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**Physiology of Chatham Island Forget-me-not
(*Myosotidium hortensia*) Seed**

A thesis presented in partial fulfilment of the requirements for the degree
of
Master of Applied Science
in
Seed Science and Technology
at Massey University,
Palmerston North,
New Zealand.

**Craig Robert McGill
2003**

ABSTRACT

Chatham Island forget-me-not (*Myosotidium hortensia* (Decne) Baillon) is endemic to the Chatham Islands where it is mainly confined to the outer islands. There is speculation that seed of *M. hortensia* is recalcitrant and reports that germination can be slow and erratic. Moreover there is little information on the seed biology of *M. hortensia* available.

In this study the seed structure and composition of the seed storage reserves of *M. hortensia* were determined. The seed is a dicotyledon. The embryo is predominantly cotyledonary tissue with a only small embryo axis present. There appears to be a single cell thick layer of endosperm tissue between the embryo and seed coat. Food reserves are stored as both protein and oil with no starch reserves apparent. The seed contains 24% oil and therefore can be considered an oilseed. These oil reserves include the commercially important γ -linolenic (*cis, cis, cis*-6, 9, 12-octadecatrienoic) acid (9% of the fatty acid content).

Seed of *M. hortensia* was evaluated for recalcitrant behaviour by determining if desiccation to low seed moisture content caused a loss of viability. Seed was harvested at two moisture contents, 47.4% (green seed) and 35.5% (black seed), and air dried to a final moisture content of 7.5%. Seed viability and germination performance were monitored at harvest and as moisture content declined. At 7.5% seed moisture content viability was 89% and germination 92% for seed harvested at 47% seed moisture content, and 82% and 78%, respectively, for seed harvested at 36% seed moisture content. Within each colour classification, after desiccation there was no significant difference in germination compared to that at harvest, indicating that *M. hortensia* seed can be desiccated to a low seed moisture content without loss of germination and is therefore not recalcitrant.

Seed stored at 5°C and 7.5% seed moisture content showed no decline in viability after 21 months, but, seed stored at the same temperature and 9.5% seed moisture content showed a significant loss of viability after 9 months storage. The loss of viability at this higher (9.5%) seed moisture content is characteristic of oilseeds, but it is not clear whether the high oil content of the seed alone can account for the loss of viability after nine months storage at a temperature of 5°C.

This study confirmed earlier reports that germination of *M. hortensia* seed is slow and erratic. At maturity seed of *M. hortensia* is dormant. Seed dormancy is a function of the seed coat rather than the embryo. The dormancy is likely to be a result of either physical constraint of embryo growth or restriction of gas exchange by the seed coat, or a combination of both. Removal or weakening of the seed coat allowed germination to proceed. However, some of the treatments used to weaken the seed coat resulted in an increase in abnormal seedling development. An effective and non-damaging technique for alleviating dormancy was to prick the seed coat with a 0.6-0.8mm diameter dissecting needle in the middle of the cotyledons.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

We are the custodians of a New Zealand heritage of world interest

Sir Charles Fleming

New Zealand's long isolation from other land masses has led to the development of a distinct flora (Martin, 1961). Approximately 75 percent (Laing and Blackwell, 1949) to around 80 percent (Mark and Adams, 1979) of the indigenous flowering plants in New Zealand are not encountered elsewhere. The flora of New Zealand represents a unique genetic resource (Fountain and Outred, 1991). At the Tauranga Native Plants Symposium, held in 1990, Given reported that between 10% and 15% of New Zealand flora is either threatened or restricted to localised areas. He comments "conservation of these plants will require an integrated approach involving on-site and off-site techniques as well as vegetation restoration." (Given, 1990). The success of attempts to conserve and regenerate flora in the natural environment will in part be dependent on our ability to store, germinate and propagate seeds of native species. Yet our knowledge of the germination characteristics and storage requirements of many of these species is at best limited and often nonexistent (Fountain and Outred, 1991; Bannister and Jameson, 1991). Information that is available is frequently anecdotal and found in nonscientific literature such as home gardening guides (Bannister and Jameson, 1991). Moreover, this information is often conflicting or inconclusive.

Chatham Island forget-me-not (*Myosotidium hortensia* (Decne) Baillon) is endemic to the Chatham Islands of New Zealand (Crisp *et al.*, 2000). Maloy (1992) reports the seed will germinate readily if fresh, but Metcalf (1995) comments that the germination is erratic and seedlings may not emerge from seed shed in December-January until the following spring. He also recommends the seed be germinated in cool conditions (10°C to 15°C). Wilson and Given (1989) confirm Metcalf's observations reporting that the seed can take up to twelve months to germinate. Metcalf (1995) also suggests the seed will store for twelve

months or more. Fountain and Outred (1991) comment that *M. hortensia* produces seedlings shortly after shedding and speculate that this may indicate recalcitrant behaviour but that the moisture status of seed would need to be determined to confirm this.

1.2 Aims of the Study

The aims of this study were therefore to:

1. determine if seed of *Myosotidium hortensia* is recalcitrant or orthodox
2. determine the longevity of seed of *Myosotidium hortensia* under storage conditions of low temperature and low seed moisture
3. determine the nature of the seed storage reserves in seed of *Myosotidium hortensia*
4. determine if the germination behaviour of seed of *Myosotidium hortensia* is erratic as reported by Metcalf (1995) and, if so, the reasons for this erratic behaviour.