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"Development on the margin"

Monitoring Water Stress Responses of *Ipomoea aquatica* (Forssk.) by Thermal Imaging in Different Soil Materials of Northern Thailand

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Abstract

Water morning glory, *Ipomoea aquatica* (Forssk.), is a widely used leafy vegetable throughout Southeast Asia and China. The fast growing plant produces high biomass with a soft watery tissue. This study focuses on the responses of water morning glory to water deficit under controlled conditions.

Three cemented soil basins (8 m × 1 m × 1 m) under a plastic shelter were filled with soil material representative for northern Thailand, taking care that the natural layering and bulk density was altered to the least extend possible. The original soil bodies were Acrisols from a mountainous site at Mae Rim District (a red, well drained, acid clay loam soil derived from granite on a slope), Vertisols (a brown, clayey alluvial soil deposited on flood plain) from Mae Ai District and Regosols (a well drained loamy sand developed on a middle terrace) from Mae Jo, Sansai District.

I. aquatica (cv. 'Reptan') was planted and three weeks drip irrigated keeping the soil close to field capacity (<-100 mbar) until complete soil cover. Each soil basin was divided into two longitudinal segments. On one segment of each soil basin irrigation was continued for control and on the other segment irrigation was stopped for monitoring water stress responses.

Weather data were collected on site and matric potential was monitored with tensiometers. Stomatal resistance was determined once a day by a porometer (Decagon SC-1) and thermal images were acquired with an IR-camera (Infratec Variocam) at the same time. Crop water stress index (CWSI) was calculated as (TC - Tbase) / (Tmax - Tbase), where TC is the mean canopy temperature, Tmax is the upper threshold temperature of leaves where transpiration is suppressed by vaseline coating and Tbase is the temperature of water sprayed leaves and therefore the threshold for maximum evaporative cooling. After ten days of drought the plant material was harvested for determining above ground fresh and dry biomass.

CWSI based on thermal imaging showed a high correlation with the stomatal resistance. It was possible to visualise the differences between well watered and stressed plants by thermal imaging before visible signs of wilting started.

Keywords: CWSI, irrigation, leaf temperature, matric potential, stomatal resistance, water morning glory

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