

Application of New Red Meat Processing Technology

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Abstract. Red meat is the main meat in most of the world. In recent years, many people have studied the nutritional value and potential risks of red meat. The shortcomings exposed by red meat make people realize that it is urgent to improve the traditional processing technology of red meat. In this paper, a new type of cutting technology, fermentation technology, red meat pickling process, restructuring meat and red meat product processing technology was studied, comparing with the traditional processing technology, analyses the advantages and disadvantages, and analyzes the influence of different process for the red meat processing industry, as well as the process put into use in real life problems. This paper studies the red meat processing technology that may be applied to actual production and life in the future. It is believed that in the future, with the update of technology, some problems existing in red meat can be well solved, and people can eat healthy, nutritious and delicious red meat processing products.

Keywords: Red Meat, Food Industry, Meat Processing.

1. Introduction

Red meat refers to a type of meat that comes from mammals, which appears red and dark color when it is raw, because it contains more myoglobin than other types of meat. There is some common red meat in our lives such as beef, pork, lamb, veal, goat, bison, venison and other game. Red meat is consumed all over the world, especially in the West country, where it is an extremely important part of people's diet. Red meat is rich in nutrients, including iron, protein, zinc, niacin, vitamin B12, thiamine, riboflavin and phosphorus [1]. However, many studies have shown that red meat is not as healthy as white meat, and there are even some potential risks when eating red meat, which shows a link between red meat consumption and cancer [1]. However, many countries in the world still eat red meat as their main meat, and red meat and its products are also important economic sources in many regions. It is impractical to discourage people from eating red meat, so we should start by improving the processing of red meat products. On the one hand, the research of red meat processing technology can expand the economic benefits of red meat and animal products processing. On the other hand, it can improve the existing problems of red meat products to a certain extent, after that people can eat red meat more healthily.

At present, there are a lot of red meat products processed in the world. There are many common red meat processing methods, the first is cooking processing, its product quality is greatly affected by raw materials and processing conditions. What's more there is no specific processing standards, the final product is difficult to achieve standardization. Second, it is the salted or dried red meat products processing, the production process of this kind of product with a relatively systematic and the products have long shelf life, but to control the process is difficult for some factors, such as the content of nitrite [2]. At the same time, in the process of production, products are also susceptible to microorganism or some other factors, lead to products from deterioration [3]. Third, it is use the red meat for some western-style meat products processing, such as ham, bacon, sausage, etc., this kind of product already has a relatively complete processing technology, also has the corresponding standard to each product of the processing. However, this kind of products also have some shortages like some parts of the process are difficult to control, and long-term consumption of these products may bring adverse effect to the human health [1]. In addition, there are a large number of processed red meat products, such as some convenience food or some semi-finished products, most of which still have some problems to be solved, such as immature technology, unhealthy nutritional composition of the products, and difficult to control some parts of the process. In short, there are still

many problems to be solved in the existing red meat processing technology. Therefore, the food industry needs some new processing technology to improve the processing of red meat, so that people can enjoy better and healthier red meat processed products.

In this paper, the author will study some of the existing new red meat processing technologies, analyze the advantages and disadvantages of these new technologies, and analyze their potential impact, in order to make a preliminary outlook for the future red meat processing industry.

2. Red meat processing technology

Internationally, red meat processing represents the highest level of meat processing. The scale, technology and equipment of red meat processing industry are ranked first in meat processing. More than 50% of other meat products should be added with different proportions of red meat, such as all kinds of steamed sausage, steamed brine ham and other dozens of types as many as thousands of varieties. In developed countries, the intensive processing and transformation of red meat has reached more than 80% [4]. Technologies such as cold segmentation, biological fermentation, tender and water preservation, automatic filling, continuous cooking, functional packaging, and cold chain storage and transportation have been fully integrated into the industrial technology system, and are also widely used in emerging industrial countries and some developing countries. In the future, the red meat processing industry will pay more attention to the safety and nutrition of products, and the construction of perfect product quality and safety control and traceability system will become the focus. The growth of red meat industry will be mainly concentrated in developing countries in the future. Technology and equipment will realize a rapid transformation from traditional manual and small-scale oriented industrialization and scale, and various emerging processing methods will gradually be used in the processing system of red meat products, then this technology will promote the progress of the whole meat processing technology.

