Use of medicinal and aromatic plants in food

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Medicinal and aromatic plants in food

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Abstract

In recent years, due to the harms of synthetic-added foods, consumers are turning to food products that contain natural food additives, less processed, safer, healthier and have a longer shelf life. Therefore, the food industry has focused on finding natural compounds as an alternative to synthetic food additives, both to meet the new demands of consumers and to increase market competitiveness. Due to these natural pursuits, medicinal and aromatic plants have found an increasingly widespread use in food production. The rich nutritional content of medicinal and aromatic plants, high antioxidant capacity and functional properties such as antimicrobial enable these plants to be widely used in the food industry for their natural additive and protective effect. Therefore, the production of medicinal and aromatic plants and products obtained from these plants is constantly increasing throughout the world. Organic food and functional food production is carried out by incorporating various extracts of natural medicinal and aromatic plants with proven natural health benefits into food formulations. The abundance of bioactive compounds and cost-effective sources, especially in medicinal and aromatic plants, facilitate the use of these plants in minimally processed food products. Within the scope of this study, information about their use as spices, herbal tea, food supplements and food additives, which are the most common forms of use in the food industry, were presented in line with their functional properties.

Keywords

Medicinal Plants, Aromatic Plants, Natural Compounds, Food Supplements, Food Additives

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Introduction

Nutritional components such as carbohydrates, proteins, fats, minerals and vitamins are very important in human life. Plants that contain these nutrients in their structure are very important sources in terms of nutrition. A significant part of the nutrients that living things need in order to survive are obtained from plants.

In this sense, plants that meet important nutritional needs also have an important place in the food, chemistry, cosmetics, agricultural struggle, toothpaste, soap, sugar, beverage industry sectors, especially in the pharmaceutical industry. Medicinal and aromatic plants, which have been used for treatment since ancient times, have been used for human, animal and even plant health, sometimes by trial and error methods, and sometimes by professional medicine. Medicinal plants are mainly used in traditional and official medicine, while aromatic plants are used for the aroma and flavor of foods. Many in vitro studies define aromatic plants as effective antimicrobial and antioxidant compounds, while aromatic plants are defined as compounds used in food products such as traditional milk, meat and bakery products [1]. Moreover, medicinal and aromatic plants are defined Food and Agriculture Organization Biodiversity Handbook of the United Nations as the plants used to prevent and treat diseases and to protect health. Medicinal and aromatic plant derivatives with GRAS status are used in many areas in the food industry because they have many properties such as extending the shelf life of foods, antioxidant activity, antimicrobial activity. Based on common usage areas, medicinal and aromatic plants are used as spices, herbal tea, food supplements and additives.

Market volume of medicinal and aromatic plants

Depending on the increase in the consumption of medicinal and aromatic plants, the market volume also shows a rapid development. With the increase in demand for these plants, which were previously collected from nature, the agriculture of these plants has been accelerated. 50% of the medicinal and aromatic plants traded in the world are used in the food industry, 25% in cosmetics and 25% in the pharmaceutical industry [2]. The world has a foreign trade volume of 60 billion dollars of medicinal and aromatic plants. Coffee takes the biggest share in this trade in terms of food. Although the trade volume of medicinal and aromatic plants in the world is very high, our country, which has rich flora, unfortunately gets a low share from this market. The biggest factor in this being the case is that medicinal and aromatic plants are mostly exported raw without processing. Turkey ranked 18th in the world medical export list, which includes 110 countries. According to TUIK data, sesame seeds have the largest share in Turkey's imports of medicinal and aromatic plants. Apart from sesame seeds, coffee, safflower seeds, other spices, garlic and plants and parts used as pharmaceutical perfume and insecticide are taken. Other spices, poppy seeds, plants and parts used as medicine, perfume and insecticide, cumin, red pepper and allspice take the biggest share in exports.

Classification of medicinal and aromatic plants

Spice Plant: Plant parts and their mixtures used to flavor foods. Most of the spice plants have medicinal properties.

Fragrant Plants: Plants used in perfumery and cosmetic products.

Drog: Plant parts such as flowers, fruits, leaves, etc., which are used for therapeutic purposes, and which are used for commerce as dried whole or fragmented.

Uses of medicinal and aromatic plants

Medicinal and aromatic plants, which have a wide area of use, are used as a whole, fresh and dry. There are many different forms of use, such as plant parts such as leaves, roots, flowers, seeds, bark, tubers or aerial parts, which are also called herbaceous parts, their fragmented or ground forms, and their extracts prepared in different ways.

