

## A Review on Effects of Modified Atmosphere Packaging on Quality and Safety of Fresh Meat and Meat Products

Pavan Rao<sup>1</sup>

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### Abstract:

*Nutrition, durability of food products and quality is the first priority for the costumers. The main motive behind this study is basically to review published literature on modified atmosphere packaging of food products available. In this review, fresh meat is considered as a food products. To identify the freshness at the time of purchasing and especially colouration of meat is checked. Analysing the gas mixtures that maintains the colour of the fresh meat, its stability, and shelf life by minimizing the growth of microorganism, lipid oxidation is emphasized. Food processing industries have developed modern technologies of using modified or altered atmosphere for food packaging to fill these loopholes*

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### Authors:

1. School of Professional Studies, Periyar University, Salem, Tamil Nadu, INDIA

## Introduction

The life style of human has changed from previous eras more than expectations. As the demands of consumers is increasing, food industries have evolved up to date technologies for packaging to meet consumer's expectations. The individual expectations of nutritive and sensory food quality are the crucial for the acceptance of the product development which are the main concepts of quality of food. Nowadays people are bound to eat food away from home due to long working hours and other reasons, for which the need food items that need few ingredients for cooking, quality, fresh taste and of long shelf life. It also include the deterioration from chemical and bacterial infection.

## Meat quality and its safety

Food quality is accompanied with safety, durability and nutrition. Because of the changing eating habits, changing of food products, adulteration, increased population and pollution, food safety is greatly required. People prefer ready to eat food products to raw food material therefore to fulfil the required standards and requirements for food products, food systems and guidelines should be followed. Vacuum packaging and modified atmosphere is a popular preservation techniques for improving the shelf life of meat and other foodstuffs. Air is completely removed in vacuum packaging whereas in the packing of modified atmosphere packaging, it provides altered gas conditions. A specific atmospheric condition of gas is actively maintained throughout the storage period, however, controlled atmosphere packaging is also a modified atmosphere packaging. Retention time of meat color is much more in modified atmosphere packaging as compared to vacuum packaging but microbial content in both the ways do not differ much

An important area of advancement of modified atmosphere packaging is active packaging that enhance the safety of meat products and other foodstuffs which are vital for human nutrition. Many factors such as color change, lipid and protein oxidation and contamination by microorganisms affects the quality of stored fresh meat but for their protection different standards can be applied.

## Packaging gases as food additives

Compulsory indication of certain foodstuffs is necessary to provide for ensuring the receiving of adequate information of consumers. The packaging

gases used for the packaging of several foodstuffs should not be mentioned in the list of ingredients present in the packet label, as gas is used in its preparation, it is used only for packaging considered as an ingredients. Consumers must know the reason certain product is durable due to the gas which is used for its packaging. Modified atmosphere packaging is a technology to reduce oxygen concentration surrounding the food products. This method is used to extend the shelf life or durability of food, including fresh meat. To increase the efficiency of modified atmosphere packaging it should be used with refrigeration as it lowers the temperature and hence slowed down the bacterial growth and other kinds of food products spoilage. The commonly applied substances on the fresh meat and meat products are oxygen, carbon dioxide, nitrogen and carbon monoxide.

- **Oxygen**

Aerobic organism metabolically use oxygen gases which the major factor for the determination of shelf life. The major function of the oxygen gas in meat is to maintain myoglobin into oxymyoglobin (oxygenated form). The bright red color of the red meat is brought about by the oxygen gas but it is also responsible for decreasing shelf life of meat in some oxygen sensitive products. For ensuring the color stability, more consistent, juicy and tender product, injection enhancement of fresh meat is adopted by the meat industry. There are many problems in storage in high oxygenic atmosphere i.e. loss in softness of the meat and content of free protein when compared with packaging without oxygen which results in the oxidation of meat products while keeping in high oxygen atmosphere.

- **Carbon Dioxide**

Carbon dioxide inhibit the bacterial growth by increasing the lag phase and generation time of organisms through which the shelf life of foods products gets longer. Modified atmosphere packaging overcome many disadvantages of the vacuum packaging techniques and become more common to apply on different meat products. Microbial growth phase is the factor on which the efficacy of the carbon dioxide depends. The formation of metmyoglobin causing the certain degree of darkening is the major disadvantage of high carbon dioxide concentration in meat modified atmosphere packaging especially in case of lower oxygen concentration.

- **Nitrogen**

Nitrogen has slightly soluble in both water and fat. It is an inert gas. It displaces the oxygen and increase the durability of food items by retarding the growth of aerobic bacteria indirectly is the main function in modified atmosphere packaging. It does not alter the color of meat because it has not antibacterial properties.

- **Carbon Monoxide**

The other component of the modified atmosphere packaging is the carbon monoxide which is the 0.4 percent of the total component. Fresh cuts of muscles meat and ground meat is packed through this packaging system which maintain the wholesomeness, provides facility in distribution and reduces shrinking of the meat. Carboxymyoglobin is formed simply by showing the strong affinity of deoxymyoglobin for carbon monoxide (CO) to produce a stable red color to the muscle and this is explained by the most meat researchers so the meat color can be preserved by the carbon monoxide.

#### **Review of Literature**

**Fonseca, Oliveira and Brecht (2002)** discussed certain widely used methods for the calculation of rates of respiration along with their benefits and limitations in this technique. Respiration rate is influenced by the variables of the fresh cut products such as preparation method, cutting size and duration after cutting the food product.

**Ozogul, Polat and Ozogul, (2003)** told that air stored sardine has the highest concentration of tetramethyamine then sardine stored in vacuum

packaging and negligible in modified atmosphere packaging.

**Diana, et al., (2007)** for the sanitization of fruits and vegetables in the fresh cut industry, chlorine solution is used. They suggested the need to find substitutes of fresh cut fruits and vegetables for improving the ability of washing treatments. The association of chlorine with carcinogenic chlorinated compounds in water has put up a question on the use of chlorine in processing of food.

**Caleb, Opara and Witthuhn, (2011)** worked on review of modified atmosphere packaging of pomegranate fruit and arils, and highlighted slowing down of respiration rate and extended shelf life of fresh produce is possible due to the modified atmosphere packaging.

**Mangaraj, Goswami and Mahajan, (2015)** reviewed on use of plastic films for modified atmosphere packaging of fruits and vegetables. Modified atmosphere packaging of fresh produce is depend on the modification of atmosphere within the package.

#### **Conclusion**

Today, the consumers gives more priority to nutritive and quality, appearance of meat products. Modified atmosphere packaging us widely being used commercially for controlling the biological contaminants in order to make healthy meat and meat products and to increase their durability and maintain their colour and natural properties. Maintenance of fresh meat odour, slowing down of oxidative reactions and extending meat shelf life by retarding the bacterial growth is the other challenge or researchers and meat producers in future.



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