

# Differential growth of hybrid pine families in Misiones, Argentina, is not linked to their stomatal behavior

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## Introduction

The 34% forested area of the country is concentrated in the province of Misiones, where conifers are the predominant species, reaching 82% of the implanted area in the province. INTA-PINDO hybrid pine is the result of the crossing between *Pinus elliottii* var. *elliottii* and *Pinus caribaea* var. *hondurensis*. This species presents a higher performance than its parents and commercial controls (Belaber et al., 2018). Because of the crown characteristics and branches diameter, it is suitable to be used in silvopastoral systems. On the other hand, IPCC reports indicate that the frequency and intensity of drought events as well as the amount and distribution of precipitation have changed (IPCC 2007). For all this, it is relevant to include the ecophysiological performance of the different genetic materials from the breeding program. The aim of this study was to analyze variables that can explain the differential growth between two hybrid pine families.

## Materials and methods

This study was carried out in the Montecarlo Department in Misiones Province, Argentina (26° 30'S, 54° 40' W). Plants of the two families, F12 and F28, were established under field conditions in July 2020, with periodic measurements until April 2021 of Total Height (TH, cm). Since October, on the same moment, maximum stomatal conductance ( $g_{smax}$ ,  $mmol\ m^{-2}\ s^{-1}$ ) and leaf water potential ( $\Psi_l$ , MPa) were measured at 10 a.m. On the other hand, in dry (December) and wet periods (March), daily curves of  $g_s$  and  $\Psi_l$  were traced. Analysis of variance (ANOVA,  $\alpha = 0.05$ ) was applied to evaluate the effects of the sources of variation of increment, leaf water potential and stomatal conductance.

## Results

Initial TH was different between F12 and F28 ( $30.1 \pm 3.8$  and  $20.8 \pm 2.5$  cm respectively;  $p = 0.007$ ). The accumulated increment in TH was different between families since September, being final increment in TH (April 2021) of F28 ( $71.4 \pm 18.0$  cm) higher than of F12 ( $33.3 \pm 10.3$  cm) (Figure 2). The whole growing-season mean of  $g_{smax}$  and  $\Psi_l$  were similar between families ( $323.3 \pm 150.4$ ,  $373.3 \pm 103.1\ mmol\ m^{-2}\ s^{-1}$ ;  $-1.9 \pm 0.57$ ,  $-1.8 \pm 0.52$  MPa;  $p > 0.05$ ). Daily  $g_s$  and  $\Psi_l$  were different comparing dry and wet periods ( $g_s$ :  $p = 0.016$ ;  $\Psi_l$ :  $p < 0.001$ ) (Figure 3), but not between families ( $p = 0.754$  and  $0.315$ ), without interaction between factors (period\*family) ( $p = 0.842$  and  $0.646$ ).

*Family stomatal behavior was not related to initial size and morphological dynamics, which could be related to a differential allocation to aboveground vs. belowground biomass or to differences in resource use efficiency.*



Figure 1: Size initial of hybrid pine in August 2020 (left picture). Measure of stomatal conductance in November 2020 (right picture).