Bioactive compounds of medicinal and aromatic plant derivatives

Today, new natural compounds are sought to reduce or replace the use of chemical additives for food preservation. In line with this approach, medicinal and aromatic plant extracts and essential oils are used in food production. Medicinal and aromatic plant extracts and essential oils are considered to be an important factor for food quality and safety, as they strengthen the taste and color of foods, as well as prevent many aggravating factors such as microbial spoilage and oxidation.

Today, around 3000 plant extracts and essential oils have been produced using at least 2000 plant species, 300 of which are commercially important [3]. Medicinal and aromatic plants, which are generally localized in temperate and warm countries such as the Mediterranean and tropical countries, contain bioactive compounds with different compositions and activities as secondary metabolites [4].

The essential plant extract and bioactive components in medicinal and aromatic plants include terpenes, terpenoids and sesquiterpene hydrocarbons and their oxygen-substituted derivatives and hydrocarbons as non-volatile residues, sterols, fatty acids, waxes, carotenoids and flavonoids/flavanols [7].

These components can be synthesized by all plant organs of medicinal and aromatic plants such as seeds, roots, branches, bark, leaves, buds, flowers, and fruit shells. These components are stored in secretory cells, ducts, epidermic cells or glandular trichomes. The qualitative and quantitative compositions of medicinal and aromatic plants, which determine their antioxidant and antimicrobial potential, depend on which part of the plants is used and the selection of the appropriate extraction procedure [8]. The amount of volatile components can vary between 0.01% and 10% of the total mass of the plants [9].

The use of medicinal and aromatic plants in the food industry

Medicinal and aromatic plants have been an integral part of daily life and culture all over the world for centuries. Recently, due to people's demands for less processed and healthier food products, the search for natural substances to replace synthetic food additives has accelerated. Therefore, today, the production of healthy food is being used more widely as an alternative to potentially harmful synthetic food additives [8]. Because of this, the food industry has undergone innovative changes and developments over the years. As a result of the application of new food processing techniques, new packaging methods and new food ingredients and materials, new food products based on natural additives that are currently considered medicinal are introduced to the market. In addition, the food industry has recognized the benefits of using aromatic plant derivatives not only as flavor enhancers, but also as natural preservatives that extend the shelf life of their products [9].

In addition, foodborne diseases are a growing public health problem worldwide. To solve this problem, more effective, safe, natural and environmentally friendly food preservation strategies should be found [10]. In addition, it has been observed that food preservation strategies such as refrigeration, freezing, low temperature preservation techniques, thermal preservation techniques such as pasteurization and sterilization sometimes do not protect foods sufficiently. In fact, these methods sometimes cause negative effects on the nutritional and sensory properties of foods. Appropriate means of preservation are needed to maintain the quality and safety of these foods. Therefore, a combination with preservation technologies of medicinal and aromatic plants is needed to ensure food safety and the overall quality of food products. For example, essential oils of aromatic plants are used as part of a technology combining various food preservation factors to ensure the microbial stability of food products. For this reason, extracts and essential oils of medicinal and aromatic plants have found a great

place as new generation natural compounds in food production and human health with their proven benefits [11].

The inclusion of medicinal and aromatic information in packaging materials contributes to food safety, thanks to its anti-quorum detection and anti-biofilm properties. These potential food safety properties and increasing demand for natural food additive options have increased interest in their use, especially in traditional meat, dairy and bakery products, to provide an added value to them and increase market competitiveness.

Improving the nutraceutical properties of foods is an expected beneficial effect of incorporating aromatic plant derivatives into foods and is closely related to their health-promoting properties [12].

1. Use of medicinal and aromatic plants as basic nutrient

With the increase of interest and awareness in healthy foods in the world, the value of medicinal and aromatic plants has increased among today's foods and has caused them to be among high quality food products [13]. For centuries, a wide range of medicinal and aromatic plant products have traditionally been produced. For example, buckwheat, which is considered as a medicinal and aromatic plant, is mostly used in the food industry rather than health and economic fields. In addition to being grown as human food, buckwheat is used as feed instead of other grain products in the nutrition of farm and poultry. In addition, the share of the medicinal and aromatic plants sector in the beverage and edible product sectors is gradually increasing.

