Animal oil production and processing

Animal fats, including pigs, cows, sheep fats, etc., have irreplaceable unique flavors compared with general vegetable oils, and are widely used in food processing industries such as fried instant noodles, pastry shortening, quick-frozen foods, daily chemical soaps, soaps. Processing of soap-based raw materials, glycerin extraction, etc. In recent years, it has been found that animal fats and oils (especially lard, sheep oil, etc.) have higher levels of cholesterol, which leads to a gradual decrease in the number of people who eat, but animal fats and oils contain various fatty acids, and some animal fats and oils contain saturated and unsaturated fatty acids. It is of equal content, has high nutritional value, and can provide extremely high calorie, especially suitable for people in cold regions. This paper reviews the extraction and processing techniques of animal fats and oils, in order to provide reference for the research of animal fats and oils.

1 animal oil extraction

Animal fats are mainly derived from adipose tissue isolated from animal slaughter and cutting, but most of the fat tissue is accompanied by protein and water, so oil extraction is required. Common methods for extracting animal fats include: tanning, cooking, solvent, enzymatic, supercritical fluid extraction, and water-soluble methods. The development process of the animal oil extraction process is to continuously improve the extraction rate and extraction purity of the oil, while minimizing the environmental pollution caused by the impurities generated during the processing.

1.1 Tanning method

The general animal fat tanning process is to release the oil from the adipose tissue cells by heating, and some processes have a lower heating temperature, mainly by mechanically destroying the cells to release the oil. The tanning process is divided into dry process and wet process. Dry tanning is carried out without adding water or steam during the process, and can be carried out under normal pressure, vacuum and pressure. In the wet tanning process, adipose tissue It is heated in the presence of moisture, usually at a lower temperature than the dry method, and the resulting product is lighter in color and soft in flavor.

1.2 cooking method

The cooking method is mainly used for the extraction of visceral oil and fat, and has the advantages of low cost, simple operation and no chemical agent added, and the extracted oil is safer. Chen Gongxuan et al [1] used grass carp viscera as test material and determined its optimal extraction process. The results showed that the maximum oil yield was 35.06% when the extraction time was 55 min, the temperature was 45 °C, and the water addition was 60 m L. , where extraction time and temperature are the main influencing factors, and the effect of water addition on oil yield is relatively small. The cooking method is further divided into a water-repellent cooking method and an indirect steam refining method. Bao Dan et al [2] found in the extraction test of gem fish oil that the water-repellent cooking method is nearly 10 percentage points higher than the steaming method, and the process parameters of extracting gem fish visceral oil by the water-steam cooking method are as follows: The cooking temperature is 85 ° C and the cooking time is 40 min. The indirect steam refining method has a larger investment than the water-repellent cooking method. Using these two methods to extract fish oil, the process conditions are relatively easy to control, simple and practical. However, these two cooking methods have the common disadvantage that the fat bound to the protein cannot be

separated, so the extraction rate is relatively low; the temperature extracted by the cooking method is generally around 90 ° C, which is bound to affect the quality of the oil. .

1.3 Solvent method

Organic solvents such as ether and petroleum ether are good solvents for lipids, and fats are incompatible with water. Solvent extraction of animal fats is based on the principle of using water-insoluble fats from organic solvents such as ether or petroleum ether. Extracted from the raw materials. Wang Wenliang et al [3] selected a variety of solvents to extract the Tenebrio molitor oil, and determined that petroleum ether (60 ~ 90 ° C) is the best solvent for extraction. The optimum extraction conditions were initially determined as follows: extraction temperature 60 ° C, extraction time 4 h, solid-liquid ratio 1:5, and the obtained crude product was purified to obtain a light yellow, transparent and slightly insect-rich Tenebrio molitor oil. Tao Xueming [4] screened out anhydrous ethanol as the ideal solvent for crab oil extraction. The optimal extraction conditions were temperature 75 ° C, time 60 min, liquid to material ratio 5:1.

1.4 Enzymatic hydrolysis

Enzymatic hydrolysis is the hydrolysis of proteins by proteases, which destroys the binding of proteins and fats, thereby releasing oil. The enzymatic hydrolysis method for extracting animal fats is mild, the extraction efficiency is high, and the enzymatic hydrolysate produced by protease hydrolysis can be fully utilized, which is a better method for extracting animal fats and oils. At present, enzymatic hydrolysis is mainly used for the extraction of some functional oils (flaxseed oil, grape seed oil, etc.), and fish oil is the most widely used in animal oil extraction. Hong Pengzhi et al [5] used the enzymatic hydrolysis method to extract fish oil from the yellowfin tuna fish head, and obtained the best extraction process parameters by orthogonal test, the enzymatic hydrolysis temperature was 45 °C, the enzyme addition amount was 1.5%, and the feed liquid mass ratio was 1: 1, enzymatic hydrolysis time 4h, enzymatic hydrolysis of p H8.

