3RD WORLD PLANT GENOMICS AND PLANT SCIENCE CONGRESS & 4TH WORLD MYCOLOGY AND MUSHROOM CONGRESS

July 15-16, 2019
Osaka, Japan

Unraveling the light-specific regulatory signatures and metabolic reprogramming in green leafy vegetables grown under different light quality and intensity conditions

Mandar R Godge[1], Kuppan R Dinesh[1], Shabbir M Moochhala[1], Anna Karen Carrasco Laserna[2], Sam Fong Yau Li[2]
[1]School of Applied Science, Singapore
[2]National University of Singapore, Singapore

Horticulture crop productivity and quality are seriously affected by various biotic and abiotic stresses which represent a severe threat to the agriculture production worldwide. In the present study, we have used Brassica rapa, var. chinensis, a green leafy vegetable, as a plant model to study the effects of LED lights on plant metabolome, plant defence signalling, nutritional status and overall yield parameters. Four types of monochromatic LEDs (blue, green, amber and red) and white (control) were used at low and high intensities (100 and 300 µmol•m−2•s−1, respectively). As key molecular pathways underlying plant responses to a specific light quality and intensity remain poorly understood, we have used a multi-omics-based approach to evaluate the metabolic and transcriptional reprogramming (light signal mediated gene expression). Our results show elevated contents of anthocyanin and flavonols which relates to the increase in gene expression levels of MYB12 (flavonol biosynthesis is regulated by MYB transcription factors). This demonstrates that LED lights can be used as an efficient tool for metabolic engineering of flavonoids biosynthetic pathway which could enhance the plants defence signalling. Based on previous studies and to fill in the gaps of our understanding for the effects of different light wavelengths on plant growth and development, we have investigated and demonstrated the influences of light quality and intensity on plant biomass, nutritional value and accumulation of chlorophylls, carotenoids and nitrates. These suggest that light quality can be strategically used as a modular system to enhance and maximize the economic efficiency of plant production, quality and nutrition potential of vegetables grown in controlled environment.

mandar@tp.edu.sg