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Department of Plant Production and Agroecology in the Tropics and Subtropics
Section: Crop Waterstress Management

Response of Transpiration of Lowland Rice Varieties to Water-saving Irrigation

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Introduction

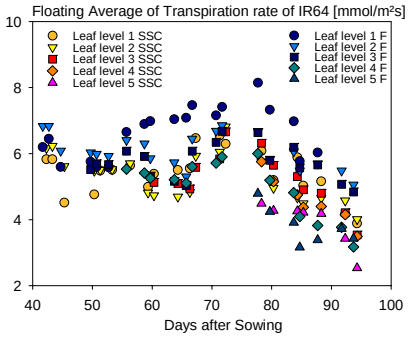
Growing rice with less water while maintaining its high yields is one of the major objectives in rice research to date. Through adapting the system of irrigation, unproductive water losses can be reduced and the level of productive water use then depends mainly on transpiration. Little is known on how such water saving techniques affect transpiration of rice as it is more difficult to observe in the field and it is also influenced by varietal characteristics. Aim of this study was to assess the transpirational responses of two contrasting lowland rice genotypes to irrigation management and the possibility to calculate transpiration over the growth period.



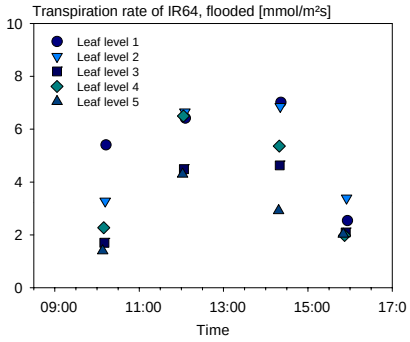
Conclusions

- Large differences in transpiration between leaf levels
- Minor differences between irrigation treatments
- Varietal differences under flooded conditions due to LAI
- Varietal differences as reaction to deficit irrigation

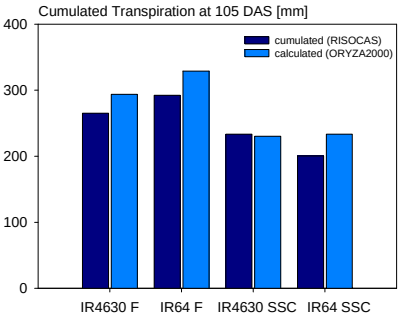
Results and Discussion



- Differences between leaf levels increase during development
- ➔Leaf area development, shading
- E rates of leaf levels differ more strongly in flooded (F) treatment than in SSC
- ➔Lower leaf area (SSC) ➔ less shading➔ more transpiration of lower leaf levels



- Largest E rates at youngest leaves
- ➔Highest light exposure
- No midday depression observed
- ➔No water-stress or insufficient number of measurements
- Shapes of diurnal E curves differ with weather conditions



- Cumulated transpiration similar to results obtained with ORYZA2000
- ➔Single leaf measurements give reliable results
- Lower transpiration in SSC
- ➔Partly due to lower leaf area and to water deficit
- Lower transpiration of IR64 in SSC can not be explained with LAI reduction
- ➔IR64 more sensitive to water availability than IR4630

Materials and Methods

Field layout

A field experiment was conducted at the Sahel station of AfricaRice in Senegal. The irrigation treatments were (1) flooded – a constant ponded water layer of about 10cm throughout the season and (2) Saturated Soil Culture (SSC) – frequent irrigation to saturate the top soil without stagnant water to reduce unproductive water losses. Transpiration rate (E) was measured (1) twice a week at noon on all active leaves of the main culm and (2) weekly diurnals each with three replications. Transpirational losses over 105 days were cumulated in consideration of the specific weather patterns.