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Unravelling the phenolic diversity of pigmented rice and their antidiabetic and anticancer properties

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Abstract

Colored rice, characterised by its red, purple, or black pericarp colours, has been grown and marketed for its dietary and therapeutical benefits. It constitutes phenolic acids, flavonoids, anthocyanins, and proanthocyanidins responsible for the anticancer properties of coloured rice. Furthermore, the resistant starch content of pigmented rice was attributed to its anti-diabetic properties. However, despite the broad claims about the importance of pigmented rice for human nutrition, the underlying metabolic diversity has not been systematically explored. This research profiled large diversity of coloured rice samples (n=300) for the glycemic index, phenolic content, antioxidant capacity, and inhibitory effects against colon cancer. Black rice has shown significant differences in the anthocyanin and proanthocyanidin contents compared with red rice. However, it did not show a significant difference in the antioxidant assays such as DPPH, ABTS, and FRAP. Generally, pigmented rice has shown greater free phenolic content than its bound counterpart. In terms of starch content and composition, there is a wide variation observed across the pigmented rice panel. Mathematical models such as artificial neural networks and random forest modelling classified the rice lines according to their nutritional content and properties. Furthermore, it has been shown that bound phenolics have a greater contribution to rice’s colour. GWAS analysis was used to identify the genes responsible for the anticancer and anti-diabetic properties. In addition, elite cultivars in terms of phenolic content and nutritional properties were determined. Correlation networks demonstrated the phenolic profile of the pigmented rice’s dietary benefits. This research has shown the influence of flavonoids on rice’s anti-diabetic and anticancer properties. We contest that this research will be utilised for breeding rice that can alleviate non-communicable diseases such as cancer and diabetes.

Keywords: Anticancer, antidiabetic, coloured rice, phenolics, rice, starch