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SPICES AND HERBS NOMENCLATURE – CURRENT RESULTS AND TRENDS. ROLE AND IMPORTANCE IN DEVELOPING THE QUALITY OF SPICES AND HERBS

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Purpose: Spices and herbs are a unique product in many different branches of industry. They are used as ingredients that improve the quality of final products, both food, cosmetics, pharmaceuticals and others. This article was created for review purposes. It presents the existing great voluntariness in defining spices and herbs. The article points out the differences in the approach to defining these kind of products and gathers herbs and spices into groups with similar properties. Articles' goal was to show significant differences in the approach to products referred to as spices in various fields and scientific disciplines. Terminology is particularly important here due to the role of the definition, which is to unambiguously explain the concept.
Design/methodology/approach: Most of the relevant existing definitions of spices and herbs are collected, their proper use and differences among them were discussed. The presented definitions have been found in official documents and in scientific papers, where they have been formulated by modern researchers. The semi-systematic/narrative review approach was used for examined subject.
Findings: Article presents the existing great voluntariness in defining spices and herbs. The existence of those definitions of this group of products and its various divisions has consequences not only for consumers but also for researchers of natural plant products.
Practical implications: The collected literature data allowed to indicate differences in the existing definitions and divisions of herbs and spices and confirmed the great diversity of this group of products. Researchers dealing with plant products must be very methodical and at the same time critical of scientific work in this field. This is particularly important in connection with the increasingly innovative use of herbs, spices and their ingredients.
Social implications: Attention to nomenclature and knowledge of the possible divisions of herbs and spices may become crucial for producers and consumers. It can influence on consumers and producers behavior on the spice and herbs market.
Originality/value: There is no such list in Polish and world literature.
Keywords: spices, herbs, definition, divisions of spices and herbs.
Category of the paper: Literature review.

Introduction

Spices and herbs occupy a unique place among products intended for consumption. They are most often used in nutrition in small quantities, and they determine the properties of the entire product. They are mainly used to shape the sensory properties of food in gastronomy, home cooking and the food industry. However, research, as well as knowledge about their previous use in various cultures, indicate a much wider range of possibilities of their use, not only as products shaping the sensory qualities of food.

Currently, this group of food products is gaining in importance due to intensive research on ingredients and the search for new compounds with bioactive effects that can be used as modern therapeutic agents, ingredients of functional foods and in cosmetology, which aims to reduce synthetic ingredients in cosmetics (Łuczaj et al., 2012; Serwańska-Leja, Czaczyk, 2016). Spices may also have additional properties, such as having a positive effect on the human body and preservatives for food (Martínez-Graciá et al., 2015; Senay, 2020; Sulieman et al., 2023).

In the literature there are many definitions and divisions of spices. The authors use various terms and expressions that are created for the needs of specific studies. The aim of this paper is to review the definitions and concepts of herbs and spices and their divisions.

The originality of the presented material lies in comprehensive approach the current state of knowledge on existing divisions, nomenclature and concepts of spices and in the absence of such an approach in Polish and foreign articles. The semi-systematic/narrative review approach was used for examined subject, because various organizations and authors created spices and herbs definitions during long time. These terms have evolved and this has negative implications for the researched topic as it introduces confusion in issues related to spices and herbs.

Spices definitions – literature review

According to historical and archaeological sources, spices and herbs have been used in food and medicine since ancient times (Tapsell et al., 2006; Sachan et al., 2018; Van der Veen, Morales, 2015). Most scientists define spices as plant-based products, although they may have a more complex composition and contain other substances in addition to plant-based ingredients, as in spice mixtures (Śmiechowska et al., 2021). Table 1 presents definitions of herbs and spices proposed by selected authors and organizations.

