Factors affecting persistence of terrestrial orchids in wet meadows and implications for their conservation in a changing agricultural landscape

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Abstract

We examined the occurrence of Dactylorhiza majalis, the most abundant terrestrial orchid species growing in rapidly disappearing wet meadows, at 50 historical sites for 3 years. We aimed to find the most frequent reasons for its recent extinction at many sites. We found that the main reasons for its extinction were absence of mowing, intensive fertilisation and washouts of fertilisers from fields nearby. At extant sites, we studied its biometric characteristics and composition of surrounding vegetation, to determine factors affecting its persistence. Bad performance of persisting populations of this species was associated with prevalence of grasses, low May temperatures and absence of mowing. This confirms, at metapopulation level, what has previously been observed at the level of individual populations. We suggest that the system of agricultural subsidies in the country should change towards more sensitive allocation of funds to those farmers, who will adopt the appropriate management of wet meadows and their surroundings.

Keywords: Dactylorhiza majalis; Extinction; Management; Terrestrial orchids; Wet grasslands

Relative effects of management and environmental conditions on performance and survival of populations of a terrestrial orchid, Dactylorhiza majalis

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ABSTRACT
For population viability analysis of endangered orchid populations, it is crucial to disentangle the effects of weather and management from intrinsic orchid dynamics. When doing this, typically several months' average temperatures and/or sums of precipitations are compared with some characteristics of plant performance. Here we tested, whether short averaging intervals (1–2 weeks) are more closely correlated with orchid performance.We used 5 years of data from five Dactylorhiza majalis populations, and have shown that the improvement of prediction by shortening the interval over which the temperatures are averaged or precipitation summed, even if detectable, is only weak and not significant. This, however, may be due to low weather variability during the study. Regarding the second aspect, the effect of management (presence or absence of mowing), we have found that leaf area of D. majalis at the regularly mown site was larger than that at the sites which weremown only once in 2 years, but we did not detect a significant effect of the absence of mowing on the incidence of flowering. Mowing can affect orchid performance in two ways: by reduced shading of orchids and by reducing competition with other species. Therefore, we have determined the co-occurring species associated with presence or absence of mowing and found that shading significantly affected the length of the flower stalk, the ratio of leaf width to leaf length at the end of the season, but did not affect seed weight and probability of flowering the next year. We conclude that the most appropriate management for D. majalis is mowing at least once a year, ideally at the end of June/beginning of July, after its fruiting.

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BRIEF COMMUNICATION

Effects of sugars and growth regulators on *in vitro* growth of *Dactylorhiza* species

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Abstract

The influence of sugars and growth regulators on shoot and root growth of *Dactylorhiza* species was studied under *in vitro* conditions. The seedling development was stimulated with the application of glucose and sucrose at concentration of 10 g dm^{-3} each. The improvement of shoot growth rate and shoot length was enhanced by cytokinins N^6-(2-isopentenyl)adenine or N^6-benzyladenine and their combination with auxin indolebutyric acid (IBA). The root growth rate and root length of seedlings increased in the presence of IBA and α-naphthaleneacetic acid. Individual *Dactylorhiza* species showed statistically significant differences in shoot and root development depending on sugar and
growth regulator combinations.

Additional key words: auxins, cytokinins, glucose, *in vitro* cultivation, sucrose, terrestrial orchids.