

STUDYING RADIO FREQUENCY DISINFESTATION OF RICE

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ABSTRACT

Rice is the most important grain in the world, especially in Asia; however, insect infestation always causes a series of problems. Adults and eggs of rice pest suffered 100% mortality when final rice temperature was above 60°C. The thermal process was developed to control the most common pest by a 40.68 MHz, 5 kW radio frequency (RF) system to replace chemical fumigation in this study. The energy outputs of RF during operating gaps between 3.5 and 7 cm were between 1.6 kW/kg and 0.6 kW/kg. After 40 sec RF treatment at gap of 3.5 cm, the final temperature of rice was above 60°C, and obtained 100% pest mortality. RF heating time did not significantly influenced moisture content of rice. Finally, the sensory qualities of cooked rice were no significantly affected among RF treatments.

INTRODUCTION

Although rice can be controlled pest infestation by a chemical fumigation, it will cause environmental and health problems, and the rice will not be accepted to be an organic rice. Several non-chemical alternative methods have been suggested to control insect pests in agricultural commodities, including ionizing radiation, cold storage, controlled atmospheres, microwave or radio frequency heating and combination. Microwave heating of rice can kill pests and eggs existing inside or outside rice kernels. Adults and eggs of rice weevils (*Sitophilus oryzae* L.) suffered 100% mortality when final rice temperature was above 55°C at 0.017 kW h/kg of microwave energy consumption. Microwave infestation treatment can be short time heating to obtain better qualities of rice. The objective was to investigate the effect of RF treatments on temperature profiles, pest mortalities of rice during storage and the qualities of cooked rice.

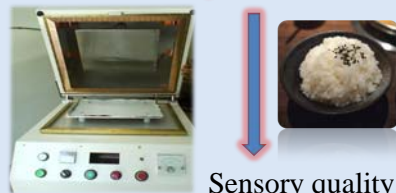
MATERIALS AND METHODS

RF operating conditions
(Gap, time, temperature)

Storage



Mortality test



Sensory quality

RESULTS AND DISCUSSION

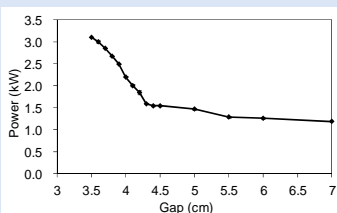


Fig. 1. The power output at different gaps of the electrode plate for loading a 2 kg rice.

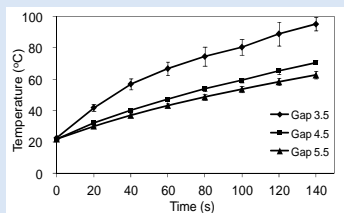


Fig. 2. The temperature profiles at different electrode gaps in the RF heating system loading 2 kg rice.

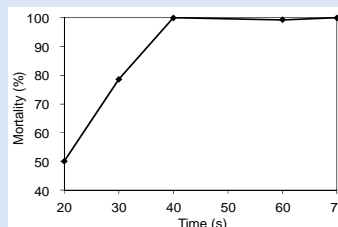


Fig. 3. The mortality of *Sitophilus oryzae* adults in 2 kg packed rice after RF with 3.5 cm electrode gap heating.

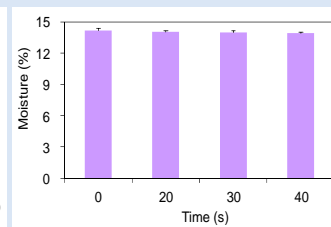


Fig. 4. Effect of RF heating on moisture content of rice.

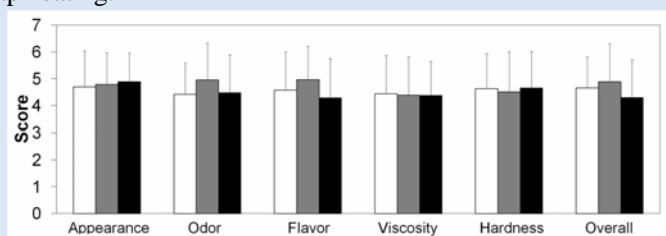


Fig. 5. The sensory quality of cooked rice by RF treatment and 60 day storage. (White: untreated, gray: RF 20 s, black: RF 40 s, n = 60)

CONCLUSIONS

The temperature of rice was above 60°C after 40 sec RF heating at gap of 3.5 cm, and obtained 100% pest mortality. RF disinfection did not significantly influenced moisture content of rice and sensory qualities of cooked rice after 60 day storage. Therefore, the RF could be better applied in pest disinfection of rice with a larger plastic package before storage or production from rice milling company.

ACKNOWLEDGMENT

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