Review: Utilization of Mushrooms, Fish and Chicken as a Source of Natural Flavoring in Foods

Ikhwatul Jannah¹, Meta M²,³*, and Andi Dirpan²,³

¹Master Program of Food Science and Technology Study, Department of Agricultural Technology, Faculty of Agriculture, Hasanuddin University, 90245, Makassar, Indonesia
²Department of Agricultural Technology, Faculty of Agriculture, Hasanuddin University, 90245, Makassar, Indonesia
³Center of Excellence in Science and Technology on Food Product Diversification, Hasanuddin University, 90245, Makassar, Indonesia

Abstract. Flavoring spices play an important role in the culinary world by enhancing the taste, aroma, and color of food. Generally, the flavorings used are synthetic flavorings that are not derived from nature but from chemical processes, while natural flavorings derived from animals and plants are very less used. There are many types of animal and vegetable raw materials such as mushrooms, fish and chicken that can be used as flavorings. Each type of raw material has a different flavor, aroma, texture and nutritional content. The purpose of writing this article is to enrich information about various types of natural seasonings and help consumers choose flavorings that suit their tastes and nutritional needs. Mushroom-based flavorings provide a delicious taste with a distinctive natural aroma, while fish-based ingredients provide a unique touch of flavor and chicken-based ingredients provide a deep savory taste. Mushroom, fish and chicken-based flavorings have amino acid components, especially high glutamic acid, which can provide umami flavor to dishes and be used as a natural flavoring. Processing with various conventional, enzymatic and fumigation extractions has potential as a natural flavoring processing method. The use of mushrooms, fish and chicken can reduce dependence on the use of synthetic flavorings.

1 Introduction

Seasoning is an important element in the cooking process and plays a role in giving a distinctive flavor to the dish. Flavoring spices play a central role in culinary by enhancing the taste, aroma, and color of food [1]. Condiments like cloves, cumin, cardamom, and black pepper are commonly used in Indian kitchens to enhance the aroma and taste of food [2].

Over time, the use of seasonings has evolved and changed in various culinary cultures around the world, creating a wide variety in their uses and types of ingredients. Consumers tend to consider the whole product when making decisions about naturalness, and products that are derived from plants and that have natural colors and flavors are considered healthier.

The current trend of food products or cuisines really needs food additives such as flavoring spices that have the aim of providing a good and savory taste in food [3]. But since

*Corresponding author: meta-mahendradatta@unhas.ac.id

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long ago until now consumers use many synthetic flavorings. Food that does not use flavoring spices will give no satisfaction to food. In the 1800s it was mentioned that food additives have been used to improve the sensory characteristics and quality of food products [4]. The term ‘flavor enhancer’ can include many compounds capable of enhancing characteristics as well as more complex flavors in the final product [5].

The most widely used flavoring spices are synthetic flavorings. Flavorings have 2 types, namely synthetic flavorings and natural flavorings. Synthetic flavorings are not sourced from nature but are obtained through chemical processes [6]. Natural flavorings are obtained from plants and animals directly or through physical, microbiological, or enzymatic processes. Consumers want to reduce synthetic flavorings, so at this time consumer demand for natural products is more important because in terms of nutrition it is better than synthetic flavorings [5]. Awareness of the importance of sustainability and environmental impact has driven the demand for more environmentally friendly natural seasonings, thus encouraging research in the use of appropriate raw materials.

Umami means savory and delicious, known as a basic taste characterized by amino acids, glutamic acid and monosodium glutamate (MSG) which can provide a savory taste sensation [7]. Flavoring powder is a combination of spices and selected raw materials that are processed by processing with the best composition through the drying stage with the aim of extending the shelf life of the product without losing its nutritional value [8].

Recent studies focusing on making natural flavoring seasonings made from various natural raw materials. Various studies have been conducted and published that focus on the use of natural ingredients as a basic component of making natural flavorings. As far as we know, there has been no review that discusses the use of natural ingredients as flavoring. In this review, we will discuss various studies on making flavorings from natural ingredients, as an alternative to synthetic flavorings.

### 2 Natural flavoring

Flavoring is a food additive that serves to improve the taste and sensory in food [9]. Natural flavorings are sourced from animals and plants directly or through physical, microbiological and enzyme processes [10]. The use of natural ingredients that are around with very high protein potential has the opportunity to be used as a flavoring spice [11].

Natural compounds are foods derived from natural flavoring ingredients that are often used, usually spices or spices, while synthetic compounds come from chemical compounds that are processed such as natural flavoring [12]. Seasoning is a mixture of spices that give flavor to food and at certain concentrations can extend the shelf life of food [13].

