of the low seed production. One genotype of *F. esculentum* and 15 genotypes were intermated. The frequency of aborted seeds was below 30% in the intraspecific crosses and over 90% in the interspecific crosses. Nomarski's interference microscopy were used to investigate the developmental stages of embryo. Embryo in different developmental stages were observed to determine the stage of abortion. These observations permitted the identification of developmental stages of embryo rescue in interspecific crosses. There were significant differences in the frequency of embryo abortion before the early globular stage among female thrum type and pin type progenitors for the intraspecific and interspecific crosses. All of delayed hybrid embryos in interspecific hybridizations of *F. esculentum* (Th) × *F. giganteum* and *F. esculentum* × *F. cymosum* in intraploid crosses, stopped their development at a globular stage near to 5 DAP. The part of hybrid embryo of the cross *F. esculentum* (Th) × *F. homotropicum* did not show significant difference in embryo size from control. The possibility for getting successful interspecific hybridization between *F. esculentum* and homostylous species in *Fagopyrum* must be highest in the cross *F. esculentum* (Th) × *F. homotropicum*. A second highest cross *F. esculentum* (Th) × *F. giganteum* and *F. esculentum* × *F. cymosum* in intraploid crosses. The results suggested that the appropriate time for embryo rescue in interspecific crosses is at the globular stage. If embryos could be rescued at the globular stage, it would be possible to increase the number of surviving embryos.

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