
Adaptation of the water primroses *Ludwigia grandiflora* to terrestrial condition

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Abstract

Biological invasions are the third cause of biodiversity decline. The water primroses *Ludwigia grandiflora* is an invasive aquatic species with important economic and ecological impacts in France. Formerly restricted to aquatic ecosystems, this species recently invaded terrestrial habitats, leading to deterioration of meadow. This extirpation from aquatic systems is surprising, and suggests that responses have been developed by the organisms to grow and develop on the ground.

In the present work, we aimed at comparing terrestrial and water morphs of *Ludwigia grandiflora*. Growth was observed in plants reared in their original environments (terrestrial or aquatic), and crossing experiments were also achieved (terrestrial x aquatic and aquatic x terrestrial). Morphological and metabolomic responses were observed.

The terrestrial morphotype showed a higher plant length, fresh and dry masses of stems and roots, whatever the rearing conditions. Metabolomic analysis of stem and root tissues revealed that the aquatic morphotype reared in aquatic conditions mobilized metabolic pathway relevant to amino acid production and degradation. Contrariwise, the metabolism of the terrestrial morphotype reared in terrestrial conditions was characterized by the presence of larger sugar amounts.

Both morphological and metabolomic differences were observed between aquatic and terrestrial morphotypes: the terrestrial morphotype presented higher developmental and biomass performance than the aquatic morphotype, independently of growing condition. In aquatic condition, the aquatic morphotype used nitrogen compounds directly while the terrestrial morphotype seemed to use nitrogen compounds to produce sugars. The results demonstrated a modified behavior of *L. grandiflora* resulting of its adaptation to terrestrial condition.

Keywords: Invasive water primrose, plasticity, adaptation, metabolomic

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