# ABSTRACT

Mango pulp, obtained by crushing and homogenizing the edible portion of mango fruits, serves as a primary ingredient in the production of juices, nectar, jam, ice cream, flavored yogurt, and so on. Mango pulp is currently preserved using thermal processing, targeting microbial safety and inactivation of spoilage-causing enzymes. However, application of high temperature causes the loss of heat-sensitive bioactive constituents and deterioration of sensory attributes. These issues have instigated the researchers to explore alternate processing technologies, such as high pressure processing (HPP), which preserve fresh-like attributes in addition to ensuring food safety. Hence, the present research focuses on the application of HPP for preserving the quality attributes of mango pulp while ensuring its microbial safety and extended shelf-life.

The study investigating the effects of pH (3.5, 4.0 and 4.5) and TSS (15, 20 and 25 °Brix) on high pressure inactivation of endogenous mango enzymes pectin methylesterase (PME), polyphenol oxidase (PPO) and peroxidase (POD), within the domain of 332 to 668 MPa/40 to 80 °C/1.2 to 24.8 min, revealed that pH 4.0 and TSS of 20 °Brix were suitable for better enzyme inactivation. At pH 4 and TSS of 20 °Brix, the effect of HPP was studied on enzymes, natural microflora (aerobic mesophiles, yeast and mold, psychrotrophs, lactic acid bacteria and coliforms), inoculated spoilage and pathogenic microorganisms (*Saccharomyces cerevisiae*, *Staphylococcus aureus*, *Salmonella enterica* and *Listeria innocua*), physicochemical attributes of mango pulp viz., color ($L^*$, $a^*$, $b^*$ values, total color difference (TCD), browning index), bioactive components (ascorbic acid, total phenolics, total flavonoids and *in-vitro* antioxidant capacity), and sensory attributes (color, appearance, texture/body, aroma, flavor, mouthfeel and aftertaste) within the domain of 300 to 668 MPa/30 to 70 °C/1 s to 90 min. During HPP, up to 70% inactivation of enzymes, > 5 $\log_{10}$ reduction of natural microflora, > 8 $\log_{10}$ reduction of spoilage and pathogenic microorganisms were achieved. The findings also suggested that physicochemical attributes and sensory quality were moderately affected (TCD < 4 and loss of the bioactives < 10%) during HPP with process temperatures below 60 °C. The developed inactivation kinetics for the studied enzymes, natural microflora, spoilage and pathogenic microorganisms showed that enzymes were more resistant than microorganisms to HPP, and due to the highest baroresistance, PME was selected as the process index.

Response surface methodology was applied to optimize the HPP condition for high quality mango pulp targeting the minimization of TCD (relative to fresh), maximization of flavonoid content, PME inactivation and > 5 $\log_{10}$ reduction of microbial population. The optimized HPP condition was 600 MPa/52 °C/10 min that resulted in TCD of 3.5, an increase in flavonoids by 18%, PME inactivation ~45% and microbiologically safe product (> 5 $\log_{10}$ reduction). The quality of optimized HPP product was fresh-like and superior to conventional thermal treatment (0.1 MPa/95 °C/15 min), based on lesser changes in color, higher retention of bioactive components, and better sensory acceptance. Further, the storage stability of the optimized HPP product was investigated under refrigerated (5 °C) and accelerated (37 °C) conditions in three different packaging films. Low-temperature storage in aluminium-based retort pouch emerged as the best for stabilizing the quality changes in all the investigated samples. Further, microbial growth and browning were identified as the critical shelf-life limiting parameters during refrigerated and accelerated storage, respectively. Based on the critical quality limits, the maximum shelf-life achieved for the optimized HPP mango pulp was 120 and 58 days during refrigerated and accelerated storage, respectively.



**Keywords:** Fruit; Novel food processing technology; Enzyme inactivation kinetics; Microorganisms; Color; Bioactive components; Sensory quality; Response surface methodology; Refrigerated storage; Accelerated storage.