2.1. Cold segmentation

Cold segmentation means that when the raw materials of meat products are segmented, the raw materials are cooled first and then segmented. In the EC approved conditions for meat processing enterprises, the conditions for cold segmentation are clearly specified: the internal temperature of the meat must be maintained at a constant temperature of 7°C or less and the room temperature should not exceed 12°C during cutting, deboning, wrapping and packaging [5].

The cold segmentation has many advantages. First of all, the cold segmentation process is first cooled and then divided, which can make the appearance of the commodity shape well. It is not easy to produce blood ice in the subsequent frozen storage, and the quality of meat is stable [6]. At the same time, the study showed that the color redness value A^* of pork raw materials changed little when the cold segmentation process was used, and the juice loss rate and TVB-N value of pork raw materials were significantly lower than those of hot segmentation, which means cold segmentation has certain advantages in the quality of meat [5]. Although the use of cold segmentation process cannot avoid some problems of red meat itself, but the cold meat has better quality, and can also play a role in improving the overall quality of red meat products.

However, there are also some problems in cold segmentation. Firstly, because the whole process needs to be carried out under low temperature conditions, the overall energy consumption of cold cutting process will be higher, and for the lack of automation in the factory, the working conditions of workers will be more severe, which brings higher labor costs. Secondly, compared with the hot segmentation the production cycle is longer, which also leads to the lower economic benefits of the cold segmentation process. In general, cold segmentation is a process worthy of being widely used in red meat processing, which can improve the overall quality of red meat processing products and meet consumers' increasing pursuit of product nutrition and safety.

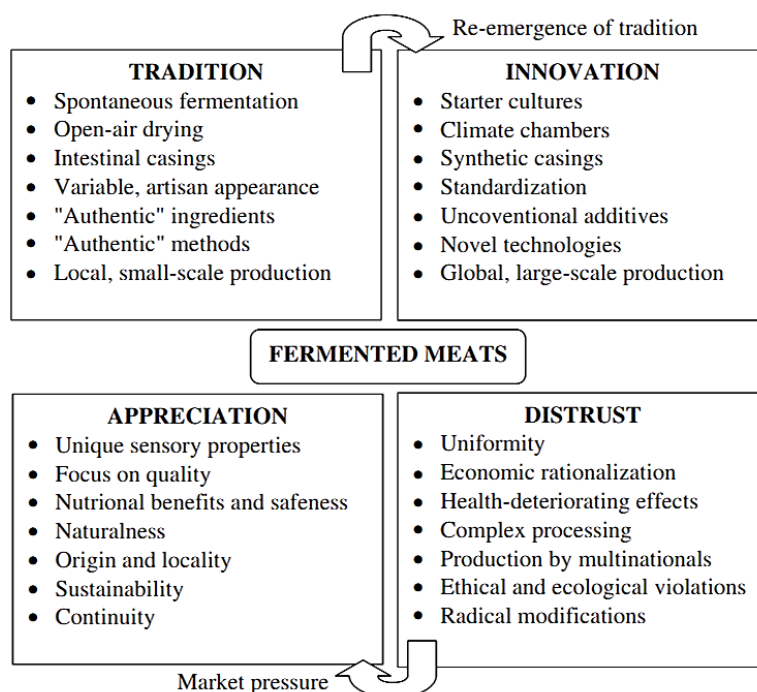


Figure 1. Technical and social positioning of fermented meat [7]

2.2. Biological fermentation

Fermented meat products refer to the use of microbial fermentation under natural and artificial control to produce meat products with special flavor, color and texture, and with a long shelf life, as shown in Figure 1. Fermented meat products are mainly divided into fermented sausage and raw ham. Nowadays, in many countries in the world, fermented meat products still belong to natural fermentation, the quality of products is not stable, and the traditional fermented food also has a lot of disadvantages like high nitrite content, fermentation process is difficult to control and other problems. In order to improve the quality of red meat products through fermentation, targeted inoculation of microorganisms and strict control of the fermentation process are required. Since fermented meat products have a good consumer market and consumption basis in the world, the technology has a good development prospect.

