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The Nutritional Implications of Pericarp Color in Pigmented Rice through Modelling

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Abstract

Various health-promoting properties have been linked to the consumption of pigmented rice due to its polyphenolic and mineral content. As consumers become more aware of these benefits, they often shift from consuming white rice to pigmented rice. Pigmented rice is easily identified in the market through its pericarp colour and is classified on this basis. Because of this, consumers have always associated the colour of rice with its nutritional value. This study examined the relationship between rice pericarp colour and its polyphenolic content and antioxidant capacity through partial least squares regression (PLS) models. In addition, we proposed a new classification scheme for coloured rice based on its mineral and polyphenolic content, which could be predicted through its colour traits by employing artificial neural network (ANN) models. The results revealed that lightness (L*), redness (a*), yellowness (b*), and hue angle (h*) are important colour properties to consider in predicting the polyphenolic contents and antioxidant capacity. While the PLS model showed modest accuracies for predicting the total phenolics (TPC, $R^2 = 0.59$), total flavonoids (TFC, $R^2 = 0.60$) and total anthocyanin content (TAC, $R^2 = 0.63$), it showed low accuracy in predicting the antioxidant capacity ($R^2 = 0.19$). This shows that colour alone could be used to estimate the phenolic contents of rice but not its antioxidant capacity since there are other bioactive compounds found in rice that contribute to its DPPH scavenging activity but not necessarily a contributor to its pigment. Furthermore, we classified the pigmented rice into four general classes based on its polyphenolic and mineral content. Class A revealed that samples containing low TPC, TFC, and TAC have high values of Mn and Na. Conversely, class C revealed that samples with high polyphenolic content have low values of Mn and Na. The neural network predicted the classes using the previously identified important colour trait with an accuracy of 31.25 % and can be further improved by adding more hidden layers to the model.

Keywords: Anthocyanin, flavonoids, neural network, phenolics, pigmented rice

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