Liquid Chromatography Mass Spectrometrybased High-Throughput, Unbiased Profiling of Upland and Lowland Rice Varieties Cultivated in Sabah

ABSTRACT

Oryza sativa L. commonly known as rice is one of the most cultivated cereal worldwide which sustained over 50% of the world's population. Malaysian rice cultivated in 2 systems namely lowland (irrigated rice) and upland (rain-fed rice). Rice varieties adapted different growth systems differ substantially from each other agronomic traits. It is challenging to distinguish from each other's using their morphological characteristics. Therefore, we aimed to propose a high-resolution mass spectrometry-based high-throughput, unbiased approach to distinguish rice species (upland or lowland cultivation) using the chemotaxonomy approach using whole rice (including barns). From our preliminary results, orthogonal partial least square discriminant analysis (OPLS-DA), a supervised pattern-recognition technique, successfully discriminates the differently cultivated rice species with R2X, R2Y, and Q2 as 0.309, 0.914, and 0.871, respectively. Dendrogram demonstrates rice species were discerned from another. There are some plant-related metabolites and phospholipids species significantly differed between the cultivated rice species. Among the identified metabolites, the upland whole rice demonstrated a higher ratio of linoleic acid esters and glycerolipids including diacylglycerol lipids (DG), monoacylglycerol lipds (MG), and phosphocholine lipids (PC) compared to lowland whole rice. Interestingly, triacylglycerolipids were reduced in the upland as compared to lowland whole rice. It is suspected the rice expressed different levels of lipids contents play essential roles in rice germinations at adopted lands. Throughout such an approach, a systematic, scientific, evident-based approach could be established and proved an insight for the researcher to distinguish rice species and avoid nutrition facts exaggeration of specific rice species over the others.