1.5 Supercritical fluid extraction technology

Supercritical fluid extraction (SFE) is a relatively new technology emerging in modern industrial separation, and it is also an advanced separation process emerging internationally. Supercritical CO2 fluid extraction technology has the advantages of simple process, no organic solvent residue, mild operating conditions and other traditional processes. In the production of oils and fats, supercritical fluid extraction technology avoids the oxidative rancidity of oils caused by distillation heating in the solvent extraction process, and there is no solvent residue. At the same time, the traditional extraction method has low yield, the refining process is cumbersome, and the product color is not Ideal and other shortcomings. Ma et al [6] determined the process parameters of supercritical CO2 extraction of egg butter from egg yolk powder by orthogonal test: extraction pressure 24 MPa, temperature 50 ° C, time 5 h, under which the extraction rate of egg butter reached 80.1%.

1.6 Other extraction techniques

In the process of preparing animal fats and oils, two or more methods are sometimes applied simultaneously to improve extraction efficiency. In recent years, the development of ultrasonic technology has provided new techniques and means for the extraction of animal fats. For example, the combination of ultrasonic technology and organic solvent method can effectively shorten the extraction time and increase the extraction rate. This technology has been fully applied in the extraction of some health-care oils and fats [7,8], and there are few applications in animal oil extraction.

2 Animal oil refining technology research

In the process of animal fat extraction, if properly processed, the obtained fat product can be used without further treatment, but in production practice, the acid value of the obtained product is too high due to a series of reasons such as blood stains during slaughter. There are impurities such as collagen, so these animal fats and oils need to be further refined when they are eaten. Food animal oil refining generally has the steps of degumming, deacidification, decolorization, deodorization and the like.

2.1 Degumming

The purpose of degumming is to remove colloidal impurities in animal fats, mainly proteins, phospholipids and mucinous substances. At present, the main degreasing method is acid degreasing, that is, degumming with sulfuric acid, citric acid and phosphoric acid. The concentration control of acid in the degumming process is the main key point. Hong Pengzhi et al [5] found that with the increase of acid concentration, the recovery rate of fish oil did not change much, but the acid value and peroxide value of fish oil decreased significantly, iodine As the value increases, the color of the fish oil gradually becomes darker.

2.2 Deacidification

Since the acid value of the animal oil after extraction by tanning is too high, it does not meet the hygienic standard of edible animal fats, so further deacidification treatment is required. The deacidification method generally has an esterification deacidification method, a distillation deacidification method, a solvent deacidification method and a neutralization deacidification method, and the most used one is a neutralization deacidification method, which is also called alkali refining. In the neutralization deacidification process, the concentration, amount and alkalization temperature of the lye should be controlled. Hong Pengzhi et al [5] found that when the amount of sodium hydroxide was 2%, the deacidification effect was better when the amount of sodium hydroxide was 2%, and the free fatty acid in the tuna oil was effectively removed, and it was easier to separate.

2.3 Decolorization

Decolorization removes the pigment component of the oil and fat, and is usually decolored by adding neutral or acidic clay, or a small amount of activated carbon may be added for decolorization. Patterson [9] proposed the recommended method for decolorization of lard and butter: the decolorization of lard is recommended to react at 95~100 °C for 15 min, the maximum dosage of natural activated clay is 0.5%, the acid active clay is 0.25%; the high-grade butter is 95. At ~100 °C, add 1% natural activated clay or 0.3% of excellent white clay, react for 20min, and the decolorization effect is good.

2.4 Deodorization

Deodorization is to remove the decomposition products of the dirt and raw material proteins mixed in the process during the process, and to remove the odorous substances such as aldehydes, ketones, lower acids and peroxides produced by the oxidative rancidity of the oil, thereby improving the flavor of the oil. Improve grease spots. Stripping and deodorization is the most commonly used deodorization method. High quality stripping steam is an important condition to ensure the deodorization effect. The deodorization time depends on the composition of volatile components in the oil. Generally, the operating temperature is about 180 °C and the pressure is 0.65~1.3. Under the operating conditions of Kpa, the deodorization time is 5~8h.

3 Development trends

At present, the production scale of domestic animal fat processing plants in China is relatively small, and the equipment is simple. Therefore, the produced animal oils have more moisture

and impurities, high acid value, and are prone to spoilage and deterioration, and it is difficult to guarantee product quality. In the aspect of animal oil extraction technology, the combination of enzymatic hydrolysis and supercritical fluid extraction, enzymatic hydrolysis and ultrasonic technology has certain advantages, and can inhibit the oxidation of some oils during processing, which has a good development prospect. At present, there are relatively many studies on fish oil and insect oils, but there are few studies on livestock and poultry oils. In general, research on animal oil extraction and refining processes has a very broad prospect.