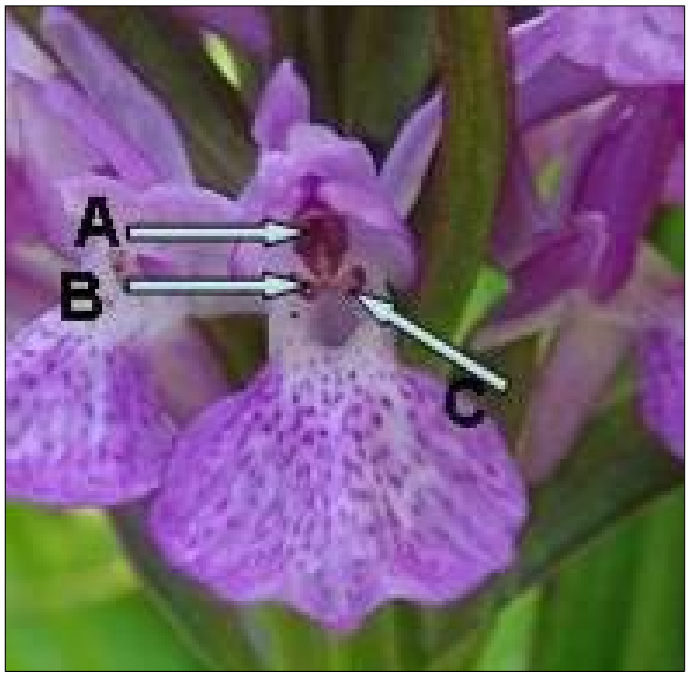
# Pollination and seeds

**Pollination**
The first problem is to get seeds. If you have orchids in the garden, it good fun to pollinate them to make more of your favourite or to make new hybrids. The pollen is released from the flower in two clumps called pollinia (A). ”Catch” the pollinia with a toothpick by touching the sticky basal disc (B). Transfer the pollen to the stigma, which is two grooves just below and behind the base of the pollinia (C). Cover the flower with a piece of sticky tape to avoid the bees adding extra pollen.



A: pollinia, B: basal disc, C: stigma.

You can also let the bees and flies do the job, but if you use seed from such open pollinations, you should be prepared that many orchids hybridize very easily. If you have several *Dactylorhiza* species you will get hybrids. The picture to the right shows *Dactylorhiza* plants from an open pollination where the seeds came from *D. purpurella* which does not have flecks on the leaves. More than half of the seedlings were flecked, I guess the father was a *D. majalis* growing nearby.

Many of the *Dactylorhiza* plants grown in gardens are hybrids. This is because hybrids are often stronger and more fast-growing than pure species, a phenomenon called hybrid vigour, and therefore selected by the gardeners. Many gardeners, however, do not recognize that a large proportion of self-seeded *Dactylorhiza* found around the garden will be hybrids.


*Dactylorhiza* hybrids after uncontrolled pollination. The mother plant was a *Dactylorhiza purpurella* without spotted leaves.

**Storage of seeds**
For short-term storage, dry the seeds at room temperature a few days wrapped in paper, and store them in the refrigerator in small, closed reagent tubes or Eppendorf caps. This way most species will remain viable for several months. For long term storage, store the dry seeds in Eppendorf caps in the freezer where the seeds remain viable for several years. The seeds do not like repeated freezing and thawing.


Orchid seeds are small, 0.1-1.0 mm. I nature, they cannot germinate without the help of specific fungi that provide sugars, minerals and other growth factors.

Even seeds from Southern European genera like *Ophrys* and *Serapias* survive freezing. Actually, freezing is the only way to keep seeds of the African genus *Disa* alive for more than a few weeks (1). Chilling or freezing may also improve the germination of many species in the genera *Plantanthera, Calopogon, Cypripedium* and *Gymnadenia.* Dried pollen can also be stored in eppendorf tubes in the freezer for more than a year.

Many orchid flowers wilt when the flowers have fulfilled their mission. *Cephalanthera longifolia* 18 hours after pollination.

*Cephalanthera longifolia before* pollination.

**Genetics**

Some orchids have bad genes which is a consequence of genetic drift and inbreeding in small populations. The most extreme case of

*Cypripedium margaritaceum ssp. fargesii* before pollination and a few days later.

inbreeding is selfing where the same plant is both mother and farther, but selfing is the only option if you only have one clone of a species. In many cases, the offspring will be all right, but sometimes you do get seed of low genetic quality that may not germinate or may show abnormal development. Shown below is *Orchis pauciflora* with normal tubers and cell masses that multiplied

Abnormal growth of *Orchis pauciflora* seedlings (right) and normal development (left).

rapidly, but never went beyond the first development stages. Such seedlings with abnormal growth should be discarded. Inbreeding depression is most common among orchids that out-cross in nature whereas naturally self-pollinating species are less affected by inbreeding (2).

Inbreeding depression is caused by deleterious recessive genes that are expressed in higher frequency when plants are inbreed. Below is a picture of a *Dactylorhiza majalis* seedling with a deletion of the lip. The parent plant had normal flowers with broad lips, but after selfing half of the seedlings looked weird. The genetic deformation of the flowers might have been avoided if two genetically different clones were cross-pollinated.

*Dactylorhiza majalis* seedling with genetic problems, most of the lip has vanished.

Orchids do not have the genetic barriers that reduce hybridization in many other plant families. Within-genera hybrids can be easy to make, for example the *Dactylorhiza* hybrids shown below. Intergeneric hybrids, that is hybrids where the parents belong to two different genera for example *Serapias* x *Anacamptis,* are more difficult, but not impossible if the genera belong to the same tribe or subtribe.

Many hybrids are fertile and make plenty of viable seeds, others make seeds without embryos (empty seeds), and others abort the whole flower right after pollination. The different responses are probably a result of chromosome numbers. If the parents have the same number of chromosomes, the hybrid offspring will have balanced chromosomes and may often be fertile. If the parents have different chromosome numbers, the hybrid will have unbalanced chromosomes and may be infertile. Even with balanced chromosomes, the hybrid may still be infertile if the parents are distantly related so that the chromosomes are too different giving problems with chromosome pairing during miosis.

*Calanthe tricarinata* seed pods. The upper and lower pods were from selfed flowers, the middle was hybridized with *Calanthe arcuata*.

The *Epipactis* hybrid Passionata (*E. palustris alba* x *E. royleana*) is very fertile.

References:
1. Michael Gallaghers' Disa homepage, www.disas.com
2. Bellusci et al., 2009. Biologia Plantarum 53: 175178.

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*Dactylorhiza* are very easy to germinate. Here it is *D. maculata....*

Or why not make hybrids, here it is *D. praetermissa* x *D. maculata*....

...and *D. incarnata f. ochrantha.*

...and *D. purpurella* x *D. ochroleuca*.....