Bothriochloa macra, B. biloba, why is one common and the other rare? - Some embryological evidence

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A key issue for the development of sustainable agriculture is the conservation of biodiversity. In the present study the reproductive biology of *Bothriochloa macra*, a common native grassland species, was compared with that of *B. biloba*, which is recognized as a vulnerable species (ROTAP code 3V, *ie.* geographic range >100 km, and vulnerable through continuous depletion). Preliminary studies suggested that low seed set of *B. biloba* could be one of the important reasons for its rarity. To understand the difference between seed production, embryological development of the two species was investigated.

Materials and methods

Fresh *B. macra* inflorescences were collected from the UNE campus and *B. biloba* inflorescences were collected from plants growing in the glasshouse during February 1996. Inflorescences at various stages of develoment were fixed in FPA (90 ml 70% Ethyl alcohol + 5 ml Propionic acid + 5 ml Formalin), embedded in paraplast, sectioned at 12 µm and stained by safranin-fast green or hematoxylin. About 60 florets of each species at different stages of development were examined under a light microscope to investigate the embyo sac development.

Results

Ten samples of each of the species were examined at the preliminary stages of embryo sac development (archesporium and megaspore mother cell). Of these, 50% of *B. macra* had only one archesporial cell, the rest had two or more. All *B. biloba* were two to multi celled in origin. One cell origin is generally considered as normal sexual process in Poaceae (Johri *et al.* 1992) and multi-celled megaspore mother cells include some cells of somatic origin. Our conclusion is that apomictic embryogeny is more common in *B. biloba* than in *B. macra*.

At the next developmental stage (dyad), of the three *B. biloba* ovules checked, one was totally degenerated, one had a functional somatic cell and a degenerate sexual cell and the third ovule had normal structure.

At the third stage (functional megaspore), we examined three *B. macra* ovules, and found two healthy and the third degenerating. Of the seven *B. biloba* ovules examined, 57% were healthy and 43% degenerating.

At mature embryo sac stage, all 24 *B. macra* ovules examined had normal eight nucleate, polygonum type structure. Of the five *B. biloba* ovules examined, four had three to four apomictic embryo sacs and one had a normal 8-nucleate embryo sac.

Discussion

The above results suggest that apomictic and multi embryo sacs occur more often in *B. biloba* compared with *B. macra*, and during megasporogenesis *B. biloba* suffers more chance of abortion during the various stages of development. At the mature embryo sac stage most *B. biloba* ovules had multi-embryo sac structure, which suffered a greater chance of abortion because of competition for nutrition among the embryo sacs.

The embryogeny of *B. macra* is mostly normal while that of *B. biloba* is abnormal with more apomictic development and more degeneration at various stages of development. This perhaps explains why *B. macra* has a much higher seed set than that of *B. biloba* and is a more common species in grasslands.

Reference

Johri, B.M., Ambegaokar K.B. and Srivastava P.S.(1992). Comparative embryology of Angiosperms. Springer-Verlag. Berlin Heidelberg.