Table 1.
Definitions of herbs, spices due to selected authors and organizations

Author	Definition
Codex Alimentarius, International Food Standards FAO/WHO (Codex Alimentarius)	In the 'Salts, sauces, salads and protein products' 12.0 category, it includes substances added to foods to enhance flavor and taste. The category 12.1. – 12. 10. listed: Salt and salt substitutes, Herbs, spices, seasonings, and condiments (e.g. seasoning for instant noodles), Vinegars, Mustards, Soups and broths, Sauces and like products, Salads (e.g. macaroni salad, potato salad), Yeast and like products, Soybean-based seasonings and condiments, Protein products other than from soybeans.
Directive 2004/24/EC of the European Parliament and of the Council of 31 March 2004 (Directive 2004/24/EC)	Herbal substances: any, mostly whole, divided or cut plants, parts of plants, algae, fungi, lichens in unprocessed form, usually dried, sometimes fresh. Some extracts that have not undergone any particular treatment are also considered herbal substances. Herbal substances are precisely defined by the part of the plant used and the botanical name according to the binomial system (genus, species, cultivar and author); Herbal preparations: preparations obtained by subjecting herbal substances to a treatment such as extraction, distillation, pressing, fractionation, purification, concentration or fermentation. These include crushed or powdered herbal substances, tinctures, extracts, oils, squeezed juices, and processed extracts.
European Spice Association (ESA) (European Spice Association)	Culinary herbs and spices are edible parts of plants which are traditionally added to foodstuffs for their natural flavouring, aromatic and visual properties. Mixture of herbs and spices (type blends) contain only herbs and spices, if necessary, is allowed using the anti-caking agents. Mixtures type seasoning is a mixture of acceptable nutrients that are included as necessary for the purposes for which they are intended as: taste, nutritional quality, functionality of food improvement. Typically it contains one or more herbs and/or spices and other substances that enhance aroma and flavor. The category includes spices with functional ingredients, e.g. thickening hazards, emulsifiers, preservatives, dyes, and anti-caking hazards.
ISO (ISO, 1995)	Spices and condiments: Vegetable products or mixtures thereof free from extraneous matter, used for flavouring, seasoning and imparting aroma in foods. The term applies equally to the product in the whole form or in the ground form.
Oxford English Dictionary (OED)	Herbs - Any soft-stemmed, aromatic plant used fresh or dried to flavour and garnish dishes, and sometimes for medicinal effects. Not clearly distinguished from spices, except that herbs are usually the leaves or the whole of the plant while spices are only part of the plant, commonly the seeds, or sometimes the roots or rhizomes.
Encyclopedia Britannica (Encyclopedia Britannica)	Spices are the fragrant or pungent products of such tropical or subtropical species as cardamom, cinnamon, clove, ginger, and pepper; spice seeds include anise, caraway, cumin, fennel, poppy, and sesame. Herbs are the fragrant leaves of such plants as basil, marjoram, mint, rosemary, and thyme. A pot herb is any plant with stalks and leaves that can be boiled as a vegetable or used in soups and stews (in larger amounts than herbs used for flavouring).
American Spice Trade Association (ASTA) CFR – Electronic Code of Federal Regulations Title 21 (2023) Spices include the spices listed in 182.10 and part 184 of this chapter (ASTA Definition)	The term spice means any aromatic vegetable substance in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, such as onions, garlic and celery; whose significant function in food is seasoning rather than nutritional; that is true to name; and from which no portion of any volatile oil or other flavoring principle has been removed.
Polish Classification of Goods and Services - PKWiU 10.84. (PKWiU)	Spices include spices, vinegar, sauces, mustard flour and meal, mustard, processed spices and spice mixtures, and salt.
Low Dog T. (Low Dog, 2006)	Spices – dried seeds, fruits, buds, root, or bark of a plant or tree used to flavor food. Spices and culinary herbs differ mainly in their source; Culinary herbs typically come from the leaves of plants, while spices come from the bark, stem, fruit, buds, or seeds.

Cont. Table 1.

Martínez-Graciá et al. (Martínez-Graciá et al., 2015)	The terms "herbs" and "spices" have more than one definition in common languages, but the most commonly used are those that refer to herbs that are extracted from the green parts of the plant, such as the stem and leaves. They differ from other plants used in food in that they are used in small quantities to import flavor rather than substances into food. Spices differ from herbs in that they are not produced from the green parts of the plant, but from other structures such as seeds, flowers, fruits, roots or even the bark of various plants.
Embuscado, M.E. (Embuscado, 2015)	Most spices are plant-based products. Spices come from parts of the plant other than the leaves, while herbs come from the leaves of the plant. Spices and herbs can be divided into different groups based on taste, taxonomy, or the part of the plant they come from.
Balkrishna, A. et al. (Balkrishna et al., 2023)	Spice is a dried aromatic or pungent plant substance such as root, stem, bark, leaves, bud, flower, fruit, seeds, etc., used as a flavor modifier in many culinary practices. A historical wisdom supports their use as an ingredient for flavoring the food and medicinal uses in various kind of healing systems.

Source: own study based on (Newerli-Guz, 2018).

It follows from the definitions given above that authors have a diverse approach to this basic question: What the herbs and spices are?

Codex Alimentarius separates substances added to foods to enhance aroma and flavor and includes salts, spices, soups, sauces, salads and protein products. These are classified as salt and salt substitutes, herbs, spices, vinegars, mustards, mayonnaise, soups and broths, sauces and similar products, salads, sandwich spreads, yeast and similar products, soy-based condiments, and protein products from non-soy sources Codex Alimentarius).

The concept of spices is therefore much broader because it includes not only spices such as plants and/or their parts used to improve palatability, but all other food products that are used to shape the palatability of food. Martínez-Graciá et al. (2015) and Embuscado M.E. (2015) list herbs next to spices and define them as products obtained from green parts of plants, most often leaves and stems, which can be used fresh or dried. Herbs can be used both for medicinal purposes and as spices, but their status in each purpose is different. The World Health Organization -WHO defines herbal medicine as the practice of herbs, herbal materials, herbal preparations and finished herbal products containing as active ingredients plant parts or other plant materials or combinations thereof (World Health Organization, 2000). The European Commission explain the meaning of herbal medicinal products as any medicinal product containing exclusively as active substance one or more herbal substances, one or more herbal preparations or a combination thereof (Commission Decision, 2018).

ESA - European Spice Association defines culinary herbs and spices as edible plant parts traditionally added to foods for their natural aroma, aromatic and/or visual properties. The ESA Culinary Herbs and Spices List contains the most commonly sold dried herbs and spices along with their most commonly used botanical names in Europe. The form of these herbs and spices, i.e. whole, chopped, ground or otherwise, has no significance in this list. Not all of these ingredients are available in all European countries and some ingredients may be used by customers for non-culinary purposes (European Spice Association, 2018). The ESA definition (Table 1) includes culinary herbs and spices, but they differ in the sources

they come from. Culinary herbs usually come from plant leaves, while spices come from bark, stems, fruits, flowers or seeds (Low Dog, 2006).

Presented in Table 1 definition of spices indicated under number 10.84 in the Polish Classification of Products and Services and those covered by the term ESA seasoning.

Divisions of herbs and spices

There are many various divisions of herbs and spices in the literature. The most commonly used divisions of herbs and spices are presented in this review. There are i.a. a taxonomic division, a division based on plant organs, a division based on the bioactive components of herbs and spices and a culinary division, and many others.

