

## ABSTRACT

The banana plant (*Musa spp.*), commonly known as plantain, is a valuable perennial herb distinguished by a pseudostem that resembles a trunk, composed of tightly wrapped leaf sheaths. Various parts of the banana plant hold medicinal value, making it an important and economical food source in India. Globally, banana production is estimated at 48.9 million tonnes, with India contributing approximately 10.4 million tonnes. However, the cultivation of bananas generates substantial waste around 4 tonnes of waste per tonne of bananas harvested, with the pseudostem accounting for about 75% of this by-product. One significant issue in pseudostem processing is the susceptibility to browning. This study aims to compare the effectiveness of retort pouch packaging and PL technology in preserving BPS juice.

The BPS juice was subjected to retort processing at temperatures ranging from 70 to 90°C for durations of 15 to 25 min, while PL processing was performed with 100 to 200 pulses, at sample depths of 5 to 15 mm, and a source distance of 4 to 10 cm. The process variables for retort and PL processing were optimized using Central Composite Design (CCD) and Box-Behnken Design (BBD) through response surface methodology, respectively. Optimal results were achieved at 75°C for 17 min for retort processing, and for PL processing, with 200 pulses, a sample depth of 11 mm, and a sample-source distance of 10 cm. Sensory quality evaluations showed that samples treated with PL maintained superior sensory characteristics compared to those treated with retort pouch processing. Rheological analysis of fresh, retort-processed, and PL-processed BPS juice indicated non-Newtonian, shear-thickening behaviour. Shelf-life studies of samples processed under these optimal conditions showed that PL-treated samples could retain their physicochemical properties and safe microbial levels for up to 70 days under refrigerated storage.