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Amphicarpy in Perennials: *Centrosema rotundifolium*

NINA NIKOLIĆ¹, RAINER SCHULTZE-KRAFT¹, STEFFEN MÜLLER², IRAIDA RODRÍGUEZ³

¹University of Hohenheim, Biodiversity and Land Rehabilitation in the Tropics and Subtropics, Germany

²National Institute of Agricultural Research (INIA), CIAE-El Tigre, Venezuela

Abstract

Amphicarpy is an evolutionary adaptation which contributes to the increase of a plant's fitness under varying conditions. It consists of a dual reproductive strategy, with formation of subterranean seeds on specialised reproductive structures in addition to aerial seeds, on the same individual. So far, research on this phenomenon has been limited to annual species. The need for sustainable utilisation of vast marginal tropical and subtropical lands has aroused research interest in some of the 35 neotropical species of the legume genus *Centrosema*, among them amphicarpic *C. rotundifolium* Mart. ex Benth. This trailing perennial originates mainly in the northeast Brazilian “caatinga” and can survive on very dry, poor and sandy soils. Effects of two factors relevant for the use of this species, on aboveground/belowground reproductive allocation, were tested on a sandy, low-fertility soil in Venezuela: Eliminating phosphorus deficiency by fertilisation improved the overall vegetative and generative growth, but did not affect the aboveground/belowground ratio of generative matter. Competition stress, simulated by planting density, showed that aerial generative matter was negatively affected already at densities higher than 1 plant m⁻², while only a severe stress (16 plants m⁻²) induced an increase in subterranean seeds on the expense of vegetative growth. A shift in reproductive allocation in response to stress might have longer-term ecological implications. Cumulative germination of viable, unscarified seeds over a 7-month period showed conspicuous differences between two seeds types, presumably due to the structure of the testa: While all aerial seeds germinated, about 40% of subterranean seeds remained hard. The growth of plants from the two seed types under no imposed stress was analysed by nonlinear models. Phenology and general growth patterns did not differ significantly; however, plants originating from aerial seeds produced 33% more aboveground reproductive biomass than plants from subterranean seeds. Subsequently, plants from aerial seeds had a slight lag in growth of tuberous (storage) roots, and about 7% less aboveground vegetative biomass. Contrary to annual amphicarps, *C. rotundifolium* starts aerial flowering early in ontogeny. However, underground reproduction, which is delayed but has about seven times higher generative biomass, remains the major survival mechanism.

Keywords: Amphicarpy, *Centrosema rotundifolium*, resource allocation