Concept Models to Simulate Salinity Effects On leaf appearance, leaf duration, Leaf Senescence of irrigated rice

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Introduction

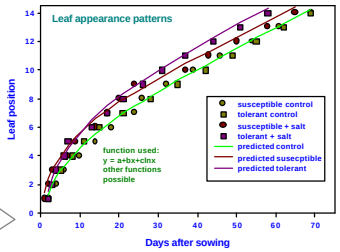
Rice varieties subjected to salinity have different strategies to scope with the stress. Modelling concept of abiotic stresses need leaf appearance, leaf development and leaf senescence.The aim of the study is to describe a mathematical description of leaf appearance patterns, leaf development and senescence level in irrigated rice as affected by salinity.

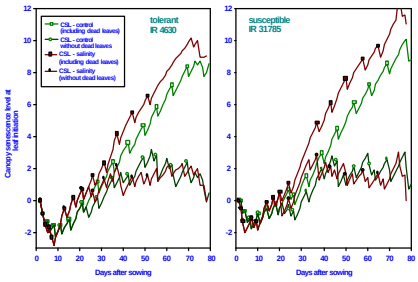
Hypothesis

The leaf appearance rate of rice plants subjected to salt stress is likely differ from non-stressed plants. Salinity increases the senescence rate and shorten significantly the active period of indiviual leaves.

Leaf initiation

Leaf initiation and appearance are hastened under salt stress, however, in the same thermal environment genotypes do not differ in leaf appearance pattern under control conditions.



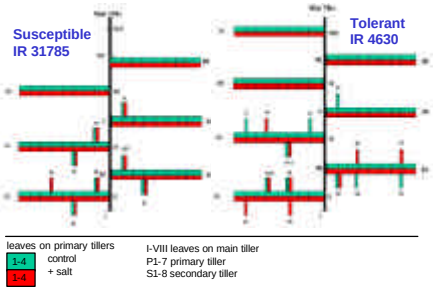


When the 1,5 leaves have passed the combined senescence level excluding dead leaves is for both genotypes on average below 2,0. So, there seems to be a genotype independent concept for leaf initiation under both salinity and normal conditions based on the overall canopy senescence level.

Leaf senescence

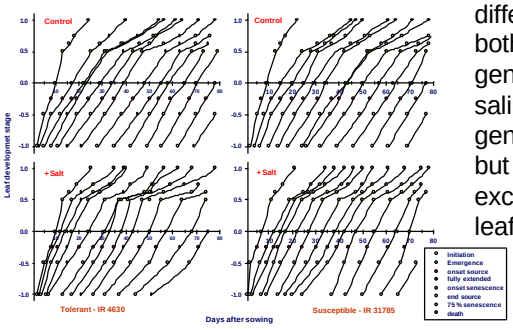
Tillering pattern

Tillering patterns for primary and secondary tillers are not so much affected in more numbers but when and where they appear. The appearance of a tiller might trigger leaf senescence or vice versa.



Leaf development

Leaf development stages do not differ up to 30 days after sowing in both genotypes. In the sensitive genotype leaves die-off faster under salinity and in the tolerant genotypes leaves appear earlier, but last about as long, the exchange in the canopy with fresh leaf material is faster.



Materials & Methods

The experiments involved two rice cultivars IR 31785-58-1-2-3-3 indica type,salt susceptible, IR 4630-22-2 medium duration, salt tolerant. Conducted as pot experiments (March 2003 to August 2003) in a temperature-controlled greenhouse of the Institute of Plant Nutrition at the University of Bonn.Two treatments (0 and 60 mmol NaCl) were replicated three times.The identification of individual leaves by their position, appearance, length, existence and senescence were recorded. At each sampling, plants were separated into roots and shoots, the shoot into individual tillers and tillers into indiviual leaves. And area of different leafs were also measured by leaf area meter.Emerged tillers were counted on all plants and their origin were also observed.For analysis of combined senescence level, development stages were defined as leaf initiation as –1, leaf appearance as –0,5, fully extended as 0, leaf senescence onset as 0,5 and leaf dead as 1.

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