Czech University of Life Sciences Prague
Faculty of Tropical AgriSciences

TROPENTAG 2021 "Towards shifting paradigms in agriculture for a healthy and sustainable future"

Physiological responses of yacon (*Smallanthus sonchifolius*) under chilling stress

Okafor Cyprian Uche*, Iva Viehmannova*, Hnilička František**

* Department of Crop Sciences and Agroforestry, Faculty of Tropical AgriSciences, Czech University of Life Sciences Prague, Kamycka 129, 165 21 Prague, Czech Republic

** Department of Botany and Plant Physiology, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences Prague, Prague, Czech Republic

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

This research is funded by: Internal Grant Agency FTA 20213114 and also by the Ministry of Education, Youth and Sports of the Czech Republic, S grant

1. Introduction

- Yacon [*Smallanthus sonchifolius* (Poeppig Endlicher) H. Robinson, Asteraceae] is a root crop that originated in the Andes (Fernández et al., 2006)
- Eaten raw, sweet, contains no starch and is nutritious (Kemp et al., 2019)
- Myriads of antidiabetic and nutritional potentials (Žiarovská et al., 2019)
- A rich source of inulin-type fructooligosaccharides
- Due to its frost sensitivity (Fernández et al., 2006), responses exhibited by yacon under chilling condition is understudied at the physiological level
- Hoping to be useful in breeding new resistance varieties and increased adaptability in cold regions

2. Objective

- Comparison of some physiological attributes of the yacon genotypes with different ploidy levels under cold treatments at different intervals

Hypothesis

- Young leaves exposed to cold will show signs of decrease in chlorophyll fluorescence, stomatal conductance, and net photosynthesis

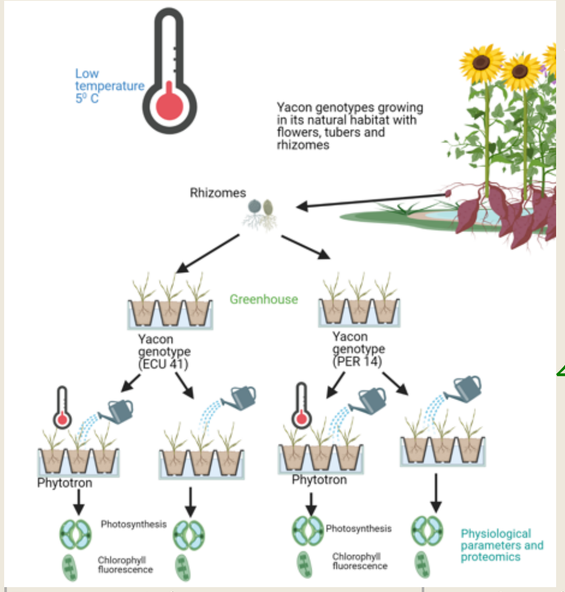

Figure 1; Schematic representation of methodology

3. Methodology

- Rhizomes from one octoploid (2n = 8x = 58)-PER 14, and one dodecaploid (2n = 12x = 87)- ECU 41 yacon genotype was selected and pre-cultivated under semi-controlled greenhouse conditions (25 ± 1 °C). The methods are highlighted in figure 1
- Statistical analysis was performed using one-way ANOVA (version 22.0)

4. Results

- Cold treatment significantly affected all parameters tested (chlorophyll fluorescence fv/fm) (figure 2), photosynthesis and stomatal opening (net photosynthesis and stomatal conductance (figures 3 and 4)

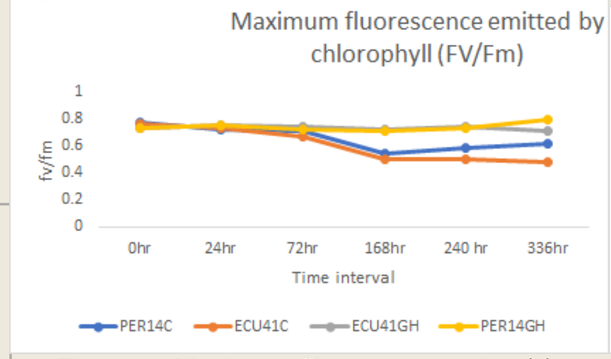

Figure 2; Maximum fluorescence emitted by chlorophyll for both genotypes

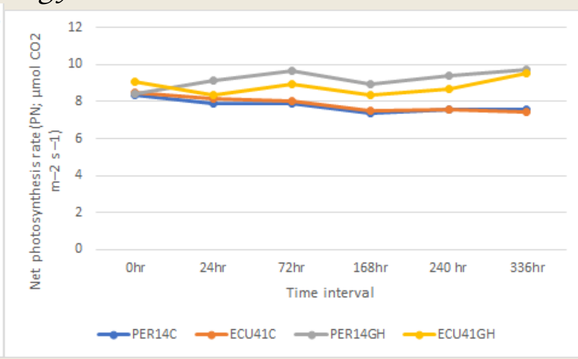

Figure 3; Net photosynthesis for both genotypes

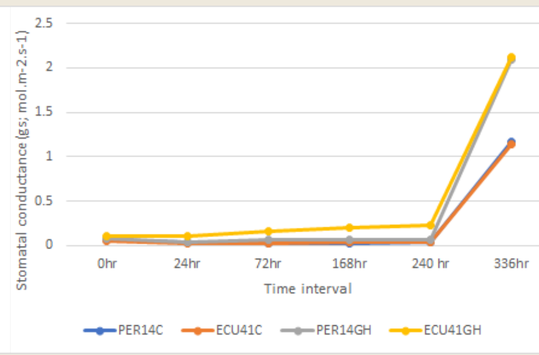

Figure 4; Stomatal conductance for both genotypes

5. Conclusion

This ongoing investigation may help in:

- understanding cold stress response for improved breeding
- discovering reasons why higher ploidy genotype proved superior through further physiological/proteomic analyses

References:

- *Fernández EC, Viehmannová I, Lachman J, Milella L. 2006. Yacon [Smallanthus sonchifolius (Poepping & Endlicher) H. Robinson]: A new crop in Central Europe. Plant Soil and Environment 52: 564 - 570*
- *Kamp L, Hartung J, Mast B, Graeff-Hönninger S. 2019. Plant growth, tuber yield formation and costs of three different propagation methods of yacon (Smallanthus sonchifolius). Industrial Crops and Products 132: 1 - 11*
- *Žiarovská J, Padilla-González GF, Viehmannová I, Fernández E. 2019. Genetic and chemical diversity among yacon [Smallanthus sonchifolius (Poepp. et Endl.) H. Robinson] accessions based on iPBS markers and metabolomic fingerprinting, Plant Physiology and Biochemistry 141: 183 – 192*