1.1. Taxonomic division

The botanical taxonomy of plants places most spices and herbs in the group Angiospermae. This group plays a crucial role in current terrestrial ecosystems, as it provides food for humans and feed for animals and has big economic importance in the development of various industries, not only the food industry. This group is dominated by Mesangiospermae, among which the two most important lineages eudicots and monocots were formerly distinguished. There is still a debate among scientists about the phylogenesis of plants. Due to the widespread division of angiosperms into monocots and eudicots, this division is still used in many publications. However, classification systems for angiosperms created since the end of the 20th century no longer include eudicots as taxon. The most important are the division according to Reveal (Reveal, 2008), the classification of the Angiosperm Phylogeny Group: APG IV (Byng et al., 2016) and the phylogenetic analysis of Yang et al. (Yang et al., 2020).

1.2. Division of herbs and spices according to their organs

One of the most frequently used divisions of plants, especially in trade and medicine, is the criterion based on the used parts of the plant. We distinguish leaf, floral, seed, bark, rhizome and root herbs and spices (Table 2).

Table 2.
Division of herbs and spices according to the used part of the plant

Part of the plant	Herbs /spices samples
flower buds/flower	elderberry (*Sambucus nigra* L.), saffron (*Crocus sativus* L.), saffron sorel (*Hibiscus sabdariffa* L.), clove (*Syzygium aromaticum* (L.) Merr. & Perry)
seeds	black cumin (*Nigella sativa* L.), white mustard (*Sinapis alba* L.), Malabar kardamom (*Elettaria cardamomum* L.), fenugreek (*Trigonella foenum-graecum* L.), Indian sesame (*Sesamum indicum* L.)
fruits	anise (*Pimpinella anisum* L.), caraway seed (*Carum carvi* L.), coriander (*Coriandrum sativum* L.), cumin (*Cuminum cyminum* L.), black pepper (*Piper nigrum* L.), wild rose (*Rosa canina* L.), vanilla (*Vanilla planifolia* Andrews)
berries	lingonberry (*Vaccinium vitis-idaea* L.), raspberry (*Rubus idaeus* L.), chokeberry (*Aronia melanocarpa* (Michx.) Elliott), cranberry (*Vaccinium macrocarpon* Aiton), blueberry (*Vaccinium myrtillus* L.)
bulbs	onion (*Allium cepa* L.), garlic (*Allium sativum* L.), chives (*Allium schoenoprasum* L.), leek (*Allium ampeloprasum* L.)
leaf	basil (*Ocimum basilicum* L.), mugwort wormwood (*Artemisia absynthium* L.), savory (*Satureia hortensis* L.), dill (*Anethum graveolens* L.), marjoram (*Origanum majorana* L.), thyme (*Thymus vulgaris L.*), lemon balm (*Melissa officinalis* L.), peppermint (*Mentha piperita* L.), rosemary (*Rosmarinus officinalis* L.), sage (*Salvia officinalis* L.), laurel (*Laurus nobilis* L.)
rhizome/root	horseradish (*Armoracia rusticana* G. Gaertn. et al.), wasabi (*Eutrema japonicum* (Miq.) Koidz.), ginger (*Zingiber officinale* Roscoe), licorice (*Glycyrrhiza glabra* L.), angelica (*Angelica archangelica* L.), calamus (*Acorus calamus* L.), stinkweed (*Ferula assa-foetida* L.), turmeric (*Curcuma longa* L.)
bark	Ceylon cinnamon (*Cinnamomum verum* J. Presl), cassia (*Cinnamomum cassia* (L.) J.Presl), Burmana cinnamon (*Cinnamomun burmanii* Nees ex Blume)

Source: own study based on (Mashabela et al., 2022).

1.3. Division of herbs and spices according to aroma and taste

According to their aroma or taste, spices and herbs can be divided into 4 groups: spicy spices, mild-taste spices, aromatic spices, and aromatic herbs and vegetables (Table 3). This division can be called the culinary division, because of their use in the dish preparation process.

Table 3.
Division of herbs and spices according to aroma and taste

Spice type	Herbs/spices samples
spicy spices	black pepper (*Piper nigrum* L.), cayenne, chilli (*Capsicum annuum* L.), black mustard (*Brassica nigra* L.), mustard – product from mustard seeds
mild-taste spices	sweet pepper (*Capsicum annuum* L.), coriander (*Coriandrum sativum* L.)
aromatic spices	clove (*Syzygium aromaticum* (L.) Merr. & Perry), caraway seed (*Carum carvi* L.), fennel (*Foeniculum vulgare* Mill.), nutmeg (*Myristica fragrans* Houtt.), Ceylon cinnamon (*Cinnamomum* spp.)
aromatic herbs and vegetables	thyme (*Thymus vulgaris* L.), basil (*Ocimum basilicum* L.), mint (*Mentha spp*.), sage (*Salvia officinalis* L.), bay leaf (*Laurus nobilis* L.), marjoram (*Origanum majorana* L.), Ascalonian garlic (*Allium ascalonicum* L.), onion (*Allium cepa* L.), garlic (*Allium sativum* L.)

Source: own study.

In some studies, the culinary division presented in Table 3 includes spices that affect the color of the dish and lists spices such as: turmeric (*Curcuma longa* L.), sweet pepper (*Capsicum annum* L.), saffron (Crocus sativus L.), kokum fruit (*Garcinia indica* Choisy) (Balkrishna et al., 2023; Chittaragi, Menon, 2023).

1.4. Classification of herbs and spices according to their main chemical constituents

Bioactive ingredients (Fig. 1) found in spices and herbs in different quantities determine their sensory, health-promoting and other important properties.

