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“Development on the margin”

Influence of Milled Rice Packing Methods on Radio Frequency Heat Distribution in Controlling *Aspergillus flavus* and their Cooking Qualities

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Abstract

This study aimed to determine the uniformity of heat distributed in different milled rice packages after various radio frequency heat treatments. The responses from the samples in controlling a contamination of *Aspergillus flavus* by heat distribution from an electromagnetic field were investigated. Milled rice var. KDML 105 with 14 percent initial moisture content was used. Samples were inoculated with *A. flavus* at a concentration of 10^6 spores per ml and incubated for 7 days. Three different loading densities were packed and evaluated: (1) vacuum full loaded, (2) non vacuum full loaded and (3) 85% loose loaded. The samples were exposed to radio frequency (RF) heat treatments at an operating frequency of 27.12 MHz with temperatures of 80, 85 and 90°C for 1, and 3 minutes. The heat distribution was taken by infrared cameras, kernel moisture content, degree of remained *A. flavus* infection, amount of aflatoxin, amylose content and cooking qualities were determined. It was found that packing methods affected the distribution of heat significantly. The packing type 1 showed to be the most effective in heat distribution which resulted to a significantly decreasing *A. flavus* infection. The RF treatment at 90°C for 3 minutes duration was the best treatment, the fungus remained was 0.64 %, aflatoxin decreased significantly from 6.68 to 2.8 ppb. The moisture content of all samples decreased with no significant differences. The cooking qualities changed: the gel consistency decreased, the percentage of amylose increased, and the elongation ratio of the rice kernel increased also. Including the changes in their viscosities: the rice's final viscosity, setback value and pasting temperature value increased, in contrast its peak viscosity and breakdown value decreased. The texture of cooked rice increased in hardness and cohesiveness but decreased in adhesiveness. Thus, vacuum packing with RF heat treatment can control *A. flavus* and aflatoxin formation effectively with positive changes in their cooking qualities.

Keywords: *Aspergillus flavus*, cooking qualities, milled rice, packaging, radio frequency