

Can *Eremostachys superba* be saved from extinction?

Biological species extinction has become a major concern of all conservation biologists today. It is estimated that every three minutes we are losing one species from the surface of the earth. While a vast majority of the extinctions go unnoticed, some species have caught the attention of biologists. One such plant species, currently on the verge of extinction, is *Eremostachys superba* Royle ex Benth.

E. superba is a highly ornamental, herbaceous species, perennating by means of a thick deep penetrating rhizome. Being a member of Labiatae this species exhibits certain characters anomalous to the family such as the thick deep penetrating rhizome, achene-like nutlets with a tuft of pappus-like hairs on the distal end and lack of any aroma in the plant body.

Despite its perennating habit and conspicuously well-adapted zygomorphic flowers, this species is most threatened today. According to the Red Data Book of India¹, about a decade ago this species was reduced to a single population of about 100 plants near Mohand, Dehra Dun in the Siwaliks of Uttar Pradesh. Prior to this, Babu² reported this species from Mohand and adjacent Rajaji National Park in UP. In the present survey of the habitat it was amazing to note that the population has drastically collapsed to hardly 25 plants in the type locality at Mohand and no population was observed at the Rajaji National Park.

A combination of strategies is required to be considered for management of the existing population of *E. superba*. According to the minimum viable population concept³, a minimum of 50 individuals is recommended for maintenance of the population. But for long-term evolutionary flexibility the population should be able to counteract the effects of genetic stochasticity for which a minimum viable population (MVP) of 500 individuals is suggested⁴. But the available population of *E. superba* at Mohand is far below this number.

This sharp decline in a short span of time suggests that the species might breathe its last in the coming 4–5 years itself if no effective conservation measures are initiated. An urgent need, therefore, is to see that the population is

drastically multiplied, so that the effects of demographic stochasticity (involving small population of 50 or less individuals) are counteracted^{5, 6}.

One of the possible reasons for the small size of the population could be, as summarized by Harper⁷, the availability of very few but widely separated sites, which are not connected by the normal dispersal ability of the plant. The only reported site for *E. superba* is Mohand and another in Peshawar in Pakistan⁸.



The influence of biotic factors, specially human beings on the population dynamics of this species cannot be underestimated. Being an ornamental plant along the roadsides, this species when in bloom attracts the attention of the passing travellers, who being unaware of the rhizome nature of the plant remove the aerial twigs including the flowering stalks and thus the chance of sexual reproduction and seed set is completely wiped out. Besides, the area is also constantly grazed by cattle and goats maintained by the Gujjars dwelling in that area.

The elaborate flower modification in *E. superba* is definitely an adaptation for outcrossing as in most other Labiatae members. The reduced and isolated population however never allows for any outbreeding and even when cross-pollination is effected it is between close relatives which is as good as inbreeding, resulting in the loss of

genetic variation. The chance movement of pollen from widely separated population in the species can also be conveniently scored out. Therefore, it is expected that in *E. superba* with very low numbers of plants a strong genetic drift and inbreeding prevails which has reduced the level of genetic variation, so much essential for the species to counteract the stochastic effects.

Low population size is not only detrimental to the species but has also affected the pollinator population in the area. Experimental studies conducted both at the natural site and at the experimental station at Lucknow provide evidence for this. This study established that the pollination mechanism in this species is of oligophilic sternotribic (nototribic in most other Labiatae) type involving only one kind of insect species specialized for gathering pollen on the ventral surface of the body. Further, hardly six insect visits, one insect working at a time for the whole inflorescence were recorded in one day's (20-3-93) observations. This study also revealed that when flowers were hand-pollinated they showed a high percentage (44.4%) of seed set compared to either the control or selfed ones (6.9% and 2.5% respectively) (Figure 1).

Equally important is the need to determine the effects of low population size on seed and fruit set in *E. superba*. Experimental data showed that out of the expected 276 nutlets from 69 flowers in one inflorescence only 19 apparently viable nutlets were harvested.

Data are lacking on the germination of the nutlets in *E. superba*. The seeds do not germinate easily under normal conditions even after one month of their sowing. Supporting this, no juvenile seedling could also be seen in the habitat. The reason for this could be physiological or biochemical or even environmental, and this aspect needs to be investigated thoroughly.