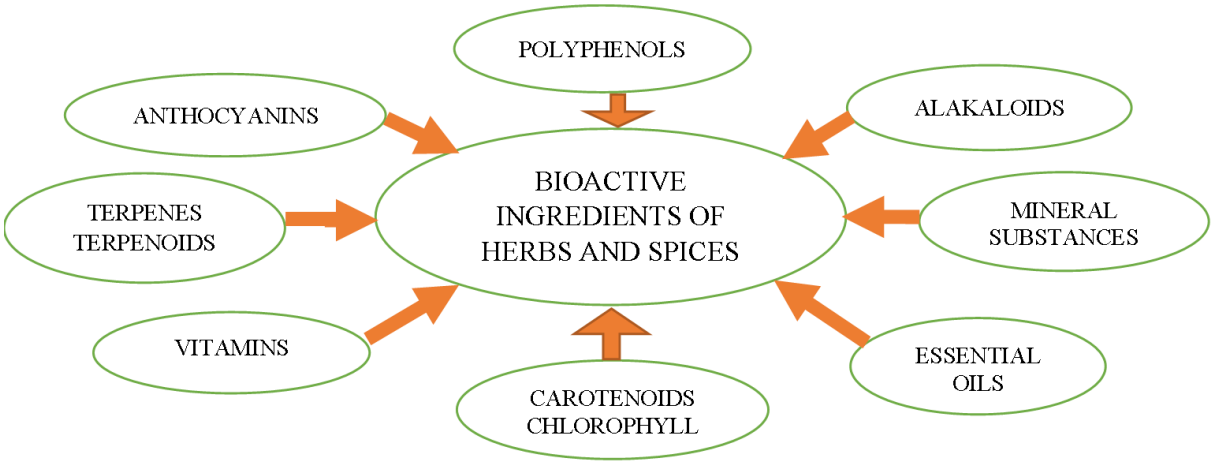

Figure 1. Bioactive ingredients of herbs and spices.

Source: own study.

Polyphenols

Polyphenols are a group of bioactive compounds found quite abundantly in herbs and spices. Over 900 mg/100g fresh weight of polyphenols contain oregano (*Origanum vulgare* L.), rosemary (*Rosmarinus officinalis* L.), thyme (*Thymus vulgaris* L.) and cinnamon (*Cinnamomum verum* J. Presl). Herbs and spices are dominated by phenolic acids and flavonoids. Some spices also contain other subgroups of polyphenols such as furanocoumarins in parsley (*Petroselinum crispum* Mill.), hydroxycoumarins in cinnamon (*Cinnamomum aromaticum* Nees), hydroxyphenylpropenones in ginger (*Zingiber officinale* Rosc.), curcuminoids in (*Curcuma longa* L.) (Opara, Chohan, 2014).

Alakaloids

Alakaloids are secondary metabolites with a strong effect on the body. Biogenetically, their precursors are amino acids and they form the basis for the classification of alkaloids (Zandavar, Babazad, 2022). A large group of alkaloids found in spices and culinary herbs are pyrrolizidine alkaloids (PA) and their N-oxides (PANO). In a study by Kaltner et al. (Kaltner et al., 2020), the lowest mean PA/PANO content was obtained for pepper (0.1 µg/kg). A low average content was determined in thyme, dill, chives, marjoram and herbs de Provence

in the range from 49.1 to 83.4 μg/kg. High average content above 100 μg/kg was determined in parsley (189 μg/kg), savory (150 μg/kg), cumin (641 μg/kg) and oregano (3140 μg/kg).

The authors believe that moderate use of PA/PANO-containing spices does not pose a health risk. In addition, it was found that the content of PA/PANO is influenced by the harvest period and the geographical origin of the spices. The highest amount of PA/PANO was found in honey and herbal teas (EFSA, 2017). That is why the European Union (EU) has introduced content limits for pyrrolizidine alkaloids in food products (Commission Regulations (EU) 2020/2040, 2020).

Another group of alkaloids that is an impurity in herbs and spices are tropane alkaloids (e.g. anisodamine, atropine, homatropin and scopolamine). This group of alkaloids can be detected in spices and herbs if they become contaminated with other plants during harvesting or processing. Again, the EU has introduced content limits for tropane alkaloids in food products (Commission Regulations (EU) 2021/1408, 2021).

One of the most commonly used spices - black pepper (*Piper nigrum* L.) important in food technology on an industrial scale, in gastronomy and home cooking, and long pepper (*Piper longum* L.) contain the pyrimidine alkaloid piperine. Piperine has been used medicinally and is even used as an insecticide (Szallasi, 2005; Lu et al., 2016). Capsaicin is present in peppers (*Capsicum annum* L.) and chili peppers (Srinivasan, 2016). Capsaicin is classified as an alkaloid even though it is not a proper alkaloid, because of absence of nitrogen in the ring, but the presence in the side chain. The feature that these alkaloid plants have in common is that they give dishes a sharp, stinging taste. Capsaicin like piperine has also been used in medicine.

Terpenes and terpenoids

Terpenes and terpenoids are among the volatile constituents of essential oils. Chemically, terpenes are derivatives of isoprene and are called isoprenoids. Terpenes depending on the number of isoprene units into hemiterpenes (C5), monoterpenes (C10), sesquiterpenes (C15), diterpenes (C20), triterpenes (C30), tetraterpenes (C40). Terpenes include myrcene present, e.g. in laurel leaf *Laurus nobilis* L., limonene present e.g. in caraway *Carum carvi* L., α and β pinene present e.g. in coriander *Coriandrum sativum* L. Terpenoids are aerobic derivatives of terpenes and can occur as alcohols, aldehydes, esters, ethers, ketones and phenolic compounds. Examples of terpenoids are: carvacrol, citronellal, geraniol, linalool, carvone, menthol, and thymol (Masyita et al., 2022).

