

ADVANCED TECHNOLOGIES FOR PROCESSING OF MEAT

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INTRODUCTION:

Changing consumer demands and increasing global competition are causing the meat product manufacturing sector to embrace new processing technologies and new ingredient systems, This is likely because the long standing positive consumer perception that meat and meat products are very good sources of minerals, vitamins, and contain complete protein

In recent years consumers become more health conscious in their food choices as a result in market demand for minimally processed or lightly processed meat has increased ,These emerging technologies have shown potential to overcome several challenges faced by meat industry such as

- Improving the process efficiency
- New product development
- Extension of shelf life and improving safety profile of meat
- Decontamination of meat

Some novel techniques such as

- High-pressure processing, shockwave technology,

- Pulse electric field,
- Super chilling
- Cold plasma technologies,
- Ultrasound processing,

These techniques have shown promising results in laboratory scale as well as pilot scale without affecting the quality attributes of the product. However, the most common drawbacks associated with these techniques include the high cost of installation and processing. Nevertheless, research is mainly focused on making these techniques user-friendly and cost-effective.

HPP TECHNOLOGY

It is one of processing technology which fulfill both consumer and scientific requirements provide food which is safe, nutritious, free from additives. HPP is well known technology to inactivate pathogens and spoilage microorganism in meat products with commercial pressure levels of 400 to 600 mpa and duration of 3 t 7 mins at ambient temperature. Macfarlane from Australia was the first person, who pioneered the use of

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pressure on meats in the year's 1970 s. After that many studies, on use of HPP for meat and meat products has evolved. Studies have revealed that high levels of pressure (> 100 MPa) are responsible for microbial inactivation whereas lower or moderate pressure levels (10–50 MPa) are used for reducing the growth and reproduction rates of microorganisms. The main principle is application of high pressure lead to denaturation of microbial proteins which ultimately causes inactivation of enzymes and stops microbial activities, Moreover; high pressure ceases the metabolic activities of microbial cells by disturbing the enzyme systems.

EFFECT OF HPP ON TEXTURE OF MEAT

The effect of Hpp on texture of meat has been investigated since 1973. The HPP treatment (100 to 200 mpa) for few minutes can improve meat tenderness when applied to pre rigor meat. In post rigor a pressure of 150 to 200 mpa cause tenderization of meat with an exposure time of 10 to 20 mins apart from that it also causes activation of enzymatic systems Calpine's and cathepsins which leads to some protein modifications and promote water retention.

ADVANTAGES OF HPP

- High pressure is not dependent on shape and size of food

- HPP retains food quality maintain natural freshness better taste, appearance and nutrition
- High pressure processing is isostatic ,so the food is processed evenly
- It is environment friendly, since it require only electric energy and there are no waste products

LIMITATIONS

- HPP influences the color of the meat especially red meat
- Moreover capital investment
- Although HPP is reality in the food industry there are still many consumers who are not aware of this technology
- Surveys need to be done for commercialization also studies need to be made to rectify the problems with

HPP

PULSED ELECTRIC FIELD (PEF) TECHNOLOGY

High intensity PEF treatment is a non thermal technology which has the ability to inactivate microorganism ,decrease the activity of enzymes and extend the shelf life of meat without significantly affecting the sensorial and nutritional attributes, Provide high-quality foods to the consumers. It is very Superior to thermal processing and preservation methods as it reduces detrimental changes in food quality and nutrition and keeps sensorial and physicall attributes of food. PEF technology

involves the use of pulses having higher electric fields for only a few micro to milliseconds with intensity in the range of 10-80kV/cm.

PLASMA TECHNOLOGY IN MEAT PRESERVATION

Among various non thermal processing techniques, plasma technology has also been extensively reviewed to extend shelf life of meat and meat products .Plasma is generated when inert gases gets in contact with electricity.Non thermal plasma is composed of reactive photons comprising ions or free electrons which have significant bactericidal effect .Plasma contains charged species, which when applied to the bacterial cell, cause Protein denaturation, enzyme inhibition, oxidation of amino acids, breakage of bonds on the cell membrane due to bombardment of radicals, DNA damage and reduction of cell membrane resulting in loss of functionality and cell death.Studies shown that plasma technologies can improve microbial safety profile of meat and also act as decontaminant However high power and treatment times for reduction of microbial load causes undesirable changes like lipid oxidation ,undesirable color.Further studies are required for application of CPT in meat product

SUPERCHILLING

Superchilling, has been defined as a process by which the temperature of a food

product is reduced to 1–2 °C or below.The terms ‘super chilling’ and 'partial freezing’ are used to describe a process where a minor part of the product's water content is frozen.At superchilling temperatures, most microbial activity is inhibited or terminated.Super chilling, as a commercial practice, can reduce the use of freezing/thawing for production buffers and thereby reduce labour, energy costs and product weight losses. The main reason for implementing this technology is its ability to extend the shelf life of meat for at least 1.4–4 times the life of traditional meat-chilling methods

SHOCK WAVE TECHNOLOGY OR HDP

'Shockwave' is an exciting an noninvasive, mechanical processing technology which can improve meat tenderness by application of high pressure waves up to 1 GPa in fractions of milliseconds .In mid-2017, CSIRO's food innovation centre acquired Australia's first shockwave equipment for use in food processing and the first commercial-scale unit outside Germany.The shockwave propagates through the surrounding medium with high-energy momentum at speeds greater than the speed of sound. It travels rapidly through the fluids (water) and any objects that are an acoustical match with water Since meat is composed of 75% water, the pressure wave crosses the meat and at points where acoustic impedances

differ, an energy momentum transfer occurs, which in turn creates mechanical stress that tears the muscle structure. This produces a “rupture effect,” and, as a result, the meat is instantaneously softened and maturation of the meat has also been observed

ULTRA SOUND TECHNOLOGY

Ultrasonic waves are sound waves having frequencies above the threshold of hearing for humans

Ultrasound is an innovative and versatile technology that has wide range of applications in meat industry

- Meat carcass evaluation
- Surface decontamination
- Tenderization of meat
- Bactericidal effect
- Brining of meat

CONCLUSION

Various emerging technologies discussed are potential to replace at least partly the traditional embraced methods for meat processing and preservation as the industry seeks to become more environmentally and economically sustainable. Apart from decontamination, novel technologies can also play an important role in various operations including drying, cooking, freezing and packaging with an aim improve the process efficiency, quality and nutritional profile of meat products.

