

Le Corps professoral de
Gembloux Agro-Bio Tech - Université de Liège vous prie
de lui faire l'honneur d'assister à la défense publique de la dissertation originale que

Madame HARZE Mélanie,

**Titulaire d'un master bioingénieur en sciences et technologies de l'environnement,
à finalité spécialisée,**

présentera en vue de l'obtention du grade et du diplôme de

DOCTEUR EN SCIENCES AGRONOMIQUES ET INGENIERIE BIOLOGIQUE,
le 29 juin 2017, à 13 heures précises (personne ne sera admis après cette heure),
en l'auditorium PhV (Physiologie Végétale, bât. 48),
Avenue Maréchal Juin, 13 à 5030 GEMBLoux.

Cette dissertation originale a pour titre :

« Plant traits variability within and among populations in the context of calcareous
grassland restoration ».

Le jury est composé comme suit :

Président : Prof. P. LEJEUNE, Président du Département BIOSE,
Membres : Prof. G. MAHY (Promoteur), Dr A. MONTY (Copromoteur), Prof. P. du JARDIN,
Dr A. FAYOLLE, Prof. J. KOLLMANN (Université Technique de Munich), Dr J. PIQUERAY
(Natagriwal).

Abstract

In Western Europe, abandonment of traditional forms of agriculture has caused the fragmentation of semi-natural grasslands, affecting ecosystems functioning as well as population survival. Habitat restoration has become a crucial aspect of grasslands conservation, and one of the main issues is evaluating restoration success and setting appropriate criteria to do so. Indicators used to judge whether a restoration has been successful may concern a wide range of organisms and may be defined at different geographical scales and may concern various levels of biodiversity organization. Among them, population parameters are less represented despite their usefulness. To consider restoration as a success, restored populations of targeted species should demonstrably possess characteristics allowing their dispersal, reproduction, growth and adaptation to the environment.

In this thesis, as a first step the use of plant population parameters for evaluating grassland restoration was assessed based on a literature review. Then, the success of calcareous grassland restoration was determined regarding colonization, establishment and intra-specific trait variability in response to the environment of restored populations of five calcareous grasslands species; *Helianthemum nummularium*, *Sanguisorba minor*, *Scabiosa columbaria*, *Hippocrepis comosa* and *Potentilla tabernaemontani*. As such, restored populations were compared to reference populations through field inventories and in-situ traits measurements in calcareous grasslands of south Belgium. Moreover, a glasshouse experiment was set-up with the aim to evaluate the intra-specific variability in response to drought stress in reference populations of *P. tabernaemontani*.

The results indicate that population parameters were less well studied for evaluating grassland restoration success compared to ecosystem and community level. The population parameters used to assess calcareous grassland restoration showed that the study species colonized restored sites and established new populations. The fitness of the restored populations was very high. High intra-specific trait variability was highlighted at a very local scale in the reference habitat. Individuals exhibited high leaf dry matter content (LDMC), low specific leaf area (SLA) and low vegetative height in relation to low soil depth and high potential incident radiation (PDIR). These environmental variables are possibly linked to lower availability of soil moisture. Further, the relationship between traits and environmental variables was not always consistent in restored sites. However, the intra-specific variability of plant traits was similar in the reference and restored grasslands. Finally, the findings from the glasshouse experiment suggested that individuals originating from drier part of calcareous grasslands better survive drought stress.

The overall conclusion of this thesis is rather optimistic concerning restored populations of the five specialist plant species, specifically regarding their colonization, persistence and response to the environment or potential climate change. The conclusions must, however, be modified depending on the reference ecosystem used as a model. This approach has to be integrated into a multi-scale and a multi-species approach to fully evaluate restoration outputs. Yet, this thesis has indeed contributed to the understanding of population responsiveness to habitat restoration, as well as to the evaluation of restoration success of calcareous grasslands in Belgium.