

# Potential Yield of Venezuelan maize varieties under variable water supply

Requirements on selection criteria of new Venezuelan maize hybrids change according to the traits involved: new maize hybrids must have an acceptable color, flavor, good mouth haptics and a fair price to satisfy consumers. They must have a high milling yield and dough properties to satisfy processors. Additionally, smallholders as well as medium- and large-size farmers prefer hybrids with high grain yield, resistance to a broad range of diseases, pests, and tolerance to abiotic stresses. Therefore, the focus of research to meet all the requirements mentioned before needs to be sustainable as possible. A review of the strategy of maize production needs to be considered, in the light of the yearly and more often occurring situation of erratic rainfall patterns and increasing temperature



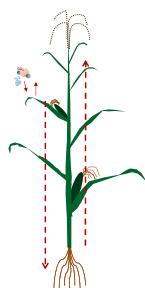
## Approach

Erratic rainfall patterns have caused severe drought conditions in Venezuela directly affecting white maize (*Zea mays* L.) production, increasing the economic risk for smallholders and compromising food security. Maize varieties resistant to drought are among the few options smallholders can employ to increase yield stability in their production system.

**Stagnation of production level** current production is 49% lower than the yield for the same hybrids obtained in experimental optimal conditions.

**Climate change vulnerability** the future pressure on environmental services in rural areas will increase in order to meet food security and economic development

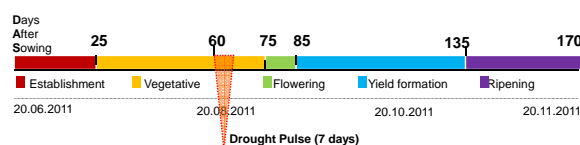
This negative current situation can increase the food insecurity not only for rural people but also for poor people in urban areas where over 93 percent of Venezuela's population live



## Research Questions

- Under drought, the formation of grain-yield on each hybrid is related to the expression of plant growth, root-shoot relations, or/and gas exchange?
- Secondary traits might be considered as selection criteria for drought tolerance in white maize?

## Methodology



- 5 Hybrids: D-3273, D-842, D-223, D1B-718, D1B-273
- 2 Treatments: Well-Watered plants (WW) and drought plants (WD)
- 4 Sampling dates Day 0 (SWC<sub>max</sub>) → Day 3 → Day 5 (SWC<sub>min</sub>) → Day 7

## Results

Trait	Treatment	Variety				
		D-3273	D-842	D-223	D1B-718	D1B-273
Grain Yield (g plant <sup>-1</sup> )	WW	9.9	0.2	10.0	7.2	2.8
	WD	0	0	7.4	2.2	0.4
WUE (P <sub>N</sub> /g <sub>s</sub> ) Water Use Efficiency	WW	0.08	0.11	0.06	0.09	0.07
	WD	0.03	0.03	0.10	0.04	0.09
P <sub>N</sub> & g <sub>s</sub> Photosynthesis & stomatal conductivity	WW	82%	95%	96%	88%	88%
	WD	-0.14	-0.19	-0.14	-0.17	-0.16
Ψ <sub>w</sub> Leaf water potential	WW	-0.14	-0.19	-0.14	-0.17	-0.16
	WD	-0.76	-0.35	-0.62	-0.51	-0.51
R/S Root-Shoot ratio	WW	0.7	0.3	0.4	0.3	0.9
	WD	0.8	0.1	0.5	1.2	0.6
Lp Hydraulic conductivity	WW	1.1	0.6	1.1	1.6	0.8
	WD	0.5	0.5	0.9	0.9	0.5



The higher sterility rate was observed in D-3273 and D-842, where no kernels per cob, thus no grain yield was achieved in DW plants



Under variable water supply a variation in SWC might induce a tight stomatal closure, therefore plant status can be maintained within a range of 20 to 4% of SWC



Changes in Lp could optimize soil water use and together with the stomatal regulation may be the driving forces (of the gradient along the observed soil-root-plant-atmosphere continuum (SRPAC) in tropical maize.

## Conclusion

- Differences in the effect to the potential yield, as well in the expression of secondary traits related not only to plant status but also to plant growth throughout the life cycle, suggest that Ψ<sub>w</sub>, Lp, g<sub>s</sub>, WUE are effective indicators to drought tolerance in Venezuelan white maize hybrids under variable water supply
- Danac-223 is recommended for use in developing drought tolerance in white maize breeding programmes in Venezuela, due to consistent responses to morphological, growth, and both root-shoot and physiological traits to tolerate water variable supply

### Acknowledgments

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