In the process of fermented meat production, microbial fermentation engineering in biological engineering is applied. The three main advantages of fermented meat products are rich nutrition, unique flavor and long shelf life, which are shown as follows:

(1) Avoiding the formation of biogenic amines. Biogenic amines are generated by histidine and tyrosine catalyzed by amino acid decarboxylase of harmful microorganisms, which is quite harmful to human body. When using beneficial starter, decarboxylase activity is very low to avoid the formation of biogenic amines [7].

(2) Inhibiting the reproduction of pathogenic microorganisms and the production of toxins. Biological fermented meat products, due to the generation of lactic acid, reduce the pH of meat raw materials, inhibit the growth and reproduction of harmful microorganisms, and lactic acid bacteria produced antibacterial substances can also inhibit the production of toxins [7].

(3) Anticancer effect. Studies have shown that eating meat products fermented by beneficial microorganisms will make beneficial bacteria colonize the intestine, reduce the content of carcinogenic precursors in the human body, and reduce the harm of carcinogenic pollution [8].

(4) Improving the nutrition of the product and promote the formation of good flavor. In the process of fermentation, the enzymes produced by bacteria decompose proteins, improve the content of free amino acids and the digestibility of proteins, and at the same time form acids, alcohols, heterocyclic compounds, amino acids and nucleotides and other flavor substances, which improve the nutritional value and flavor of products [7].

(5) The fermentation process can also improve the tissue structure of meat products and promote color development, which means it can reduce the use of food color fixative in the production process, and then reduce the residual amount of nitrite, and reduce the formation of harmful substances [9].

However, there are still a lot of problems to be solved in order to realize the directional inoculation of starter culture. Firstly, the screening of fermentation strains still needs a lot of research [8]. At the same time in the process of production and processing, also put forward higher requirements for the sanitary conditions and equipment conditions in the factory. In addition, as technology improves, costs will rise and consumer acceptance is also a big problem.

At present, the research direction for red meat fermented products, mainly studies how to use the function of enzyme instead of starter cultures, control of enzyme reaction more easily than the control of the microbial reactions, at the same time only using enzyme to reduce other produced by fermentation in the production of the occurrence of adverse events, while is easier to control, and improve the nutritional value of the products [9].

In a word, with the development of economy and the increase of people's living standard, people need some class is high, product is unique flavor and health care function of new type of red meat processing products, directional add yeast fermentation of red meat can well meet the requirements of the people, one aspect to overcome the drawbacks of traditional products, such as not easy to control and nitrite content higher shortcomings, It also has new advantages such as richer nutrition, more stable products and certain health care effects. It has good development prospects for the quality improvement of the whole red meat products.

