Accumulation and partitioning of total phenols in two varieties of Labisia pumila Benth. under manipulation of greenhouse irradiance

ABSTRACT

Two varieties of Labisia pumila (var. pumila and alata) were exposed to four levels of greenhouse irradiance (100, 70, 50, 30% of the incoming radiation (IR); equivalent to respective 670, 630, 470, 240 μmol m-2 s -1) in a 2-factorial Randomized Complete Block Design trial with the aim to determine the existence of varietal preferences in total phenols (TP) accumulation and their distribution to different organs (leaf, stem, root) due to manipulation in irradiance levels. TP were determined according to Folin-Ciocalteu method and results expressed in mg Gallic acid g-1 dry weight (DW). Total phenolic content in red var. alata consistently recorded lower values ($p \leq 0.0001$) than green var. pumila when exposed to high irradiance (100-70% IR) by 4.5-6.6%. Reducing irradiance to 50% IR; however, increased TP in red higher than green var. by 39.2% (10.96 vs. 7.87 mg GAE g-1 DW) due to marked increase ($p \leq 0.0001$) in phenols partitioning to the leaf of red var. compared to green var. (4.6 vs. 3.0 mg g"). Partitioning of phenols to the leaf in red var. alata, although kept increasing (6.5% over green var.), did not continue to enhance plant TP with further decrease in irradiance to 30% IR. Instead TP partitioning to the stem and root in green var. pumila exceeded substantially over red var. alata by 11.8-18.4%, respectively, implying there are varietal preferences between var. pumila and alata in terms of TP accumulation and partitioning related to varying levels of irradiance. Although both varieties are shade loving, var. alata was more sensitive to high irradiance than var. pumila in accumulation of TP in the plants and that manipulation of irradiance in controlled environment agriculture was able to enhance partitioning of phenols to different parts or organs of Labisia pumila for potential niche production of plant parts.

Keyword: Kacip Fatimah, biopharmaceutical production, secondary metabolites, factory-run controlled environment agriculture, microenvironment manipulation