Accepted Manuscript

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PII: S0981-9428(18)30016-0

DOI: 10.1016/j.plaphy.2018.01.010

Reference: PLAPHY 5114

To appear in: *Plant Physiology and Biochemistry*

Received Date: 13 December 2017

Revised Date: 8 January 2018

Accepted Date: 11 January 2018

Please cite this article as: J. González-Villagra, Acá. Rodrigues-Salvador, A. Nunes-Nesi, J.D. Cohen, M.M. Reyes-Díaz, Age-related mechanism and its relationship with secondary metabolism and abscisic acid in *Aristotelia chilensis* plants subjected to drought stress, *Plant Physiology et Biochemistry* (2018), doi: 10.1016/j.plaphy.2018.01.010.

Age-related mechanism and its relationship with secondary metabolism and abscisic acid in *Aristotelia chilensis* plants subjected to drought stress

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Abstract

Drought stress is the most important stress factor for plants, being the main cause of agricultural crop loss in the world. Plants have developed complex mechanisms for preventing water loss and oxidative stress such as synthesis of abscisic acid (ABA) and non-enzymatic antioxidant compounds such as anthocyanins, which might help plants to cope with abiotic stress as antioxidants and for scavenging reactive oxygen species. *A. chilensis* (Mol.) is a pioneer species, colonizing and growing on stressed and disturbed environments. In this research, an integrated analysis of secondary metabolism in *Aristotelia chilensis* was done to relate ABA effects on anthocyanins biosynthesis, by comparing between young and fully-expanded leaves under drought stress. Plants were subjected to drought stress for 20 days, and physiological, biochemical, and molecular analyses were performed. The relative growth rate and plant water status were reduced in stressed plants, with young leaves significantly more affected than fully-expanded leaves beginning from the 5th day of drought stress. *A. chilensis* plants increased their ABA and total anthocyanin content and showed upregulation of gene expression when they were subjected to severe drought (Day 20), with these effects being higher in fully-expanded leaves. Multivariate analysis indicated a significant positive correlation between transcript levels for NCED (9-cis-epoxycarotenoid dioxygenase) and UFGT (UDP glucose: flavonoid-3-O-glucosyltransferase) with ABA and total anthocyanin, respectively. Thus, this research provides a more comprehensive analysis of the mechanisms that allow plants to cope with drought stress. This is highlighted by the differences between young and fully-expended leaves, showing different sensibility to stress due to their ability to synthesize anthocyanins. In addition, this ability to synthesize different and high amounts of anthocyanins could be related to higher *NCED1* and *MYB* expression and ABA levels, enhancing drought stress tolerance.