Soil moisture availability and relative air humidity influence root signals of field-grown maize subjected to drought stress

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Signal chain under drought stress

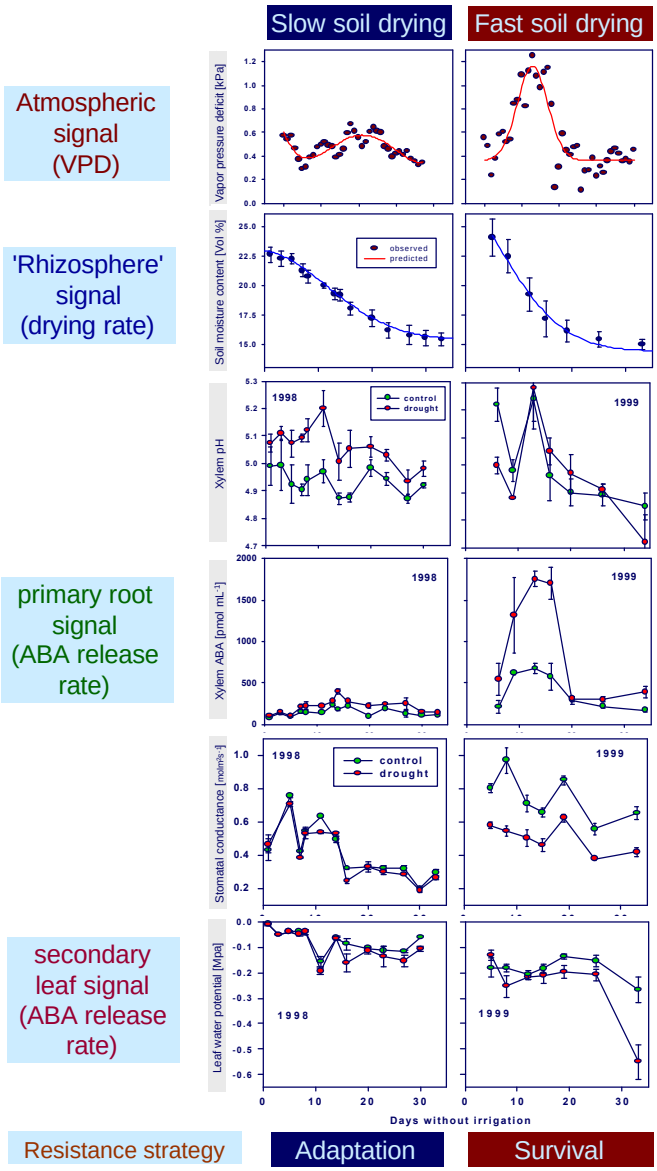
Theoretical chain of physiological events under drought stress, ultimately leading to the control of transpirational water loss.

	change	effect/site of action
soil moisture	decrease	affects root water potential
xylem pH	increase	makes guard cells more sensitive to ABA
xylem nitrate	decrease	changes the nutritional status of the leaf, and stops leaf elongation
xylem ABA	increase	triggers stomatal closure
stomatal conductance	decrease	reduces transpirational water loss
leaf water potential	decrease	triggers additional stomatal closure

Drought study in a field lysimeter

- silage maize
- 18 lysimeter plots
- sandy loam soil, 2 x 2 m
- individual drip irrigation
- automatic rain shelter
- progressive drought treatment
- climate monitoring
- pre-dawn sampling
- xylem sap by guttation
- pre-noon measurements of stomatal conductance

Results - Summary



Conclusions

- Different rates of soil drying result in different patterns of root-shoot-communications.
- In combination with strong climatic signals, plants change their resistance strategy.
- The 'normal' signal chain is interupted, over-ruling 'master signals' take over.
- It remains open, if atmospheric signals alone can be responsible for such responses.

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