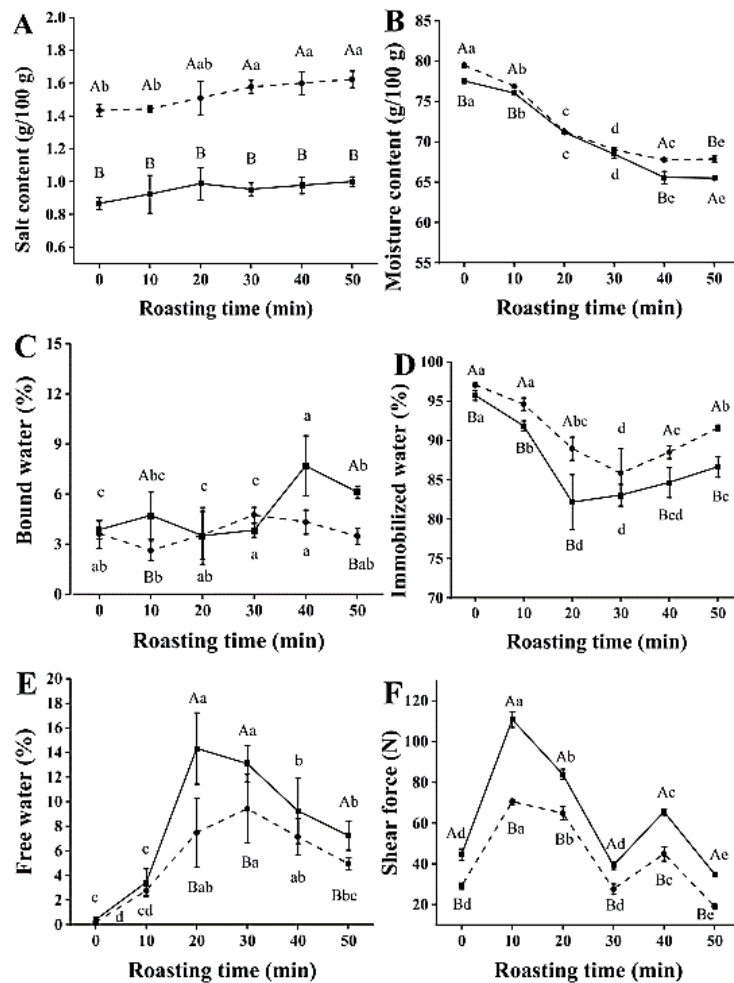


Figure 2. Changes of physicochemical indexes of roast duck breast with baking time [10]

2.3. Curing technology

Curing is an important way to preserve meat and extend its shelf life since ancient times. Red meat as a worldwide important meat, there are traditional preserved products all over the world. While the traditional curing products have many shortcomings, such as long production cycle, cumbersome process, product quality is not guaranteed.

With the development of meat processing technology and people's pursuit of high-quality meat products, some developed countries have completed the transformation from traditional curing technology to modern curing technology. The research and application of modern curing technology and new technology have the advantages of fast curing speed, short production cycle, improving meat quality and safety, which mainly includes electrical technology, ultrasonic technology, rolling technology, pressure change technology and so on.

(1) Static variable pressure curing

Static variable pressure curing refers to a method in which the material is placed in a static curing liquid and preserved under alternating pressure changes of normal pressure, vacuum and pressure. During the meat curing process, the air between the material tissues of the meat is discharged under the vacuum condition, and the curing liquid penetrates. Under the condition of pressure, the pickling liquid is fully dispersed in the intercellular space of the material [10], as shown in Figure 2. Static variable pressure curing will not make meat softening deformation, can better maintain the appearance and structure of raw meat. Studies have shown that compared with atmospheric, vacuum and pressure curing, static variable pressure curing can significantly improve the curing effect and meat quality, and has a broader application prospect [10], as shown in Figure 3.

(2) Vacuum rolling curing

Vacuum kneading is to put the meat in the roller under vacuum condition. Due to the rotation of the roller, it is subjected to a certain form of mechanical force. This force can improve the texture of the cured meat products, improve the tenderness of the cured meat products, and speed up the curing speed [11].

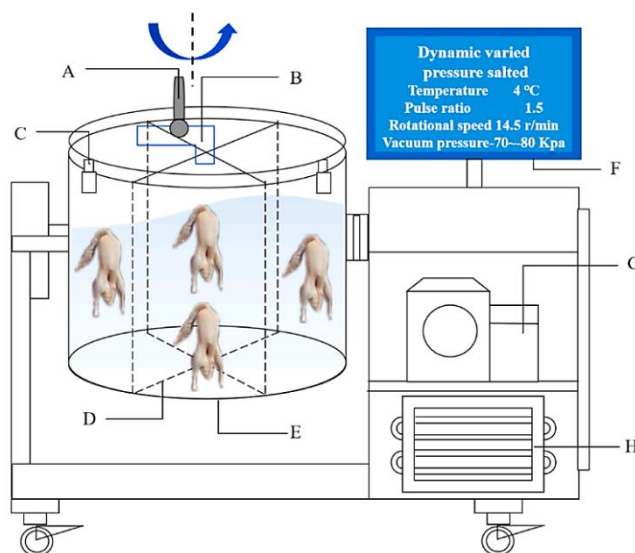


Figure 3. Schematic diagram of dynamic variable pressure curing [10]

At the same time, in a vacuum environment, the air between meat raw materials and exudates can be discharged, so as to avoid the thermal expansion phenomenon in the future thermal processing to destroy the structure of the product, and to avoid the oxidation reaction in the process of long-term continuous production, and to promote the infiltration of curing liquid. Its main advantages are short curing time and high meat quality [11].

