REMOBILISATION OF NITROGEN BY TWO HEATH SPECIES: *VACCINIUM MYRTILLUS* (DECIDUOUS) AND *V. VITIS-IDAEA* (EVERGREEN) COMPARED

By

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Résumé

Plusieurs études ont montré que les espèces sempervirentes dominent les communautés végétales habitant les sols à faible valeur nutritive, typiquement pauvres en azote. De nombreuses études ont tenté d'identifier les mécanismes physiologiques associés au maintien des feuilles persistantes et facilitant l'adaptation à une croissance en condition d'azote limitante. Ces études sont passées en revue dans la première partie de cette thèse, soulignant le rôle primordial que pourrait jouer le cycle interne de l'azote dans cette adaptation. La deuxième partie de cette thèse présente trois études expérimentales comparant certains aspects du cycle interne de l'azote de deux espèces natives de milieux pauvres en azote : *Vaccinium myrtillus* L. (feuilles caduques) et *V. vitis-idaea* L. (feuilles persistantes). L'isotope stable ^{15}N a été utilisé pour différencier l'azote provenant des réserves de celui provenant directement de l'absorption racinaire. Les résultats de ces études montrent que V. myrtillus était plus capable de tirer avantage d'une forte disponibilité en azote que *V. vitis-idaea*. A l'opposé, la croissance de *V. vitis-idaea* était plus forte que celle de *V. myrtillus* lorsque la disponibilité en azote était faible. Cette différence entre les deux espèces n'était pas attribuée à une différence dans l'utilisation des réserves azotées mais à une différente dynamique de remobilisation de ces réserves vers les nouvelles pousses. Chez *V. myrtillus*, la remobilisation était rapide et courte, tandis que chez *V. vitis-idaea* elle était lente et longue. D'autre part, les contraintes morphogénétiques imposées sur la réponse de croissance à l'azote étaient plus sévères chez *V. vitis-idaea* que chez *V. myrtillus*. Les résultats suggèrent aussi que la part des réserves, formées à partir d'azote absorbé pendant la saison précédente, differait entre les deux espèces et dépendait de la relative disponibilité en azote pendant la saison précédente et antérieurement. Finalement, la force de puits exercée par les nouvelles pousses sur les flux d'azote provenant de la remobilisation des réserves a été altérée par débourgeonnement partiel. Les résultats de cette manipulation suggèrent que les flux d'azote sont dépendants de la taille des réserves, plutôt que de la force de puits, pourvu qu'il y ait un puits.

Mots clés : écophysiologie, cycle interne de l'azote, espèces caduques et persistantes, Vaccinium, écosystemes limités en azote.

Abstract

Survey studies have established a correlation between nutrient- poor environments, i.e. mostly nitrogen or phosphorus limited, and the distribution of evergreen plants. Consequently, it has been hypothesised that species with long-lived leaves are better adapted to infertile environments than species with short-lived leaves. Research has then tried to explain which plant traits associated with leaf longevity facilitate such adaptation. In this thesis, the current knowledge on this topic was reviewed, focusing on nitrogen as the limiting nutrient. The need to search for adaptive traits involved in the internal cycling of N and to compare species within the same growth form was highlighted. The two wild species, *Vaccinium myrtillus* L. (deciduous) and *V. vitis-idaea* L. (evergreen), are native of low N environments such as heathlands. They share the same growth form but differ in their leaf habit. Three experiments were run to compare their growth response to nitrogen supply and specific features of their internal cycling of N. ^{15}N-labelling techniques were used to distinguish N derived from remobilisation of internal pools of N (stored N), from N taken up by the roots. Results suggested that *V. vitis-idaea* outperformed *V. myrtillus* when N availability was low, while *V. myrtillus* was better adapted to take advantage of events of high N availability. Although both species utilised stored N to the same extent to support new growth, there were some differences in the dynamics of remobilisation of N from storage: remobilisation was faster in *V. myrtillus*, but lasted longer in *V. vitis-idaea*. Results also suggested that plant architecture imposed a more severe constraint on the plant potential to respond to N supply in the evergreen compared to the deciduous species. Comparisons across experiments indicated that the recycling of N pools of different age differed between the two species and depended on the relative availability of N in the last year and in the years before last. Further attention was given to the interactions between morphological constraints and N storage in each species, and their ecological significance.

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