



Reproductive system of *Epidendrum purpureum* (Orchidaceae), a species potentially generated by hybridization

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Abstract

The study of hybridization is essential for understanding the emergence of new species and the origin of reproductive barriers that will contribute to this process. In this study, we investigated the mechanisms of reproductive isolation among three sympatric species of orchids of the genus *Epidendrum*, *E. denticulatum*, *E. orchidiflorum* and *E. purpureum*, the latter being a potential hybrid. Experimental crosses were performed to examine which forces maintain the integrity of these species. The results indicate high levels of fertility in intraspecific crosses in both *E. denticulatum* and *E. orchidiflorum*, which are the putative parental species. On the other hand, *E. purpureum* show significant lower levels of fertility when compared to the parental species. However, our results suggest that *E. purpureum* is able to reproduce on intraspecific crosses, suggesting an event of speciation by hybridization.

Key words:

Reproductive barriers, hybridization, speciation

Introduction

The phenomenon of hybridization is common in certain groups of plants, and its study has an important role in understanding how new species emerge and the origin and intensity of reproductive barriers between species. Different barriers can act as limiting factors in the hybridization between species, maintaining a certain degree of reproductive isolation between them. This project analyzed the fertility levels in inter and intraspecific crosses in three sympatric species of orchids of the genus *Epidendrum*: *E. denticulatum*, *E. orchidiflorum* and *E. purpureum* (Fig. 1), the latter being considered a potential hybrid. We tested the hypothesis that *E. purpureum* has lower levels of fertility when compared to the putative parental species due to its hybrid origin.

Results and Discussion

Three barriers were analyzed: prezygotic, represented by pollen-stigma compatibility, early and late postzygotic, represented by embryonic viability and hybrid viability, respectively. For this, inter and intraspecific manual crosses among individuals of the three species were performed. Fruit development was monitored and harvested when ripe. For the prezygotic barrier, the rate of fruit set per pollinated flower was calculated. For the postzygotic barriers, the seed viability rates were analyzed through the tetrazolium test. The second barrier concerns the viability of the seeds resulting from crosses between the possible parental species, while the third, from crossings involving parental species and the potential hybrid, *E. purpureum*. Permeable reproductive barriers were found between parental species, which are able to intercross, generating viable fruits and seeds. The results also indicated that *E. purpureum* is able to produce viable fruits and seeds when crossed to other putative hybrids and when backcrossed with both parental species (Fig. 2). We found no significant difference in the prezygotic barrier; however, significant lower levels of seed viability were found in intraspecific crosses of *E. purpureum*, suggesting a potential hybrid origin.

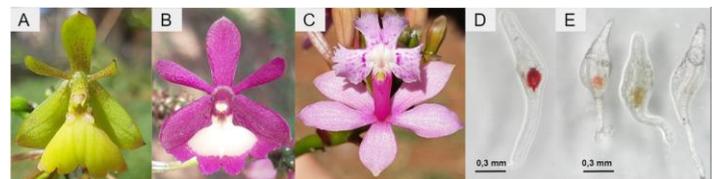


Figure 1. Flowers of the three species (A: *E. orchidiflorum*; B: *E. purpureum*; C: *Epidendrum denticulatum*) and seeds after the tetrazolium treatment (D: viable; E: unviable).

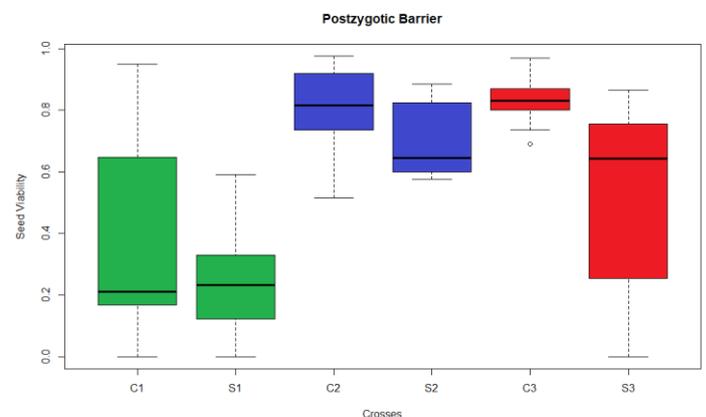


Figure 2. Boxplot of seed viability of manual self (S) and cross (C) pollinations in *E. purpureum* (1), *E. denticulatum* (2) and *E. orchidiflorum* (3).

Conclusions

The study supported the hypothesis of possible hybrid origin of *E. purpureum*, and the fact that this species is able to reproduce itself indicates a potential speciation by hybridization. This study made advances to clarify evolutionary questions about the hybridization between species.

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