2. Use of medicinal and aromatic plants as spices

Spices are the most common usage areas of medicinal and aromatic plants. Spices have been traditionally used as preservatives in various foods since ancient times. It has also created an increasing industrial demand for medicinal and aromatic plants due to their natural health support [14]. Spices have attracted the attention of people throughout history with their various properties and have been used in almost all country cuisines, as well as medicinal uses. It is recorded in the literature that various spices such as thyme, cumin, coriander were used in the oldest known civilizations. In addition, some spices are known for appetizing, facilitating digestion and preventing food spoilage [15]. In our country, plants such as poppy, cumin, saffron, fennel, anise, mint, red pepper, thyme and black cumin have also found a place in the production program. In addition to these, fennel, black cumin, fenugreek, cloves and basil can be counted among other important spice plants [16]. In addition, laurel head, rosemary and thyme are among the plants offered for consumption by collecting from nature. In addition to its spice feature, wild mint from the mint family is widely used in other branches of the food industry. Mint is also used as a sweetener in various industries, in sectors such as chewing gum, toothpaste, candy. It is used in spice mixes, confectionery, vinegars, some soft drinks and some seasoning mixes in the food industry.

3. Use of medicinal and aromatic plants as herbal tea

Medicinal and aromatic plants are used in the food industry, in the spice industry, as well as in the production of tea. It is known that herbal teas were used in different parts of the world before drinks such as black tea and coffee, which are widely consumed today. Herbal teas are preferred because of their pleasing tastes and their healing properties for some health problems [17]. In this sense, in our country, tea can be produced from many herbal materials such as sage, linden, mint, fennel, chamomile, echinacea, rosehip, apple, mountain tea, lemon balm, rosemary, cassia, thyme, nettle, tarragon, raspberry, basil, anise.

It is stated that herbal teas, whose composition can change with various factors, have antioxidant, anti-inflammatory, antimicrobial, anticarcinogenic, antiatherogenic, antiaging, cardioprotective, etc. functional properties [18]. Herbal teas with this type of functional properties can be used to relieve problems such as psychosomatic diseases, colds and congestion, gastrointestinal diseases, urinary system diseases, diarrhea, constipation, local use as mouthwash or mouthwash, as a taste and odor corrector, menstrual complaints, and physical and mental fatigue [19]. In studies on the antioxidant activity of herbal teas, it has been found that the antioxidant activities of medicinal herbal teas are generally high [20]. These properties of plants are due to their high phenolic content. The antioxidant content of medicinal herbal teas depends on the composition of the plant, the method of preparation, the processing and storage time, and the storage conditions.

4. Use of medicinal and aromatic plants as food supplements

Another common usage area of medicinal and aromatic plants in the food industry is food supplement products. In order for a herbal product to be considered a "food supplement", it must contain essential nutrients such as vitamins, minerals, amino acids, and one or more chemical substances in the plant must be purified. Products that have been standardized in this way and turned into tablets, capsules or syrups are considered food supplements.

According to the reports of the American Food and Drug Administration (FDA), the estimated number of food supplements is over 29,000 today, and about 1,000 new products are added to this number every year. Special attention should be paid to the transformation and marketing of medicinal and aromatic plant products into products with high added value such as food supplements and essential oils.

The inclusion of various extracts of medicinal and aromatic plants in food formulations enables these plants to be used as food supplements. In this way, organic food and functional food production is carried out. The abundance of bioactive compounds in medicinal and aromatic plants and the fact that these compounds are cost-effective sources facilitate the use of these plants in minimally processed food products [12].

The active ingredients of essential oils, especially found in medicinal and aromatic plants, have various properties such as antimicrobial, antifungal, and inhibition [11]. In addition, a significant part of the plants, which have especially aromatic properties, are used to give flavor to foods.

In addition to these properties, medicinal and aromatic plants are also used for natural coloring of foods. For example, annatto (bixa orellana tree) is used as red color, safflower red and yellow color, tomato red color, marigold yellow-orange color, pomegranate red-purple color, paprika red color, saffron yellow color and turmeric yellow color agent [21].

Medicinal and aromatic plants can be added to food production in fresh or dried form or in the form of extracts. However, there are some restrictions on their immediate incorporation into foods due to their intense aroma and qualitatively and quantitatively variable biological activity in the content of the bioactive components they contain [22]. However, it is not easy to include extracts of medicinal and aromatic plants in food products, which are considered a complex system of interconnected different micro-environments.