Umami taste is a key factor in evaluating the quality of mushrooms as well as food products sourced from mushrooms because umami taste influences consumer choice [14], [15]. Raw materials that are used as natural flavoring spices such as mushrooms, fish and chicken mainly contain amino acids, especially glutamic acid and volatile compounds that act as umami flavorers [16]. Various sources of flavoring raw materials, raw materials, nutrients and processing methods can be seen in Table 1.

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Type/ source</th>
<th>Nutrient content</th>
<th>Content amino acid and volatile</th>
<th>Processing methods</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>White mushrooms (Pleurotus ostreatus)</td>
<td></td>
<td>Protein 10.5-44%</td>
<td></td>
<td>Extraction with enzyme bromelin</td>
<td>[15]</td>
</tr>
<tr>
<td>Mushroom</td>
<td>Shiitake mushroom (Lentinus edodes)</td>
<td>Protein content in the hood was 284.35 g/kg and the protein content of the shiitake mushroom stalk was 188.68 g/kg.</td>
<td>Extraction with enzyme bromelin [9]</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>Biang fish (Ilisha elongata)</td>
<td>Protein 72.93%, calcium 1364 mg/kg and phosphorus 258 mg</td>
<td>Extraction conventional [8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smoked roa fish (Hemiramphus brasiliensis)</td>
<td>Protein 23.55% water 79.98%, fat 1.45% and ash 0.01%</td>
<td>Phenol and carbonyl compounds that provide taste and amino acid components are glutamic acid which gives taste and aroma to smoked roa fish -Extraction conventional -fumigation -Roasting [17], [18]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackerel (Rastrelliger sp)</td>
<td>Protein 22 g, fat 1 g, calcium 20 mg, phosphorus 200 mg, zinc 1 g, vitamin A 30 SI and vitamin B1 0.05 mg.</td>
<td>Provides taste characteristics in mackerel namely free amino acids, various peptides, nucleotides such as IMP (disodium 5'-inosine monophosphate), GMP (disodium 5'-guanosine monophosphate), AMP (disodium 5' - adenosine monophosphate)</td>
<td>Extraction conversiona l</td>
<td>[19], [20]</td>
<td></td>
</tr>
<tr>
<td>Gourami (Osphronem us goramy)</td>
<td>Fat 41% and protein 59%</td>
<td>The essential amino acids of gourami are histidine, threonine, methionine, valine, phenylalanine, isoleucine, leucine and lysine. The amount of glutamic acid of gourami is 3.12%.</td>
<td>Extraction conversiona l</td>
<td>[21]</td>
<td></td>
</tr>
<tr>
<td>Chicken Meat</td>
<td>Water content 74.86%, protein 23.20%, fat 1.65%, minerals 0.98%, and calories 114 kka</td>
<td>chicken contains amino acids such as serine, glycine, alanine, histidine, valine, arginine which gives it a sweet and bitter taste</td>
<td>-Filtration - Extraction with Alkali-aided protein</td>
<td>[22], [23]</td>
<td></td>
</tr>
</tbody>
</table>

### 3 Flavoring raw materials from mushrooms

Mushrooms are an integral part of the normal human diet and lately, the amount of their consumption has increased considerably, including a wide array of species [24]. Edible mushrooms are considered a good source of free amino acids, which give a strong umami taste and a pleasant sweetness [15,25]. Mushrooms do not have a long shelf life and only last 2-3 days after being harvested [26] so they need further processing such as flavoring. Aspartic acid and glutamate are MSG-like components found in mushrooms. There are various types of mushrooms that can be used as natural flavoring raw materials and are safe for consumption and have an umami taste, namely shiitake mushrooms, white oyster mushrooms. [27-29].

Mushrooms have a lot of protein, fat, carbohydrates, vitamins, minerals, fiber and contain amino acids, especially glutamic acid which can provide an umami taste so that it can be used as a natural flavoring. Oyster mushroom (Pleurotus ostreatus) has a glutamic acid content of 53.3 g/ 100 g and has a protein content of 10.5-44% [15]. The protein content in mushrooms is higher than rice, even cow's milk [30]. Oyster mushrooms have a taste that is easily accepted because it contains free amino acids. The composition of umami components
detected in mushrooms consists of 5'-nucleotide groups namely inosinic acid (IMP), adenyl monophosphate (AMP), guanylic monophosphate (GMP), xanthosin monophosphate (XMP), and free amino acid groups namely: aspartic acid and glutamate, 5'-Nucleotide components and free amino acids is what causes the acceptance of oyster mushrooms to be the best when compared to other mushrooms [29].