Carotenoids

Carotenoids are compounds commonly found in nature and are synthesized primarily in organisms with the ability to photosynthesize like plants, algae, and cyanobacteria. The importance of carotenoids is related to the possibility of transformation into retinoids, i.e. vitamin A, which is essential for the human body. About 50 carotenoids have been identified, but the most important for humans are α-carotene, β-carotene, lycopene,

β-cryptoxanthin, zeaxanthin and lutein, as well as phytoene and phytofluene (Meléndez-Martínez et al., 2022). Epidemiological studies have shown that diets rich in carotenoids are associated with a lower risk of breast, cervical, ovarian, colorectal, cardiovascular and eye cancers (Milani et al., 2017). Studies show that the highest number of carotenoids is found in leafy spices. The highest amount of β-carotene was found in coriander leaves, curry leaves, mint, and green chili (Aruna, Baskaran, 2010). Coriander leaves are particularly rich in β-carotene, which is also confirmed by the research of Ashokkumar et al. (Ashokkumar et al., 2020). Recently, a high content of carotenoids has been determined in dried peppers (Ponder et al., 2021). Spices and herbs rich in carotenoids can also be included in the group of color-influencing (Arimboor et al., 2015).

Anthocyanins

Anthocyanins are widespread in the plant world. The most common are malvidin, petunidin, pelargonidin, peonidin, cyanidin and delphinidin. These compounds are classified as flavonoids, and their presence gives plants specific color and flavor characteristics. Anthocyanins give the red, blue and purple colors to some vegetables, fruits and seeds. A high content of anthocyanins is found in flowers, which have recently found great use in compositions of herbs and spices and are used to decorate dishes. Among the edible flowers most often used for culinary purposes and for processing, *Hibiscus rosa-sinensis* L., *Punica sekretum* L., *Tropaeolum majas* L., *Cucurbita maxima* Duchesne, *Rosa chinensis* Jacq, *Myosotis sylvatica* Hoffm, and others (Pires et al., 2012). Flowers, apart from their aesthetic appearance, are also responsible for the specific taste and smell of the food served. Consumers perceive flowers by their attractive appearance, size, shape, taste, smell and color. Color plays a very important role in food and nutrition and is an organoleptic property of edible flowers. The color of flowers depends primarily on the content of carotenoids and anthocyanins. However, it must be remembered that edible flowers must meet safety standards, just like all food products. The consumer must have no doubt that flowers may pose a threat (Śmiechowska, Matyjaszczyk, 2020).

Chlorophylls

Chlorophylls are naturally occurring pigments that are responsible for the various shades of green in plants. Chlorophyll is not a homogeneous substance and occurs in several forms, the most important of which are chlorophyll a and b. Herbs and leaf spices contain the most chlorophyll, such as marjoram, oregano, mint, sage, basil and others. There is a relationship between the chlorophyll content and the level of nitrogen fertilization. This may explain why plants from organic farming contain less chlorophyll than those from conventional crops (Hallmann, Sabała, 2020). The chlorophyll content is also influenced by the intensity of sunlight and the length of exposure to sunlight. Fresh leaf of herbs and spices contain more chlorophyll. Processing processes, depending on the processing method, reduce the chlorophyll content

(Thamkaew et al., 2021). Research shows that chlorophyll has many health benefits due to its structural similarity to human blood and its good chelating ability. It has antimutagenic and anticancer properties. Chlorophyll helps neutralize the pollutants we inhale every day, making it a good supplement for smokers. It effectively provides magnesium and helps in blood transport. It has also been found to be useful in the assimilation and chelation of calcium and other minerals. It has been observed to have great potential in stimulating red blood cells to improve oxygen supply. Chlorophyll is also used to color food after extraction from plants with organic solvents (Kizhedath, Suneetha, 2011).

Mineral substances

Spices are a source of mineral compounds, which is confirmed by research conducted on commonly consumed spices such as ginger (*Zingiber officinale* Roscoe), cinnamon (*Cinnamomum verum* J. Presl.), black cumin (*Nigella sativa* L.), fenugreek (*Trigonella foenum-graecum* L.), cardamom (*Elettaria cardamomum* L.), cloves (*Syzygium aromaticum* (L.) Merr, Perry) and saffron (*Crocus sativus* L.). The results revealed that the tested spices are a diverse source of macronutrients and microelements. The content of Ca, K, Mg, Na, P and S as well as Co, Cu, Fe, Mn and Zn, which are important in the diet, was tested. The ash and fiber content also varied (Al Dhaheri et al., 2023). Spices are also monitored for the content of toxic elements that threaten human life and health. In Italy, tests were carried out on the content of Cd, Pb, As, Hg in spices such as cumin, cloves, saffron, coriander, black pepper, cinnamon, fenugreek and sesame seeds and others. Most spice samples did not exceed the limits applicable to these elements in European Union regulations, except for two samples with increased Pb content (Cicera et al., 2022).

Vitamins

Vitamins are organic compounds that are mostly not synthesized in the human body, but are necessary for its proper functioning. Spices are not food products that can be treated as the main source of vitamins in the diet, because they are added to dishes in small amounts, usually "quantum satis" to achieve the expected sensory characteristics. Fresh herbs and spices, especially in the form of leaves, contain more vitamin C than dried ones. The level of vitamin content is influenced by the type and method of drying. Studies have shown that the herb dried in the air in a shaded, well-ventilated room at a temperature of 25-32°C for 10 days lost over 80% of ascorbic acid (Capecka et al., 2005). Moshari Nasirkandi et al. (Moshari-Nasirkandi et al., 2023), examining the properties of spices from the *Lamiacae* family, found that the level of vitamin C is influenced by plant genetic factors, climate, weather and environmental factors. Environmental stimuli include light intensity and temperature. This research is important because *Lamiacae* group includes very popular herbs and spices such as *Salvia* sp., *Mentha* sp., *Thymus vulgaris* L., *Lamia alba* and others. In spices such as ginger root (*Zingiber officinale* Roscoe), turmeric (*Curcuma longa* L.), cloves (*Syzygium aromaticum* (L.) Merr, Perry) and

black pepper (*Piper nigrum* L.) in Nigeria, in addition to vitamin C, vitamins B1, B2, B3, B6, B9, B12 and β-Carotene and α-Tocopherol (Ayoade et al., 2023).

