VIVIPARY AND EFFECTS OF MATERNAL TISSUES ON GERMINATION IN SOME NEW ZEALAND SEEDS

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Vivipary is an interesting and somewhat unusual phenomenon among the seeds of wild plants. Technically it is the germination of seeds while they are still on the parent plant. It has been selected against in most wild plants because there are strong advantages for the seeds in delaying their germination until they reach places where the seedlings that emerge have a good chance of surviving. Delays are imposed in several ways that are summarized (usually under the heading dormancy) in books such as Bewley & Black (1982), Mayer & Poljakoff-Mayber (1982) and also in a little article that I published a few years ago (Burrows 1989). I prefer to confine the term dormancy in seeds to the situations where the germination delay is maintained by a biochemical blocking system similar to that which prevents buds or flowers from opening. I use other terms for other causes of germination delay. Some seed species have two or three different means for delaying germination.

Vivipary occurs sometimes in grain cultivars such as wheat or barley when the harvest period is wet. Grain seeds have been selected, artificially, so that their germination is not delayed. Vivipary is very well known among mangroves from different genera and families. The large seeds germinate and often fall, root-first, into the mud beneath the parent, thus effecting immediate seedling establishment. Our native mangrove, *Avicennia resinifera* exhibits the phenomenon very well. Margaret Simpson (1979), recorded vivipary in seeds of *Pachystegia insignis* var. *minor, Abrotanella linearis* var. *apiculata* and (in a pot-grown specimen) *Euphrasia disperma*. Vivipary is also noted for *Corokia macrocarpa* by Fountain & Outred (1991). I listed *Juncus maritimus* as being viviparous (Burrows 1989) and Allan & Cranwell (1942) did the same for *Phormium*, but these last two records are erroneous. Various monocotyledon plants produce small plantlets in their old flower heads, by vegetative proliferation. These offshoots may break away and establish new plants but not much is known about whether this "pseudo-vivipary" is usually effective.

One of the phenomena I described in the article about seed germination of native woody plants was the inhibition of seed germination by the pericarp tissue, (almost universal in fleshy-fruited species). The pericarp, ultimately, is derived from the ovary, part of the maternal parent. It is not yet clear what is the ultimate cause of germination delay in these cases. It might be the high osmotic pressure in the fleshy tissue, or the presence of some chemical inhibitor(s). The latter is likely to be the most general cause because the moisture content of the fleshy pericarp may be relatively low (i.e. there is not really a solution being maintained around the seeds). By the same token, the seeds do not appear to dry out to the same extent as is the norm for herbaceous and dry-fruited species. Seeds of some dry-fruited species are inhibited from germinating by presence of the pericarp (e.g. *Pittosporum tenuifolium*). The inhibitory effect on seed germination, whether the pericarps are fleshy or dry, can be removed by removing the pericarp and soaking the seeds in water. It is interesting that the

fleshy fruit tissues of some species are also strongly antibacterial and antifungal. They remain undecayed, wet, in petri dishes, for months.

The occurrence of fleshy tissues that prevent seed germination but provide seeds with a suitable environment while they are awaiting the arrival of some agent (such as a bird) which will eat the fruit and disperse the seeds, makes good ecological and evolutionary sense. By observation I know that the fleshy fruit of many native woody species have the potential to remain, succulent, on the parent for months before they are eaten. I have proved this for some (e.g. *Griselinia littoralis, Pennantia corymbosa, Pseudopanax arboreus, Myrsine australis*) by putting nylon mesh bags over fruit to exclude birds.

When birds eat fleshy fruit the pericarps are removed in their gut and the seeds that are passed out have the potential to germinate. Some fleshy fruit dry out on their parent if not eaten by birds but the seeds remain viable (e.g. *Cordyline australis*).

In some *Coprosma robusta* plants (originally from the Port Hills) in our Avonhead garden in 1990 most of the fruit were removed by blackbirds and silvereyes in February-April. Some fruit on lower branches escaped the notice of the birds, while remaining succulent. In September I investigated these and found, to my surprise, that in a proportion (about 30%) seeds had germinated in the fruit.

I collected *Ripogonum scandens* fruit at Peraki Bay Saddle Bush, Banks Peninsula in April 1990 after most of the crop had been removed (by kereru and blackbirds). Some of the seeds (about 5%) had germinated. This was contrary to my experience with this species in an earlier year when seeds, freshly gathered in April, contained very immature embryos, which were difficult to locate.

In these *Coprosma* and *Ripogonum* seeds the inhibitory effect of the fleshy pericarp had been relaxed. This might be related to the influence of low temperature prior to collection. Careful experimentation is needed to identify just what is going on in these fruit and seeds. Does anyone know of further instances of vivipary in seeds of native plant species?

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