Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

SEED DORMANCY AND GERMINATION OF A PANEL OF NEW ZEALAND PLANT SPECIES:

Carex trifida, Coprosma robusta, Cyperus ustulatus, Hebe stricta, Muehlenbeckia australis, Myrsine australis, Phormium tenax and Sophora prostrata

A thesis presented in partial fulfilment of the requirements for the Degree of Master of Science at Massey University, Palmerston North, New Zealand.

ALLISON MACKAY

2004

Abstract

Literature was reviewed on the germination and possible uses for revegetation of the New Zealand indigenous species selected. Seeds of *Carex trifida*, *Coprosma robusta*, *Cyperus ustulatus*, *Hebe stricta*, *Leptospermum scoparium*, *Muehlenbeckia australis*, *Myrsine australis*, *Phormium tenax*, *Phormium* 'Yellow Wave' and *Sophora prostrata* were assessed for germination rates, percentage germination, dormancy and the effects that temperature has on germination. Seeds of *Carex*, *Cyperus* and Myrsine showed no germination in light or dark at 20°C. In contrast, 12 weeks of low temperature stratification resulted in a high percentage of seed germinating for *Carex* and *Cyperus*. There was no germination of *Myrsine* despite high viability in the initial germination experiment and the stratification experiment. Removal of the endocarp and a period of stratification increased germination percentage of *Myrsine* to 91%. Germination was low for Muehlenbeckia in the light at 20°C, but 4 weeks of low temperature stratification increased germination rate. After 2 years, 80% of *Coprosma* seeds germinated but germination rate increased after subjecting the seed to 8 weeks or more of stratification. No seeds of *Coprosma* or *Muehlenbeckia* germinated in the dark. Rapid germination of *Hebe* seeds was obtained, with 100% of the seed germinating in the light while only 7% germinated in the dark. *Leptospermum* had rapid germination, with 100% germinating in the light, while only 3% germinated in the dark. A low percentage of *Phormium* seed germinated in both the light and dark in the first month and no further germination was observed. In contrast, 8 weeks or more of low temperature stratification resulted in almost complete germination. There was rapid germination of *Sophora* seeds with 100% of the seed germinating in the light and dark. *Carex* seed had a limited temperature range at which it germinated (22°C to 26°C), while *Cyperus* had a wider range (18°C to 32°C) but did not germinate at low temperatures (6°C to 14°C). The optimum germination range for *Cyperus* was 24°C to 30°C. *Hebe* did not germinate at high temperatures (30°C to 32°C) but successfully germinated at all other temperatures with the optimum germination range being 6°C to 24°C. *Leptospermum* did not germinate at 6°C but had maximum germination at most other temperatures. *Muehlenbeckia* and *Phormium* germinated at all temperatures tested (6°C to 32°C) with the most seed germinating at 20°C for *Muehlenbeckia* and between 14°C to 22°C for *Phormium*. *Sophora* did not germinate at the low temperatures (6°C to 10°C). The germination rate increased with temperature for *Cyperus*, *Hebe*, *Leptospermum*, *Muehlenbeckia*, and *Phormium*. Generally, for *Carex* and *Sophora* as temperature increased germination rate slowed. It appeared that light is required for *Hebe* and *Leptospermum* to germinate. *Sophora* required scarification but not light. *Coprosma* and *Muehlenbeckia* required light and a period of chilling to increase the rate of germination. A small

percentage of the *Phormium* population is not dormant but a period of chilling increased the germination percentage for that portion of the population that is dormant. *Carex* and *Cyperus* required a period of chilling in order to break dormancy. *Myrsine* required removal of endocarp and a period of chilling to germinate. A list of cleaning descriptions and the equipment that was used for each species studied is reported. Preliminary results of a hydroseeding trail using the species studied were also reported.

Acknowledgements

I would like to express my sincere gratitude and appreciation to the following people and organisations:

Firstly, thank you to Associate Professor David Fountain, my chief supervisor, for his guidance, supervision and help throughout the duration of the research and editing of this thesis. Thankyou also to Dr John Clemens my second supervisor, for advice given throughout the research, his help with the hydroseeding trial, and detailed editing of this thesis.

I would like to acknowledge help and assistance from those at the Centre for Plant Reproduction and Seed Technology, especially Craig McGill and Robert Southward. Thanks also goes to Ruth Morrison for seed testing of the grasses used in the hydroseeding trial.

Thank you to Raymond Bennett and Doug Hopcroft of HortResearch Institute for their assistance with the histology and light microscopy.

I am very grateful to The Foundation for Research, Science & Technology for funding the research. Thank you also, to Robert Coulsen of Rural Supply Technologies Ltd. for his involvement and ideas with regards to this research.

Finally, a special thanks to my daughters, Melissa, Jessica and Louise, who spent hours helping to collect seeds and to my husband Craig for his support and encouragement as well as his help with the computer technology.

Table of Contents

List of Tables

List of Figures

List of Plates

List of Appendices