Radio Frequency Processing of Peanut: Effect of Structure and Particle Size

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Low water activity foods (water activity, aw< 0.85) are regarded to be microbiologically safe, but recent Salmonella outbreaks in these products (eg. peanut butter, tahini) have raised food safety concerns. For the case of peanut butter, decontamination procedures are suggested, but processing the raw material might be a more effective approach.

Radiofrequency (RF) heating is promising thermal processing to reduce safety risks. Therefore, a 10kW, 27.12 MHz staggered through electrode RF system was used to thermal process the peanut samples of different sizes. A water-cooled mill was used to reduce the sample size of the peanut, and 8 different particle sizes (3.55 to 0.28 mm) were obtained by sieving. The oil and moisture content of the peanut samples were 56 and 1.48%, respectively with the aw of 0.28 at room temperature. RF process was applied at different electrode gaps and power levels to determine the optimal process conditions. The target temperature for the samples was to reach over 70 - 80 °C for salted, unsalted, shelled, and unshelled peanut samples. The samples were placed in polypropylene boxes (95×150×75 mm). It took 40 to 50 min at 3500 V for the whole salted-shelled peanuts to reach a surface temperature of 75 °C and for the unsalted-shelled samples to 83 °C. On the other hand, decreasing the particle size increased the heating rate. Within the given process time, samples with a particle size of less than 2 mm reached over 88 °C.

The results demonstrate that the shelled and salted samples reached the target temperature faster than the unshelled and unsalted samples, and particle size was significantly effective. Additional physical mechanisms (eg. turning the product upside down through the process) were noted to improve the temperature uniformity.

The potential of RF heating for thermal processing of peanut as a low moisture food was confirmed, and RF was demonstrated to be potential thermal processing. Additional studies for quality changes and microbial decontamination rates are required to suggest this process for industrial settings.

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