PROJECT TITLE

Comparative analysis of Salt-induced changes in the Metabolome of Hydroponically grown cultivated Cardoon and Arundo donax

CONSORTIUM

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SUMMARY OF THE REPORT

Global warming and unpleasant environmental changes punish plant cultivations. Soil salinization is particularly increasing where evapotranspiration is more prominent than rainfall, thus severely impairing agricultural production. As regard, species growing on marginal lands offer the chance to select favorable traits for plant survival. In this context, the monocot giant reed (*Arundo donax*) and the dicot cultivated cardoon (*Cynara cardunculus* var. *altilis*), vigorously growing in the Mediterranean area have been object of our interest. In our previous works (Docimo *et al,* 2019, Docimo *et al,* 2020), we investigated both species for their molecular and biochemical behavior under salt stress and we selected three giant reed ecotypes and two cultivated cardoon lines with differential response to NaCl treatment. However, little is known about global metabolic changes of primary metabolism in response to salinity in these two species. To fill this gap, the selected giant reed ecotypes and cultivated cardoon lines were subjected to saline treatments of 21 days at 150mM NaCl for *A. donax* and 2 and 21 days at 100mM NaCl for cultivated cardoon in controlled conditions in hydroponics, and plant tissue samples were collected, and flash frozen in N_2 for further analyses. Moreover, salt- or cold-stressed cardoon calli were produced and sampled. The objective of this proposal is to understand tissue and cellular metabolic reprogramming for maintaining appropriate osmotic homeostasis and activation of signaling pathways, that involves changes of primary and secondary metabolites. Indeed, metabolic analysis on salt stressed cardoon plant revealed a prompt biosynthesis of phenylpropanoids (Docimo *et al,* 2020). Besides, we believe that a focus on changes in primary metabolites belonging to sugar, amino acid; aromatic amino acid; fatty acid metabolism; and precursors for secondary metabolic pathways can elucidate the metabolic changes having important roles during salt tolerance (Bandehagh A and Taylor NL, 2020). Moreover,comparison of a monocot vs a dicot species will clarify possible differences associated to salinity tolerance. As well, the availability of different tissues will allow comparison of the tissue response to the high NaCl environment either directly (roots) or systemically (stems and leaves). In addition, chilling and salt stress experiments performed on cardoon leaf derived-calli will allow to investigate the metabolic stress response independent of tissue organization and to elucidate metabolic differences between responses to salt stress, having osmotic and ionic disequilibrium effects, and to chilling stress, also sharing osmotic constraints but lacking ion toxicity. Overall, we aim to understand weather in different lignocellulosic species, in distinct tissues (Wu D, *et al* 2013) and at cellular level (Hossain MS, *et al* 2017) there are metabolites playing a vital role in osmotic adjustment, carbon storage and free radical scavenging.