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FTIR analysis of Thermal and Plasma Treatments on Riceberry Brown Rice

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Riceberry brown rice is known for its valuable nutrients with texture similar to white rice. Recently our group has used plasma treatment on riceberry brown rice to effectively shorten their cooking time and soften their texture. During plasma treatment, rices were also subject to elevated temperature. This sometime has lead to confusion whether the thermal effect dominate. In this study we have carried on these issues by using Fourier Transform Infrared spectroscopy (FTIR) to follow changes in vibrational characteristics of riceberry brown rice the plasma treatment. The treatments were performed using inductively coupling plasma and low-pressure argon with 13.56-MHz RF-generator at 100 W for about one second. This is done in comparison to conventional thermal treatment at 45^o, 60^o, and 75^oC for 120 minutes. Stark contrast changes have been observed from FTIR spectra. Firstly, in the region of 2500 –3000 cm^{-1} the O-H stretching group was found to increase in the plasma treated samples; while decreasing in all the other thermal treated samples. The decrement has varied monotonically with temperature. Secondly, there is also significant increasing of C-O-C skeletal mode of a-glycosidic linkage and C-O-H bonding and C-O-C asymmetric stretching glycosidic bonds in the plasma treated samples; while the decrement were observed in the thermal treatment. This is understood as a consequence of cross-linking effect; leading to increasing in glycosidic bonds along with H_2O abstraction during plasma treatment. It can be concluded that plasma treatment has caused more inclusive effects which never be achieved by the lone thermal treatment.

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