JAMES RENNIE BEQUEST

REPORT ON EXPEDITION/PROJECT/CONFERENCE

Expedition/Project/Conference Title:

Investigating the germination requirements of selected endemic and endangered Chilean arid land geophytes

Travel Dates: ……. June- September 2005

Location: …… Institute of Agricultural Research, Base Seed Bank, Vicuna, Chile

Group Member(s): ……Sally Hinds

Aims: …….To investigate the germination requirements of rare and endemic Chilean geophytes

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OUTCOME (not less than 300 words):-

The aim of this work was to investigate the germination requirements of rare and endemic Chilean geophytes in order to improve knowledge of the species ecology and to determine the appropriate conditions for seed viability testing. A secondary aim was the propagation of germinated seeds to produce plants for reproductive studies and to thereby increment the number of seeds available for ex situ conservation and further research. This contributed to the project '*Ex situ conservation of endemic, vulnerable and endangered plant species from Desert and Mediterranean zones of Chile*'— a long term collaboration between The Millennium Seed Bank Project, Kew and the Chilean Institute of Agricultural Research (INIA).

During my time at the seed bank I conducted germination studies on several native geophytic species. My main project concerned the germination requirements of endemic species in the family Tecophilaeaceae. Because of the extremely rare status of some of these species (and a correspondingly low availability of seeds) an important factor of this work was the need to design a protocol which would be capable of producing statistically significant results with a minimum seed quantity. A protocol was designed and seed germination was tested for 7 Tecophilaeaceae species from three genera. Germination in untreated and pre-treated seeds (by abrasion of the testa) was tested at a range of temperatures and thermoperiods. In a second phase of the study response to cold stratification was tested.

Of the three genera studied, one- *Tecophilaea* (species *T. violiflora* and *T. cyanocrocus*) did not germinate under any of the test conditions during a two month experimental period. It is thought that a longer period of cold stratification may be required. Additionally germination at 4˚C was <1% for all species studied; However, in the genera Zephyra and Conanthera appropriate conditions for good germination (>80%) were recorded for all species. It was discovered that while cold stratification did not promote good germination, in some species pre-treatment of the seed by abrasion of the testa had a significant effect on germination response and the importance of this effect was dependant on incubation temperature and/ or thermoperiod.

Species from the genus Zephra (*Z. compacta* and *Z. elegans*) had similar germination responses. There was a poor response to cold stratification (<20%) but both pre-treated and non pre-treated seeds had a good germination response at 20 C (>80 %). When exposed to alternating temperatures of 20 and 4 C, seeds without a pre-treatment had a low germination response (~50%); However abraded seeds had a good germination response (>80%) suggesting that this pre-treatment of the testa positively affected germination response under these conditions.

In the endemic genus Conanthera (C. bifolia, C. campanulata and C. urceolata) there was more infrageneric variation in germination responses. C.urceolata seeds, both abraded and non abraded, had a good germination response at both 20 and 20/4 degrees (>75%) with germination at 20 C being significantly higher in abraded seeds. C. campanulata and C bifolia had poor germination responses at 20 C (6%, and 15% respectively), though for C. bifolia germination was significantly improved by an abrasive pre-treatment (40%). Germination response was higher at alternating 20/4 degrees for both abraded (67%, 83%) and non pre-treated seeds (70%, 80%). Cold stratified seeds had very poor germination in C. urceolata and C. bifolia (<1%) but better in C. campanulata (>40%).

The response of each species to each of three temperature and thermoperiods is shown in figure 1. The effect of pre-treatment, by abrasion of the test on each species is shown in figure 2.

Figure 1. showing the effect of temperature on germination in each of six species from the Family Tecophilaceae.

