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Is the Transpiration History of Rice Leaves Indicative for the Salt Load of Individual Leaves?

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Abstract

The question raised in the title was already once answered negatively by an English group working on rice seedlings using a tracer for water use. However, that study concentrated on leaf blades only. Our earlier work has shown, that leaf sheaths and leaf blades of field grown irrigated rice subjected to salinity differ in sodium accumulation. After the appearance of the leaf, the leaf sheaths accumulate sodium, whereas the little sodium is found in the leaf blades. With the leaf fully expanded, leaf sheath accumulation of sodium slows down, whereas leaf blade accumulation of sodium increases. Through sequential transpiration measurements on the same leaf, we are now able to accurately estimate the water use of individual leaves through their life cycle and through sequential sampling throughout the life cycle of the plant, we know the accumulation of sodium in the leaf sheaths and blades of any particular leaf.

Based on the overall water-use of the plant and the share of the leaf area of any individual leaf of the total leaf area, combined with the results on stomatal conductivity from the sequential transpiration measurements, we know how much water passed through any leaf sheath and blade of the particular rice plant. Since water is the carrier for sodium in transpiration-driven xylem transport, the amount of sodium passing through those tissues can also be known. In our study we compare two rice varieties differing in salinity resistance. Individual leaf water-use and salt uptake will be calculated for sequential leaves. The results will be presented and discussed.

Keywords: Leaf appearance, leaf sheath retention, sodium uptake, stomatal conductance, water-use

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