In addition, the low water solubility and high volatility of biocompounds in medicinal and aromatic plants make their use difficult for some food applications. The instability of biocompounds in medicinal and aromatic plants, the fact that volatile compounds are easily affected by external factors such as light, oxidation and heating cause their rapid deterioration. Therefore, care should be taken to add these components directly to foods [6].

There is a wide variety of food supplement products on the market. In addition to the benefits of food supplements, which have such a large market, their harms should also be determined and their production should be controlled in accordance with the legislation. As the market

for food supplement products increases, it is becoming increasingly difficult to find products that can be trusted and that have been tested with high quality and health-appropriate properties. In our country, medicinal and aromatic plants such as echinacea, medicinal mint, sage, thistle, lemon balm, anise, centaury and thyme are prominent in food supplements [23].

5. Use of medicinal and aromatic plants as preservative food additives

Medicinal and aromatic plants are suggested as promising sources of natural food additives for the food industry. Therefore, medicinal and aromatic plants have recently been used to replace synthetic preservatives and antioxidants that help increase the physiological functionality and storage stability of foods. Today, essential oils, especially in medicinal and aromatic plants, are used as biopreservatives in the food industry to prevent spoilage and increase the shelf life of products [24]. Since these oils are complex mixtures, their degree of effectiveness varies depending on the amount and type of substances they contain.

Components used as preservatives in foods should not impair sensory acceptance in foods to which they are added. In this respect, medicinal and aromatic plants do not create negative sensory properties in the foods to which they are added. For example, Tohma and Turan (2015) showed that the use of rosemary extracts extended the shelf life of hazelnut oil for frying without any adverse effects on the sensory acceptability of french fries [25].

In a study conducted in India by Srinivasan et al., the antimicrobial effects of 50 different medicinal plants were investigated. It was revealed that 72% of the plants used in this study had antimicrobial activity, 22 plants had an inhibitory effect on gram-positive and gram-negative bacteria, and 9 plants had an antifungal effect. These data reveal that medicinal plants are very important in this sense [28]. Similar results have been obtained in this and many similar studies. Studies show that medicinal plants and their products are an important alternative for antimicrobial production in this sense.

6. Use of medicinal and aromatic plants as antioxidant food additives.

It is stated that the antioxidant activity of medicinal and aromatic plants is related to the phenolic compounds in its composition. The antioxidant effect of phenolic compounds is due to their properties such as scavenging free radicals and forming compounds with metal ions. It has been stated that phenolic compounds are mostly found in the leaves, flowers and woody parts of the plant. Since the chemical composition of these plants differs according to many factors, their antioxidant effects can also vary. Many studies have been conducted on the antioxidant effects of medicinal and aromatic plants. In a study by Çoban et al. on the antioxidant effects of medicinal plants, rosemary, sage, thyme, cloves, turmeric, and black pepper were emphasized. In another study, the antioxidant effects of 31 kinds of aromatic plants were tested on sunflower oil, and as a result of the study, it was revealed that especially rosemary was quite effective. In the study by Kıralan et al. on the importance of natural antioxidants in the stabilization of vegetable oils, it is stated that especially rosemary and sage can be used to prevent the oxidation of vegetable oils on an industrial scale [27]. In the study conducted by Dıraman et al., the effects of the addition of thyme, rosemary and mint on the oxidative stability of some vegetable oils were investigated and they revealed that these plants significantly prevent the oxidation of oils [28].

Conclusion

There is a rapid return to natural products due to the harm caused by artificial or harmful foodstuffs to human health. Accordingly, the food industry has been undergoing innovative changes and developments over the years. One of the current issues in the food industry is the use of natural products in food. As a result of the application of new food processing techniques, new food ingredients and materials, new food products based on natural additives are introduced to the market today. One of the new and natural product groups are medicinal and aromatic plants.

By adding medicinal and aromatic plants to food formulations, they both replace synthetic additives and preserve product quality. For this reason, the food industry uses extracts and essential oils of medicinal and aromatic plants to increase the quality of foods, maintain long-term stability and extend the shelf life of food products by preventing oxidation. The nutraceutical properties of foods can be increased by incorporating medicinal and aromatic plant derivatives into foods. In this respect, the health-promoting properties of such products are also prominent.

Due to these beneficial effects, it is estimated that the use of medicinal and aromatic plants in the food industry will increase with the increase of conscious consumers in the future. However, food and food supplement products produced from medicinal and aromatic plants must also be produced after undergoing some evaluations. In our country, there is a need to develop products that can be evaluated in this sense and to investigate the health effects of these products.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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