

Seed production in *Gunnera hamiltonii*

Colin J. Webb
Manaaki Whenua - Landcare Research
PO Box 69
Lincoln 8152

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Introduction

Gunnera hamiltonii is a creeping coastal herb confined to five sites in coastal Southland and Stewart Island (Webb & Webb 1977, Wilson 1994, Malcolm & Johnson 1995 in press). It grows on the margins of mobile sand dunes, a habitat that is increasingly invaded by adventive herbs and shrubs that shade out the gunnera. The species is listed in the category "Endangered" in the most recent New Zealand Botanical Society threatened and local plant lists (Cameron et al. 1995).

Like all but one of the other four native gunneras, *Gunnera hamiltonii* is dioecious, i.e., it has separate male and female plants. It seems that one or other sex has been lost from the wild populations rendering these single-sex populations unable to reproduce except by vegetative means.

Gunnera hamiltonii is an attractive garden plant and is easily propagated vegetatively as it has stolons with offset rooting rosettes of leaves. It can thus grow to form large colonies in cultivation and in the wild. However, sexual reproduction is essential for the long-term survival of the species in the wild and for the maintenance of genetic diversity (currently as few as five genotypes may be in existence). There have therefore been attempts to produce seed by crossing cultivated male and female plants from different populations.

The Fruits and Seeds of *Gunnera*

The inflorescence of *Gunnera* is a simple or compound spike with small wind-pollinated flowers. The female (or in some overseas species hermaphrodite) flowers have only one ovule. In *G. hamiltonii* the flowering and fruiting spike is a simple stalk with the fruits when they form moderately spaced along it rather than in a dense cluster.

In all gunneras, each of the fruits on the spike is a drupe with a fleshy outer layer surrounding an inner stone containing the seed. The stone (or endocarp) is a thickened layer of the fruit wall that protects the seed. The seed has a thin outer layer (testa) within the stone and contains abundant starchy nutritive tissue (endosperm) and a small embryo.

Mature fruit has seldom been observed or collected for *Gunnera hamiltonii*, but from what little material and information is available, the individual fully mature fruits should be pear-shaped and red with the flesh closely attached to the seed (Webb et al. 1988).

Present Investigation

Chris and Brian Rance hand-pollinated plants cultivated at Otatara and collected the infructescences (fruiting stalks) when they appeared to be forming fruits but were damaged by frost.

Fruit also appear to at least begin developing in some wild populations and infructescences of this sort were collected from Three Sisters dune near Omaui.

I examined samples of both the hand-pollinated cultivated plants and the wild plants to determine whether plants had been fertilized and were forming sound seed.

Analysis of Samples

1. SAMPLES FROM HAND-POLLINATED PLANTS AT OTATARA

Fresh and pickled material from two collections was examined. The fresh sample from Otatara comprised four fruiting stalks with a mixture of fairly mature swollen green fruit and larger fruit that were brown as a result of frost damage.

Twenty of the most developed fruit were dissected and examined under a stereomicroscope. All showed swelling of the fleshy part of the fruit. In all fruit the endocarp was developing with a fully formed stone being present in the most advanced fruit. Eleven of the twenty fruit had, in addition, a fully formed starchy endosperm and a thin brown testa, while in the other nine the seed had aborted or was aborting (seed withering to completely dry and flat).

The five largest fruit from the pickled material, collected three weeks earlier, were dissected and all had fully formed seeds with endocarp, testa and endosperm.

Conclusion:

The full formation of endocarp and endosperm indicates that the plants had been successfully fertilized and the resulting seeds are sound. The abortion of some seeds post fertilization may have been caused by frosting or other factors. 100% fruit production is rare in nature.

2. SAMPLES FROM WILD UNMANIPULATED PLANTS FROM THREE SISTERS DUNE

The sample from Three Sisters dune comprised four fruiting stalks with fruit apparently at various stages of maturation from shortly after pollination to the point where the fruit was beginning to swell but was not colouring.

Ten fruit at the early stages of maturation were dissected and examined under a stereomicroscope. In all of them the fleshy part of the fruit was beginning to expand, but the ovule, although fleshy, was slightly flattened, dull, pale brown and apparently aborting.

Ten fruit from the most advanced fruiting stalk were also dissected. The fleshy layer in these fruit was turgid and expanding, i.e., clearly beginning to develop. However, in most fruit the ovule had aborted completely (dry, brown and flat) and in the remainder was beginning to abort.

In none of the fruit was there any evidence of the formation of good seed (no endocarp, testa or endosperm).

Conclusion:

No fertilization had occurred in these wild plants. Some fruit appear to be developing parthenocarpically (outer part of fruit developing but not containing seed) as occurs in some other native plants (e.g., Godley 1979). Such fruit development may function as an additional attraction and reward for the birds that disperse the filled fruits.

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