Essential oils

Essential oils are secondary metabolites produced by plants as mixtures of volatile organic compounds. The significant importance of these compounds as "*Quinta essentia*" was discovered by the famous alchemist and physician Paracelsus (1493-1541). There are many definitions of the term "essential oil", but the most frequently cited is the one recorded in the European Pharmacopoeia, which states that an essential oil is: "a product obtained from a natural raw material of plant origin, either by distillation with water or steam, or from the epicarp of Citrus sp. fruit by a mechanical process or by "dry distillation" (European Pharmacopoeia). The essential oil is then separated from the aqueous phase by physical methods" (De Souza et al., 2023). Essential oils have very different biological activities (Table 4), which depend on many factors such as: plant variety and species, harvest period, part of the plant from which the essential oil is obtained, methods of obtaining the oil, and the geographical area of origin of the plant (León-Méndez et al., 2019).

Table 4.
Bioactive effects of essential oils of selected herbs and spices

Bioactive effects of essential oils	**Examples of herb and spices essential oils**
Antibacterial	*Thymus vulgaris* L., *Cinnamomum verum* J. Presl, *Syzygium aromaticum* (L.) Merr, Perry, *Piper nigrum* L., *Mentha sp.*, *Rosmarinus officinalis* L.
Antiviral	*Origanum vulgare* L., *Artemisia vulgaris* L., *Allium sativum* L., *Cuminum cyminum* L., *Curcuma longa* L., *Syzygium aromaticum* (L.) Merr, Perry
Antifungal	*Cinnamomum verum* J. Presl, *Origanum vulgare* L., *Curcuma longa* L., *Myristica fragrans* Houtt., *Syzygium aromaticum* (L.) Merr, Perry
Insecticides and repelent	*Coriandrum sativum* L., *Cymbopogon nardus* (L.) Rendle (Lemon grass), *Ocimum* spp.
Anticancer activity	*Zingiber officinale* Roscoe, *Peppers spp.*, *Rosmarinus officinalis* L., *Curcuma longa* L., *Nigella sativa* L., *Syzygium aromaticum* (L.) Merr, Perry, *Piper nigrum* L.
Anti-inflammatory activity	*Pimenta dioica* (L.) Merr., *Ocimum basilicum* L., *Piper nigrum* L., *Capsicum spp.*, *Syzygium aromaticum* (L.) Merr, Perry, *Trigonella foenum-graecum* L., *Zingiber officinale* Roscoe
Antioxidant	*Syzygium aromaticum* (L.) Merr, Perry, *Zingiber officinale* Roscoe, *Origanum majorana* L., *Myristica fragrans* Houtt., *Rosmarinus officinalis* L., *Curcuma longa* L., *Thymus vulgaris* L.
Anti-mutagenic activity	*Syzygium aromaticum* (L.) Merr, Perry, *Calendula officinalis* L., *Salvia officinalis* L., *Scutellaria baicalensi*,

Sources: own study based on: (Mashabela et al., 2020; León-Méndez, 2019; Akram et al., 2020; Patil, 2020; Garnier, Shahidi, 2021; Talib et al., 2022).

Consumers are becoming more and more aware and are looking for food that does not contain synthetic preservatives. This role is fulfilled by herbs and spices containing essential oils with multidirectional effects, including those that act as natural preservatives. Essential oils are also used in the food, pharmaceutical, cosmetic and perfumery industries as well as in aromatherapy (Żukowska, Durczyńska, 2024).

1.5. Division of herbs and spices according to their effects on the body

Since ancient times, herbs and spices have been used in herbal medicine. In Asian countries such as China and India and in African countries such as Zambia, Tanzania and Uganda, support for herbal medicine is based on cultural acceptability because herbal remedies have been around for centuries. The increase in support for herbal medicine is due to the fact that plants are perceived as healthier than conventional biosynthetic drugs. However, herbal products are not control and supervised in all countries, which may lead to threats to life and health (Msomi, Simelane, 2018). That is why we have recently seen an increase in interest in herbal medicine. Research is conducted to examine the composition and content of bioactive substances and their effects on the human body. Figure 2 shows the main health properties of herbs and spices.

