



Library Indian Institute of Science Education and Research Mohali



DSpace@IISERMohali (/jspui/)

/ Publications of IISER Mohali (/jspui/handle/123456789/4)

/ Research Articles (/jspui/handle/123456789/9)


Please use this identifier to cite or link to this item: <http://hdl.handle.net/123456789/1926>

Title:	NMR-based investigation of the altered metabolic response of Bougainvillea spectabilis leaves exposed to air pollution stress during the circadian cycle
Authors:	Mishra, Sumit (/jspui/browse?type=author&value=Mishra%2C+Sumit) Gogna, N. (/jspui/browse?type=author&value=Gogna%2C+N.) Dorai, K. (/jspui/browse?type=author&value=Dorai%2C+K.)
Keywords:	Abiotic stress Air pollution Circadian rhythms NMR-based metabolomics
Issue Date:	2019
Publisher:	Elsevier
Citation:	Environmental and Experimental Botany, 164, pp. 58-70.
Abstract:	<p>The metabolism of plants has evolved several different strategies to cope with different types of abiotic stresses, ranging from reconfiguration of central metabolic pathways such as carbon, nitrogen and energy metabolism, to biosynthesis of specialized secondary metabolites. The plant circadian clock is intimately connected with plant response and tolerance to abiotic stress. We performed metabolite fingerprinting of the leaves of Bougainvillea spectabilis (a plant known to be tolerant to several kinds of abiotic stresses) using one- and two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy. Several of the metabolites identified in our study show a consistent rhythmic pattern during the circadian cycle, indicating that circadian rhythms are a strong influence on plant metabolism. We also used NMR-based metabolomics to identify metabolites that are significantly different in two types of B. spectabilis leaves: from plants exposed for prolonged durations to high levels of vehicular emissions and air pollution stress, and from plants grown under controlled conditions with no exposure to vehicular emissions. We used multivariate statistics to understand how air pollution stresses disturb different metabolic pathways in the plant. Our observations of alteration in primary metabolism of B. spectabilis in response to air pollution stress include changes in concentrations of amino acids, tricarboxylic acid cycle (TCA) intermediates and sugars. These metabolic markers are indicators of photosynthetic dysregulation as well as osmotic readjustment. Sugars such as sucrose and glucose accumulate rapidly in the leaves subjected to pollution stress, which could be a source of protection against oxidative damage via osmotic adjustment. Secondary metabolites produced in abundance in the leaves exposed to air pollution include putrescine, γ-aminobutyric acid (GABA), trigonelline and several phenylpropanoids and flavonoids, all of which have been previously noted to be elevated in model plants which are tolerant to abiotic stresses. These metabolites are possibly acting as Reactive Oxygen Species (ROS) scavengers, metabolism regulators and ultraviolet (UV) radiation screens.</p>
URI:	https://www.sciencedirect.com/science/article/abs/pii/S0098847218316058 (https://www.sciencedirect.com/science/article/abs/pii/S0098847218316058) http://hdl.handle.net/123456789/1926 (http://hdl.handle.net/123456789/1926)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format	
Need to add pdf.odt (/jspui/bitstream/123456789/1926/1/Need%20to%20add%20pdf.odt)		8.63 kB	OpenDocument Text	View/Open (/jspui/bitstream/123456789/1926/1/Need%20to%20add%20pdf.odt)

[Show full item record \(/jspui/handle/123456789/1926?mode=full\)](#)

 [\(/jspui/handle/123456789/1926/statistics\)](#)

Items in DSpace are protected by copyright, with all rights reserved, unless otherwise indicated.