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"Resilience of agricultural systems against crises"

Potential Yield of Venezuelan Maize Varieties under Variable Water Supply

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Abstract

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, but selection tools are needed to better identify varieties tolerant to water deficit. To this end we evaluated the differences in yield response based on secondary traits in five Venezuelan white maize hybrids (D-3273, Danac-842, D1B-718, D1B-283, Danac-223) subjected to variable water supply. At 55 days after sowing (DAS), plants were subjected to two contrasting water supplies; (1) full irrigation (WW) and (2) a shock-like drought (DW) where irrigation was withheld for five days, followed by resumption of full irrigation. Under drought conditions, soil water content sharply decreased at 60 DAS, due to a combination of leaf, root and shoot responses. Flowering length and grain-yield of the five hybrids were negatively affected. However, Danac-223 plants were less affected with no reduction of their harvest index. Drought stress also significantly affected gas exchange parameters, with stomatal control being the major factor affecting photosynthesis. Under variable water supply, intrinsic water use efficiency improved in D1B-278 and Danac-223, whereas it decreased considerably in Danac-842. In all hybrids, water stress induced a decrease in root hydraulic conductivity which highly correlated with leaf water potential. Danac-223 was found to be a promising hybrid for cultivation in the western plains of Venezuela under variable water supply, due to its medium specific leaf area, a more efficient root water transport, enhanced WUE, and stable yield production under drought stress.

Keywords: Drought tolerance, secondary traits, water use efficiency, white maize

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