

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA18201

STSM title: Testing seed germination from old herbarium specimens for conservation purposes

STSM start and end date: 27/01/2020 to 25/02/2020

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PURPOSE OF THE STSM:

(max.200 words)

My PhD research is dedicated to find germination protocols for trying plant de-extinction from seeds preserved in herbarium specimens. With my application to Short Term Scientific Missions I visited the Herbarium of Meise Botanic Garden (BR; Belgium) where some seminal works on this topic have been carried out by the Senior Researcher Sandrine Godefroid.

Therefore, my visit aimed to learn how to obtain seeds from old herbarium specimens (extracted from BR herbarium specimens), to learn how to perform seed germination tests and to start some preliminary tests on seeds. The visit is within the general context of the development of a protocol for germination of herbarium specimens' seeds, which can be applied to de-extinction.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

During the STSMS I successfully carried out the following plan, agreed with my host and advisor Sandrine Godefroid:

- 27/01: Visit to the facilities and labs and meeting staff and researchers involved in seed germination projects and herbarium management. Definition of the common list species to check in the herbarium, based on the number of specimens reported in the internal database.
- 28-31/01: Seed collection from herbarium specimens. Specimens had been chosen considering the collection year (7 time groups were chosen from the 19th century to date), the abundance of seed per specimens, the specimens' quality (ripening stage, pest traces, completeness of data reported in the label). Seeds had been placed in bags labelled with collection day and specimens' data. Of the 20 common species previously selected, more than 2800 herbarium specimens were checked, and more than 9700 seeds were collected from 174 specimens.
- 3-7/02: Registration of the collected seeds data (species, plant collection year and seeds collection day, specimens barcode, number of seed per specimens); planning of the germination tests for each species, based on Kew and EnscoBase datasets protocols; seed cleaning and counting, agar preparation, seed scarification (Fabaceae), disinfection and hormones (gibberellic acid) treatments were applied, and each species was assigned to the most suitable incubator with different temperatures and light cycles, depending on the species biology. 9687 seeds were placed in 518 Petri dishes and the incubators temperatures were: 20°C (11 species), 23/9°C (7 species) and 33/19°C (2 species).
- 10-25/02: germination scoring was performed twice a week, mouldy spots and seeds cleaning or removal, seedlings transfer (3 per specimens) to the greenhouse at circa 20°C. The internal herbarium database was checked in order to find specimens of species of conservation interest; 7

species (9 specimens) were found: 3 globally extinct, 1 extinct in the wild, 2 critically endangered and 1 vulnerable species. Unfortunately, none of the specimens bears seeds.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

20 species out of the 24 initially planned were considered due to the low number of specimens present in 4 species. It was not possible to cover all the different time groups for all the species, but seeds from 19th century specimens were collected for every species, while specimens from 1971 to date were scarcer. Seed germination was observed already after 3 days of incubation for 3 species. After 15 days, 6 specimens of different species germinated: those were some of the most recent specimens, from 2015 to 1992. Neither disinfection nor hormones significantly affected seed germination rate. However, the speed of germination seems strongly dependent on the specimen age, as none of the specimens before 1992 germinated. Moreover, less than 10% of the seeds of the specimen from 1992 germinated, while seeds from 2015 shown a germination rate between 44% and 92%.

The duration of my stay at Meise (30 days in total, 15 days of scoring) was not long enough to complete seed test scoring as well as to measure the growth of seedlings in the greenhouse and obtain statistically significant data. Data gathering will continue thanks to the staff of Meise, which will extend the collaboration well beyond the duration of the visit (see Future collaboration).

FUTURE COLLABORATIONS (if applicable)

This internship strengthened already existing collaborations between the Meise Botanic Garden and RomaTre University and provided the opportunity for both these institutions to expand their knowledge, skills and understanding of conservation techniques and their applications. This collaboration is being continued because Dr. Godefroid and the staff of Botanic Garden Meise will continue monitoring the germination tests and plant seedling in the greenhouse. Further interactions will happen for data analysis and interpretation and finally for writing one or two publications, depending on the result obtained.