Shiitake mushrooms are one type of mushroom in the 3rd order consumed worldwide [7]. Jamur shiitake is one of the many foods with a strong umami taste, due to the presence of amino acids, glutamic and aspartic acids, as well as 5-ribonucleotides, especially 5'-GMP the main source of flavor-enhancing properties of shiitake mushrooms, as well as 5-IMP, 5'-XMP, and 5-AMP which have a synergistic effect on umami taste, and compared to other types of mushrooms shiitake mushrooms contain the highest 5-thousand nucleotides [7,31]. Shiitake mushrooms have preventive abilities against several diseases such as cancer, diabetes, hypotension, inflammation, nociceptive, hypocholesterolemia [32].

4 Flavored raw materials from fish

Food additives in the form of natural flavoring spices can also be sourced from seafood, one of which is fish [33]. Fish has an important role in fulfilling human nutrition because it contains high protein and has the advantage that the amino acid composition is easy to digest [34], and fish is also a source of fats, fatty acids, vitamins and minerals [10]. Amino acids that are widely found and form the taste of food in fishery products are glutamic acid. Glutamic acid is the dominant amino acid in all parts of fish [35,36]. Fish is a natural source of flavor because it contains glutamic acid [37]. Fish has a natural ability to impart a strong savory or umami flavor to food. There are various types of fish that can be used as raw materials for making flavoring spices such as prickly fish (Ilisha elongata), smoked roa fish (Hemiramphus brasiliensis), mackerel (Rastrelliger sp), and gourami (Osphronemus).

Biang fish needs further processing such as use as a natural flavoring spice. Biang fish meal contains 91.93% amino acids which consist of 45.89% essential amino acids and 46.04% non-essential amino acids [38]. Glutamic acid plays an important role in the formation of umami (savory) taste in the prickly fish flavoring powder that will be added to cooking.

Roa fish is one type of economically important fish because it has a savory taste [39]. Roa fish is processed still using traditional processes by smoking using wood [40]. Smoking is the process of penetration of volatile compounds in fish produced from burning wood that can provide a specific aroma and taste [41]. Chemical compounds from wood smoke in the form of phenols as antioxidants, organic acids, hydrocarbons, carbonyls, alcohol, nitrates and there are several compounds that are attached to the surface and penetrate into fish meat namely aldehydes, ketones, esters and ethers [41,42]. Of all the compounds produced from the smoking process, it will affect the taste characteristics. The taste of smoked fish is influenced by the content of non-volatile compounds such as free amino acids, namely glutamic acid which provides umami taste and inorganic salt so that it can be used as an instant flavoring seasoning [17]. Roa fish contains omega 3 fatty acids by 0.27%, omega 6 fatty acids by 1.45%, and omega 9 fatty acids by 11.96%.

Mackerel is a fish that contains omega 3 and omega 6 which are good for disease prevention, provide nutrition to the brain and improve fat levels in the body [43]. Mackerel has red meat and a strong taste that causes umami and savory taste in processed food products and mackerel contains 3.12% glutamic acid so that it can be used as an alternative in making flavoring seasonings [44].

Carp (Osphronemus gouramy) is a type of freshwater fish originating from Indonesia which has many enthusiasts [21]. The taste of Gourami fish meat is good and the nutritional content is high, it is very beneficial for growth and energy formation [45]. The content of
essential amino acids in carp from the highest to the lowest amount is leucine, lysine, isoleucine, valina, threonine, phenylalanine, methionine then histidine [18].

5 Flavoring raw materials from chicken

One of the flavorings sourced from meat is chicken because it can improve the taste and aroma. The faint yellow chicken seasoning grains are one of the most popular spices. It is widely consumed due to its natural chicken and umami flavor, which can be used as a food flavor enhancer [46,47]. Protein content and quality are important factors for determining the nutritional value of meat [22]. Chicken is an easily accessible source of protein with a balanced composition of essential amino acids (EAAs) especially very high lysine [48,49]. Amino acids can contribute to shaping flavor through the millard reaction [50]. Free amino acids are one of the main flavoring agents of meat, with sour, sweet, bitter, salty flavors, such as monosodium L-glutamate (such as MSG) and other flavors [22]. Glutamic acid (Glu) and aspartic acid (ASP) have a mixture of sour and MSG-like flavors. Serine, glycine, alanine, show sweetness, histidine, valine, arginine taste bitter [22,51].

6 Conclusion

Various studies show positive value in the use of natural ingredients that are made as flavoring spices. Natural raw materials that are used as flavoring such as white oyster mushrooms, shiitake mushrooms, prickly fish, roa fish, mackerel and gourami as well as chicken meat have high nutritional content and amino acids. The form of processing as a flavoring spice is one of the processing to extend the shelf life of raw materials.

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