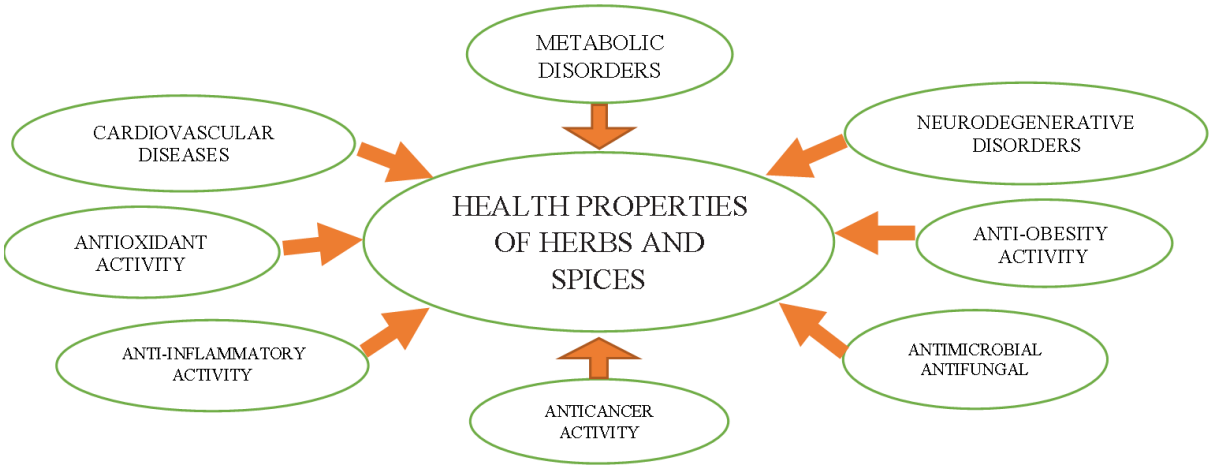

Figure 2. Division of herbs and spices according to their health properties.
Source: own study.

Metabolic disorders

One of the serious health problems of modern society is metabolic syndrome. Clinical research suggests that a diet rich in herbs and spices may have a positive effect on factors related to metabolic disorders. Spices such as cardamom can reduce inflammation markers, and cinnamon, ginger and turmeric reduce blood lipids (Mackonoichie et al., 2018). Moreover, in the case of chili, ginger and cinnamon, there is evidence of a beneficial effect of culinary doses of spices in the prevention of related disorders such as obesity and diabetes. A beneficial effect on reducing obesity rates has been demonstrated for spices such as basil, cinnamon, cardamom, coriander, ginger and black cumin (Deekshith et al., 2021). In turn, the effect on diabetes was demonstrated for coriander, cumin, oregano, rosemary, thyme and tarragon. However, the effect on hyperlipidemia was demonstrated for herbs: basil, bay leaves, coriander, fennel, oregano, rosemary, sage and thyme (Bower et al., 2016).

Cardiovascular diseases

The latest research shows that greater cardamom (*Elettaria Cardamomum* L.), coriander (*Coriandrum sativum* L.), turmeric (*Curcuma longa* L.) and ginger (*Zingiber officinale* Roscoe) can be effectively used in the prevention and control of cardiovascular diseases (Rastogi et al., 2017; Tsui et al., 2018).

Antioxidant activity

In recent years, there has been a significant increase in interest in natural antioxidants for use in food as a replacement for potentially harmful synthetic antioxidants such as BHA and BHT. Natural antioxidants have been shown to have several biological properties, such as anticancer, antimutagenic, antidiabetic, hypolipidemic, and anti-inflammatory properties, as well as preventing the oxidation of lipids in food (Hossain et al., 2023). The source of these natural antioxidants are spices. Research shows that spices belonging to the *Lamiacae* family (oregano (*Origanum vulgare* L.), thyme (*Thymus vulgaris* L.), rosemary (*Rosmarinus officinalis* L.) have a higher antioxidant potential than spices belonging to the *Apiacae* family caraway (*Carum carvi* L.) and lovage (*Levisticum officinale*) (Ulewicz-Mogulska, Wesołowski, 2023). Moreover, it has been shown that spices from organic farming have a higher antioxidant potential than spices from conventional farming (Hęś, 2022). Studies have also shown that spice mixtures have a synergistic effect and thus cause a greater antioxidant effect (Hossain et al., 2023).

Anti-inflammatory activity

Many years of research indicate that the main risk factors for most chronic diseases are infections, obesity, alcohol, tobacco, radiation, environmental pollution and diet. These factors cause acute and chronic inflammation and, as a result, lead to many chronic diseases. Epidemiological studies indicate that the cancer incidence in countries such as India, where spices are consumed daily, is much lower (94/100 000) than in countries where spices are not consumed, such as the United States (318/100 000), suggesting a potential role of spices in cancer prevention. Studies have shown that nutraceuticals derived from spices such as cloves, coriander, garlic, ginger, onion, pepper, turmeric, etc., remarkably prevent and treat various chronic diseases by targeting inflammatory pathways (Liu et al., 2017). Research shows that a diet rich in spices such as *Curcuma longa* L., *Capsicum annuum* L., *Zingiber officinale* Roscoe, *Syzygium aromaticum* (L.) Merr, Perry, *Nigella sativa* L. and *Piper nigrum* L. can reduce inflammation and have a preventive effect on diseases. related to inflammation. Although these spices have been traditionally used for centuries to treat inflammatory diseases, their therapeutic use in preventing or treating inflammatory diseases requires further in-depth research (Srinivasan, 2022).

Anticancer activity

Cancer is one of the main causes of death and therefore research in recent years has been focused on finding measures that will contribute to the treatment and prevention of these diseases. Recent research shows that ginger, pepper, rosemary, turmeric, black cumin and cloves have chemotherapeutic and chemoprophylactic properties. Ginger and black cumin have the highest anti-cancer activity, targeting many of the hallmarks of cancer. Induction of apoptosis is the most common pathway activated by various spices in the Mediterranean diet to inhibit cancer (Talib et al., 2022).