The poor sexual reproduction and failure of seed germination in *E. superba* also creates the doubt whether the population is genetically maintained (genets) or clonally produced (ramets). The development of thick, well-developed underground rhizome in a species like *E. superba* with an

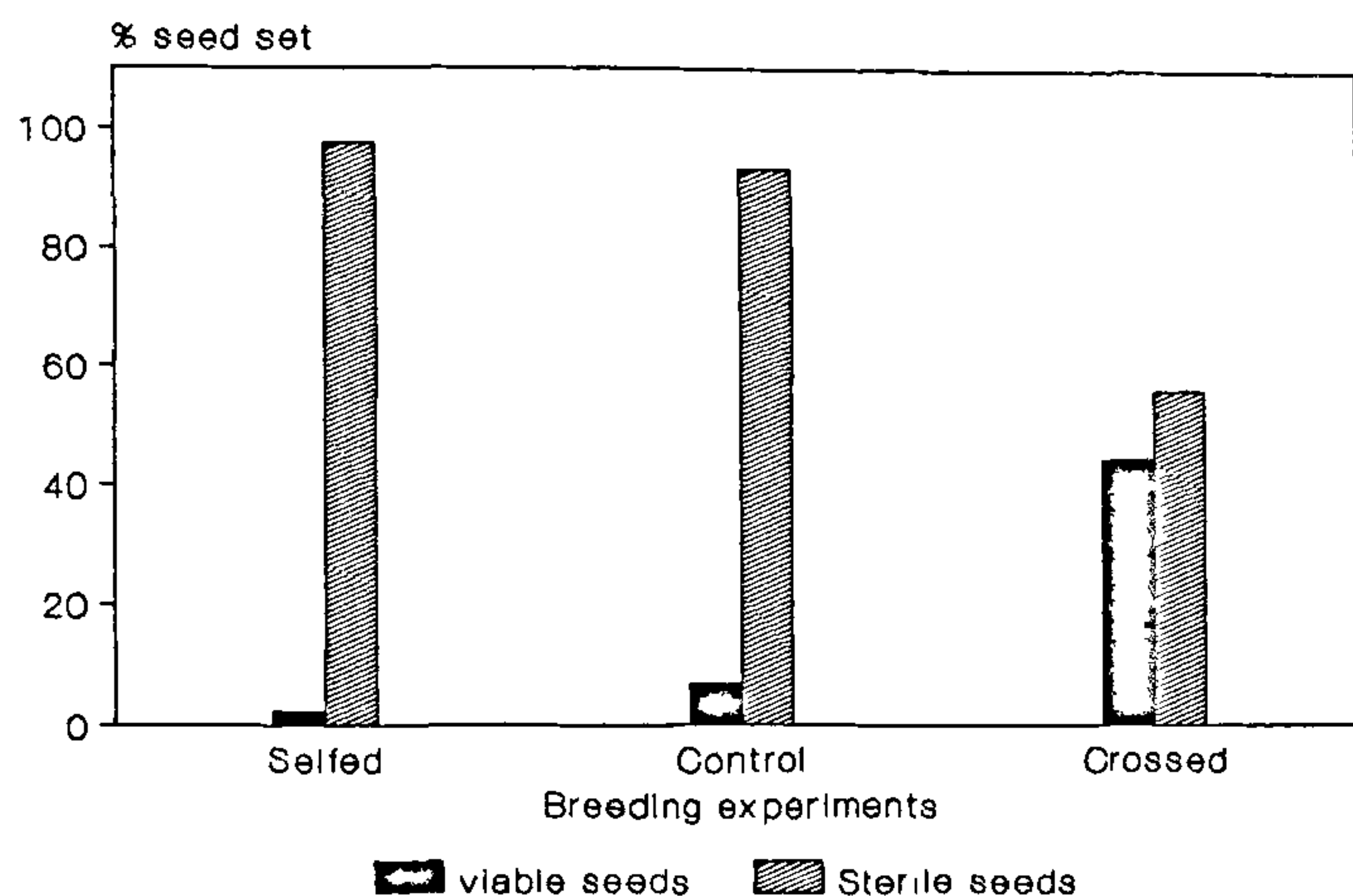


Figure 1. Seed set in *Eremostachys superba*.

elaborate flower structure is perhaps an adaptation to overcome the poor sexual reproduction and also to serve as a buffer to the ramet population from environmental stochasticity. But for the perennial nature, the species would have become extinct long back.

To conclude, conservation of *E. superba* is not only challenging but urgent. Preservation of the habitat alone, as attempted in most cases may not assure the long-term conservation of this species. Considering the severity of the problem an urgent task before conservation biologists lies in the multiplication and rehabilitation of the species through tissue culture tech-

niques. Because of the isolated and fragmented nature of the population a strong genetic drift and inbreeding depression has set in rendering the population almost devoid of variation and prone to extinction. For assured long-term conservation of the species one has to work out strategies that can increase the genetic diversity in this species. At the same time, the genetic diversity cannot be inducted in this species for want of any other population within the range of the pollen or seed dispersal. The current status of the population near Domel, Peshawar, Pakistan⁸ is not known. If these two populations could be brought together

by some means the chances of survival of this species may increase. Till such time the fate of *E. superba* remains uncertain.

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