(3) Ultra-high pressure curing technology

Ultra-high pressure technology (UHPP) is a non-heat treatment technology, with water or other fluids as the conduction medium, the food is sealed in the high-pressure treatment bin, applying high

static pressure (100~1000MPa), pressure for a period of time, macromolecular substances deactivated, gelatinization and denaturation, to achieve the effect of cold sterilization and protein denaturation [12]. The high pressure technique can shorten the curing time and improve the efficiency of curing meat products. In addition, since UHV technology acts on non-covalent bonds in food and has no destructive effect on covalent bonds, UHV technology can better retain the intrinsic sensory quality and nutritional composition of food, and can also give food new flavor [12].

In short, modern pickling methods are diverse and can adapt to the requirements of different products for meat raw materials. At the same time compared with the traditional curing technology has more obvious advantages. However, its disadvantages should not be ignored. Most modern curing technologies have higher requirements for equipment, and the technical difficulty is significantly higher than that of traditional methods [11]. In addition, consumers' acceptance of various new curing technologies is not high, and it will take some time to popularize them in the market. Modern curing method can obviously improve the yield and quality of red meat processing products, and promote the development of red meat processing industry.

2.4. Recombinant meat products and composite meat products

Meat slices of different sizes (from cuts, minced meat to pellets) can be combined to mimic the appearance and texture of whole meat, or to form new products with unique texture. Such products are called reconstituted meat products. In all these products, the surfaces of adjacent slices of meat are held together by a gel network structure. The gel network structure may be formed from gelatin converted from collagen tissue during cooking, or it may be formed from exogenous gelatin. The processing mechanism of reconstituted meat products is as follows: surface meat protein interaction must form an adhesive for adjacent meat to bond into shape; The meat must be soft and smooth and easy to compress or mold; Proteins need to be heated to solidify, so that adjacent pieces of meat or muscle stick together firmly. And the last principle is closely related to the first because protein must be present on the surface of meat before hot processing, so that heating and subsequent cooling can form a strong bond [13]. Reconstituted meat products can make full use of the raw materials of red meat products, thereby reducing the processing cost of red meat products and promoting the development of the industry.

Compound functional meat products refer to the meat products that have certain health function factors and micronutrient nutrient fortifier are added into traditional meat products through appropriate carriers, and are basically not affected by high temperature, high pressure and pH value in the processing process, and achieve certain health purpose after eating [14]. With the continuous development of modern food science and technology, the majority of consumers also more and more attention to their own health care, the pursuit of high nutrition, pollution-free, no harmful substance residue, packaging easy recycling green food; The pursuit of low fat, high protein, low heat energy, low calories and reasonable sources of nutritious healthy food. In order to meet the needs of market development, many enterprises are developing new foods and improving dietary structure to prevent and treat some diseases, especially while maintaining the basic function of food, research and development of food with obvious physiological regulation function. Compound meat products can adjust the nutritional structure of red meat according to some shortcomings of red meat, and remove some substances that are unfavorable to human health. Finally, on the premise of retaining the advantages of red meat, red meat products become healthier.

Restructuring meat and compound meat products such as new meat can bring economic benefits for enterprises, improve the red meat processing technology, but its research and development are still confined to the laboratory stage, laws and regulations for this kind of products is also not perfect, whether consumers will accept this kind of product also is still a problem, if you want to application have a lot of work to do.

3. Conclusion

Along with the development of society and the progress of science and technology, people demand for edible products will gradually rise, the red meat processing industry should also with The Times progress, development and application of new technology, to improve the shortcomings part of red meat, finally developed the high nutritive value and special flavor, good quality new products, to meet the consumer demand for new meat products. It is believed that the new red meat products with balanced nutrition, good color and flavor will have broad application and development prospects in the world, and its production will bring significant economic and social benefits.

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