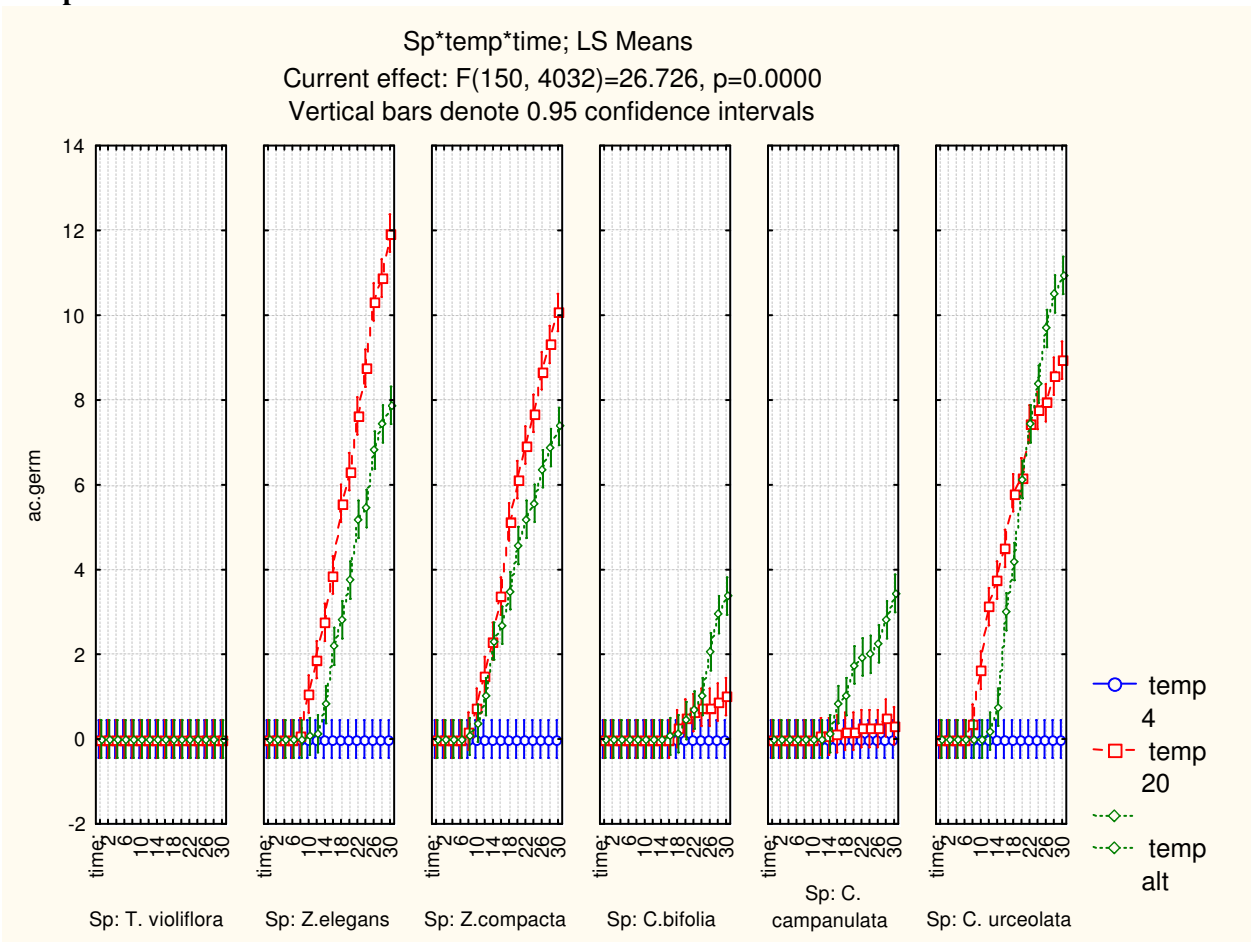

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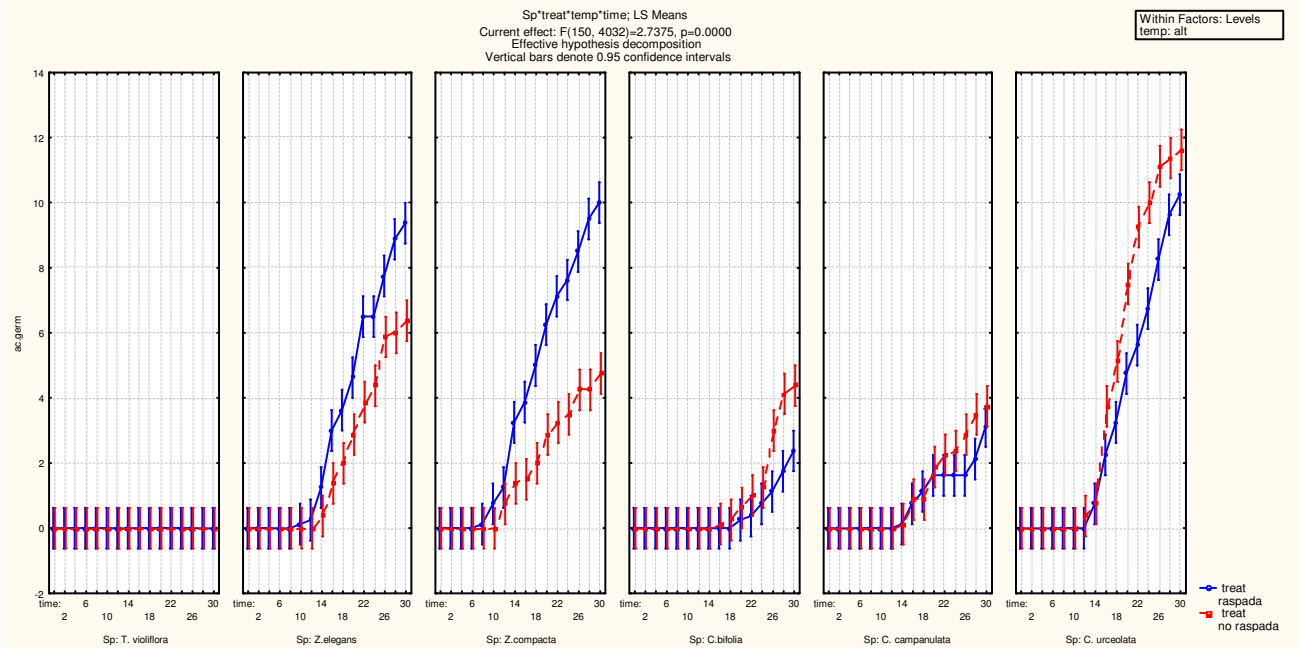
Figure 2. showing the effect of pre-treatment by abrasion of the testa (in blue) on germination (red - untreated) in each of six species from the Family Tecophilaceae.



An initial analysis of the data has produced some interesting results which can be used as a basis for further research, and for those species in which conditions favourable for germination were discovered a protocol for testing seed viability can now be established. In addition the experimental design can be used at the seed bank for the study of other species for which seed availability is low. There is currently little information available for species of the Tecophilaeaceae family, and due to their threatened status and potential as ornamental plants this data is therefore of considerable interest. A paper will now be written and it is expected that this will be published in due course.

This opportunity to undertake a period of research in a leading Chilean institution was supported by a travel busary from the James Rennie Bequest and I feel I have benefited enormously from the experience. My time at the seed bank has been extremely stimulating and has encouraged my interest in the conservation and utilisation of plant genetic resources. It has been immensely satisfying and instructive to go through the whole research process, starting with a question, compiling and reviewing the existing information from diverse sources, producing an appropriate experimental design based on the resources available, and collecting and analysing the data. I am now looking forward to completing this cycle with the production of a scientific paper which presents these findings and I feel that through this process I have developed skills which will prove to be useful for my future work in Plant Science research.