Effects of Fumigation with Phosphine Generated from Aluminum Phosphide on Quality of Brown Rice and Palatability of Cooked Rice

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Abstract: Phosphine (PH₃) generated from aluminum phosphide (ALP) is the primary fumigant used to protect the majority of world's grain and a variety of other stored commodities against insect pests. Many studies have reported the results of PH₃ residue analysis in stored grain after fumigation; however, few studies have investigated on the effects PH₃ to quality and palatability in rice. The objective of this study was to evaluate the effects of PH₃ fumigation on quality of brown rice and palatability of cooked rice. Brown rice harvested from two different regions in Japan, 2011, packaged in kraft paper sacks containing 25 kg, were inserted in 0.2 m³ gas-tight exposure chamber and fumigated using 0.6 g ALP pellet each, which were based on the applied dosage (1.0 g/m³ of PH₃). Fumigations were carried out for five days at mean of 22 degrees and 54% air relative humidity. Following one hour of post-fumigation aeration, each brown rice was subjected to residue analysis test by Japan Grain Inspection Association. Within 72 hours post-fumigation aeration, no detectable residue of PH₃ or less than 0.01 ppm was found in each brown rice analyzed which is the limit of quantification, and was investigated in the following tests. 1) Six physicochemical parameters including germination, water content, protein, amylase, hardness and stickiness was evaluated for PH₃ exposed brown rice; 2) The sensory evaluation of cooked rice which was conducted was evaluated using panels of 20 professional members to determine the acceptability. Five parameters including appearance, smell, taste, stickiness, and hardness was evaluated. No significant effects of PH₃ fumigation on the quality of brown rice and palatability of cooked rice was observed throughout the study.

Key words: Phosphine (PH₃), aluminum phosphide (ALP), fumigation, quality of brown rice, palatability, cooked rice.