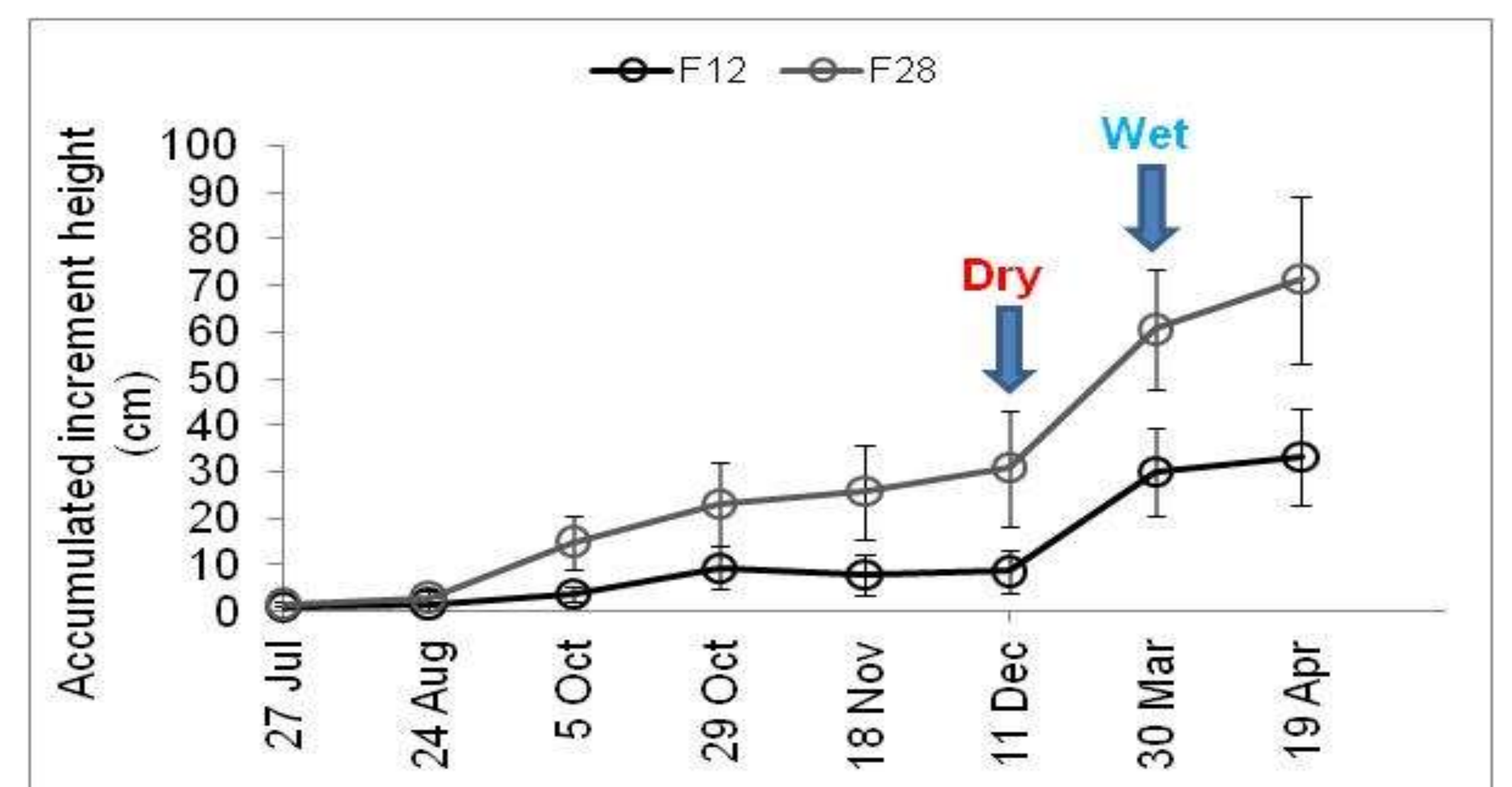


Figure 2: Accumulated increment in total height for each family. Arrows indicate the dry (December) and wet (March) periods, moment where daily curve of stomatal conductance and leaf water potential were traced.

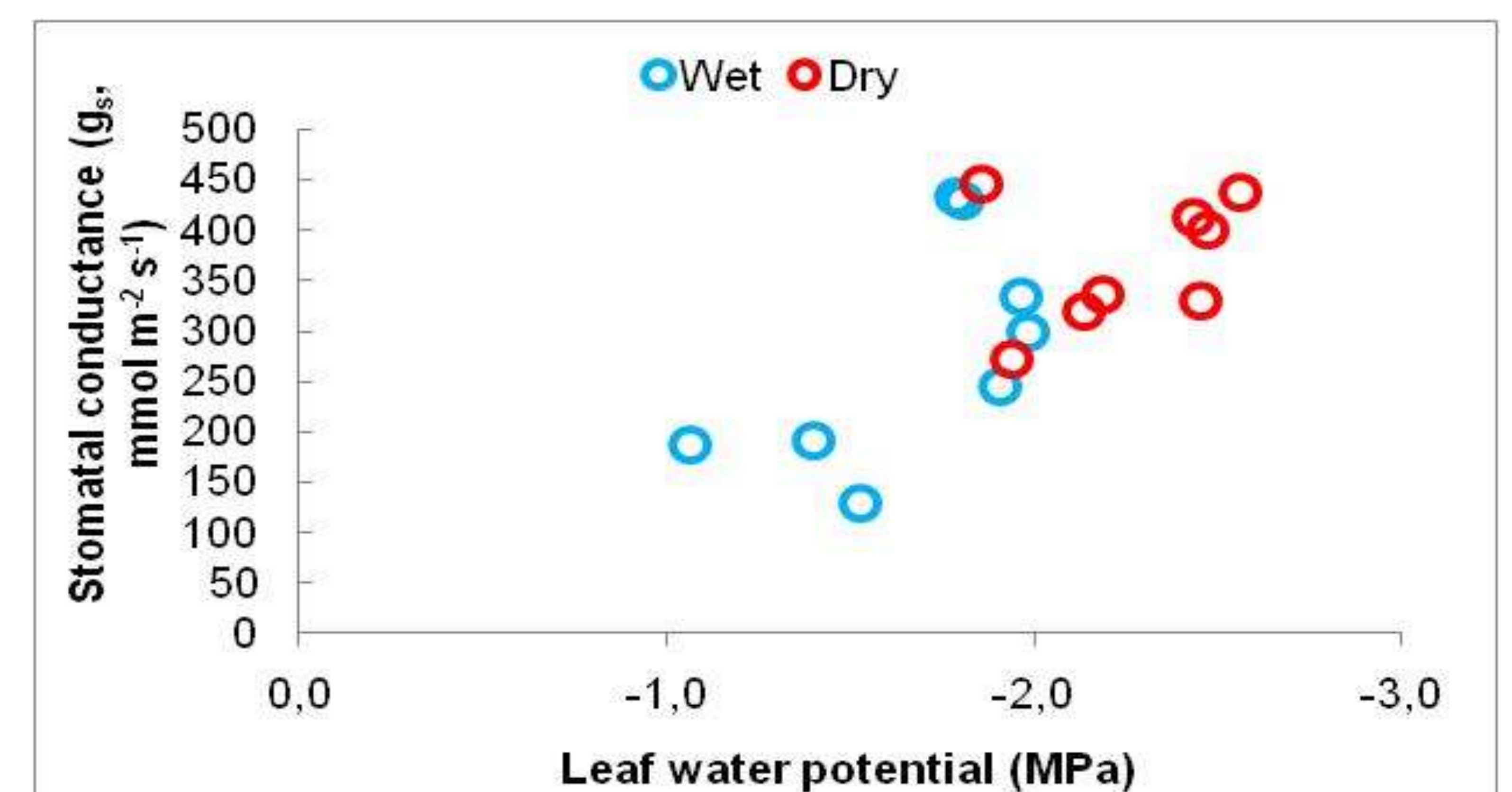


Figure 3: Daily curve of stomatal conductance and leaf water potential in dry (December) and wet (March) periods.