

20th Global Summit on

Food Processing, Safety & Technology

November 06-08, 2017 | Las Vegas, USA

X-ray photoelectron spectroscopic study on the chemical composition of rice kernel and flour

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The objectives of the present study were to evaluate the ability of X-ray Photoelectron Spectroscopy (XPS) to differentiate rice macromolecules and to estimate the surface composition of rice kernels and flours. The uncooked kernels and flours surface composition of the two contrasting (glutinous and non-glutinous) rice varieties, Thadokkham-11 (TDK11) and Doongara (DG) demonstrated an over-expression of lipids and proteins and an under-expression of starch compared to the bulk composition. The results of the study revealed that the XPS was able to differentiate rice polysaccharides (mainly starch), proteins and lipids in uncooked rice kernels and flours. Nevertheless, it was unable to distinguish components in cooked rice samples possibly due to complex interactions between gelatinized starch, denatured proteins and lipids. High resolution imaging methods (Scanning Electron Microscopy and Confocal Laser Scanning Microscopy) were employed to obtain complementary information about the properties and location of starch, proteins and lipids in rice kernels and flours. These results had significance in relation the chemical stability and functionality of rice grain. This technique can be used for the quality evaluation of aged rice samples and process related changes on the kernel surfaces which can potentially lead to a reduction in the functional quality of rice.

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