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Comparative Metabolomics Analysis of Weedy Rice (*Oryza* spp.) across Peninsular Malaysia

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Abstract

Weedy rice (*Oryza* spp.) is a notorious weed that invades paddy fields and hampers the rice's production and yield quality; thus, it has become a major problem for rice farmers worldwide. Weedy rice comprises a diverse morphology and phenotypic variation; however, the metabolome and chemical phenotypes of weedy rice grains have not been explored. Therefore, this study is aimed to investigate the metabolite profiles and chemical diversity of Malaysian weedy rice. Thirty-one biotypes of weedy rice grains were collected from selected rice granaries in different states of Peninsular Malaysia, including Selangor, Perak, Penang, Kedah, Perlis, Kelantan, and Terengganu. In addition to the weedy rice samples, four cultivated rice varieties (MR219, MR220, MR220 CL2, and MARDI Siraj 297) were subjected to nuclear magnetic resonance-based metabolomics. The PLS-DA and OPLS-DA models revealed a clear separation between the weedy rice and cultivated rice, which was contributed by the higher level of γ -aminobutyric acid (GABA), α -glucose, fumaric acid, and phenylalanine in the weedy rice, whilst valine, leucine, isoleucine, fatty acids, 2,3-butanediol, threonine, alanine, butyric acid, choline, γ -oryzanol, fructose, β -glucose, sucrose, ferulic acid, and formic acid were found dominant in the cultivated rice. Interestingly, the models also showed a separation between the weedy rice samples collected from the west coast and east coast regions of Peninsular Malaysia. The metabolites responsible for the separation, i.e., threonine, alanine, butyric acid, fructose, β -glucose, and formic acid,

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were found higher in the west coast samples, and the east coast samples were discriminated by higher levels of valine, leucine, isoleucine, fatty acids, 2,3-butanediol, choline, GABA, γ -oryzanol, α -glucose, sucrose, fumaric acid, ferulic acid, and phenylalanine. This study is the first to provide insights into the metabolite profiles and chemical phenotypes of Malaysian weedy rice that could be influenced by genotype and environmental conditions. The information on the weedy rice metabolome and omics data is important for further research on weed management and crop improvement. © 2023 by the authors.

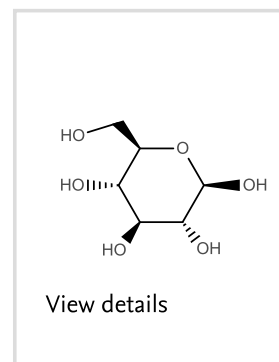
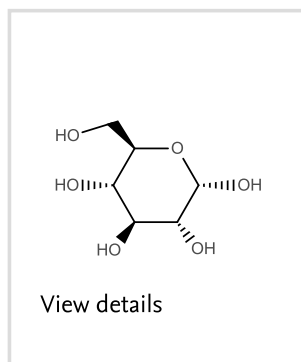
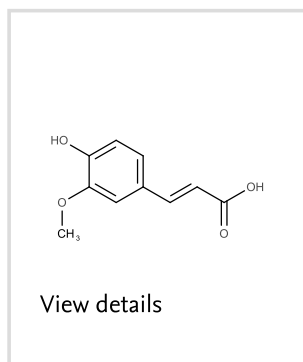
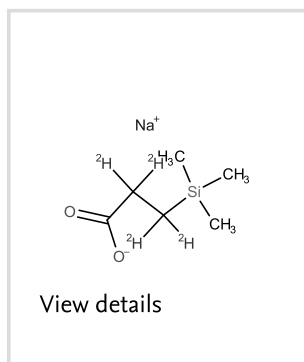
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