Antimicrobial and antifungal activity

One of the causes of diseases is food poisoning caused by food spoilage. To counteract these negative phenomena, various methods are used to extend the shelf life of food and limit the growth of bacteria that cause food spoilage. Many spices such as cloves, oregano, thyme, cinnamon and cumin have been shown in studies to have significant antibacterial and antifungal effects against food spoilage bacteria such as *Bacillus subtilis* and *Pseudomonas fluorescens*, pathogens such as *Staphylococcus aureus* and *Vibrio parahaemolyticus*, harmful fungi such as *Aspergillus flavus* and even antibiotic-resistant microorganisms (Regulation (EC) No 852/2004…). New trends in food production turn towards completely natural products. Herbs and spices and extracts obtained from them meet these criteria. The effectiveness of the antibacterial effect was confirmed for *Urtica dioica* L., *Capsicum annuum* L., *Crocus sativus* L., *Nigella sativa* L. on the growth of *S. aureus*. Moreover, essential oil components obtained from *Origanum vulgare* L., *Origanum dictamnus, Mentha piperita* L.*, Lavandula ×intermedia, Zataria multiflora* Boiss, have been reported to be effective against *S. aureus* (Berber et al., 2022). In a literature review by Mashabela et al. (Fisher, 2019, pp. 390-394) highlighted cumin *Cuminum cyminum* L., which is used as a preservative against *Bacillus subtilis, E. coli* and *Saccharomyces cerevisiae*. Cumin also has exceptional antimicrobial activity against *Agrobacterium tumefaciens, Pseudomonas oleovorans, S. cerevisiae, Trichophyton rubrum* and *Bacillus licheniformis*. Spices: *Cinnamomum verum* J. Presl, *Piper nigrum* L., *Rosmarinus officinalis* L., *Zingiber officinale* Roscoe and curry leaves (leaves of the *Bergera koenigii* L. plant) are also used as preservatives (Fisher, 2019, pp. 390-394). One of the spices with enormous health potential is black cumin (*Nigella sativa* L.), whose properties and possible applications are being researched (Ahmad et al., 2013).

Neurodegenerative disorders

Neurodegenerative disorders (Alzheimer's disease, Parkinson's disease and dementia) are diseases associated with aging. It was found that cumin (*Cuminum cyminum* L.), black cumin (*Nigella sativa* L.), black pepper (*Piper nigrum* L.), curry leaf (*Bergera koenigii* L.), fenugreek (*Trigonella foenum-graecum* L.), fennel (*Foeniculum vulgare* Mill.), cardamom (*Elettaria*

cardamomum L.), cloves (*Syzygium aromaticum* (L.) Merr, Perry) and coriander (*Coriandrum sativum* L.) have neuroprotective potential in age-related neurological disorders (Norouzkhani et al., 2022). In a review of research conducted on the use of spices and their extracts in Alzheimer's disease (AD), special attention was paid to saffron as a promising spice for future research in the treatment of AD, as well as to four other known spices - turmeric, pepper, ginger and cinnamon (Mirmosayyeb et al., 2017).

1.6. Division of herbs and spices according to the cultivation system

Obtaining herbs and spices can be done using various methods. The main methods include: traditional agricultural crops, ecological (organic) production, integrated production and conventional agricultural production. In many countries, mainly developing ones, herbs and spices are the primary source of medicines and health care, especially in rural areas. Herbs and spices for citizens of these countries most often come from home and farm cultivation, and were most often intended for consumption by a given social group (Adnan et al., 2022; Khakurel et al., 2022). A similar situation occurs in Africa, where wild spices, i.e. collected spices, constitute approximately 48% of all spices of local origin (Olife et al., 2013). In addition to this activity, herbs and spices are grown in these countries for processing and export companies (Wondimnew, 2024). Due to the globalization of food systems, the level of traditional food consumption is decreasing and conventional production carries various types of risks (Dijazed et al., 2019). Agriculture and food systems undoubtedly face a number of serious challenges, from climate change and various forms of environmental degradation to the health and well-being of farm animals, farm workers and farmers (Sumberg, Giller, 2022). Moreover, some technologies used in conventional production raise various types of doubts or are prohibited in the European Union (Schweiggert, Schieber, 2007). The search for new alternative agricultural practices has drawn attention to organic farming, which is gaining in importance. Organic farming is environmentally friendly, relying on renewable resources from farms to maintain biological processes and ecological balance (Reganold, Wachter, 2016). Organic cultivation of medicinal plants is becoming more and more important because, according to research, they contain more bioactive ingredients (Ponder et al., 2021; Hallmann, Sabała, 2020; Hęś, 2022). Alternative agricultural technologies also include integrated agriculture. Integrated plant production is a modern agricultural production system ensuring high quality food, using in a sustainable manner technical and biological progress in cultivation, plant protection and fertilization, and paying special attention to environmental protection and human health. The assumptions of the integrated plant production system are consistent with the principles of integrated plant protection, which allows for ensuring acceptable levels of residues of plant protection products, heavy metals, nitrates and other elements and harmful substances (Kokoszka, 2023; Sekeran et al., 2021).

1.7. Division of herbs and spices according to processing technology

Fresh herbs and spices quickly lose their properties and are therefore preserved using various methods. The most common method of preserving herbs and spices is drying (Fig. 3). The drying process can be carried out traditionally by air drying or using thermal methods (Janjaj et al., 2008). Studies have shown that when dried, herbs and spices lose most of their antioxidant activity. It was found that fresh herbs and spices showed a large accumulation of polyphenolic compounds (Bieżanowska-Kopeć, Piątkowska, 2022).

Before the process of preserving herbs and spices begins, the raw material must be cleaned of mechanical impurities, such as sand, fragments of leaves and stems. This can be achieved by sifting on sieves or using special separators or filter cyclones (Mrozek-Szetela et al., 2020). Microbiological contamination of herbs and spices may cause human diseases. Bacteria can enter the plant material from soil, water and air. Some of the microbiological contamination may be reduced in the blanching process, which is used before the actual drying of herbs and spices. The quality of dried herb is also very dependent on other factors such as the type of herb, harvest time, post-harvest practices, age of the plant and storage conditions (Duncan et al., 2017).

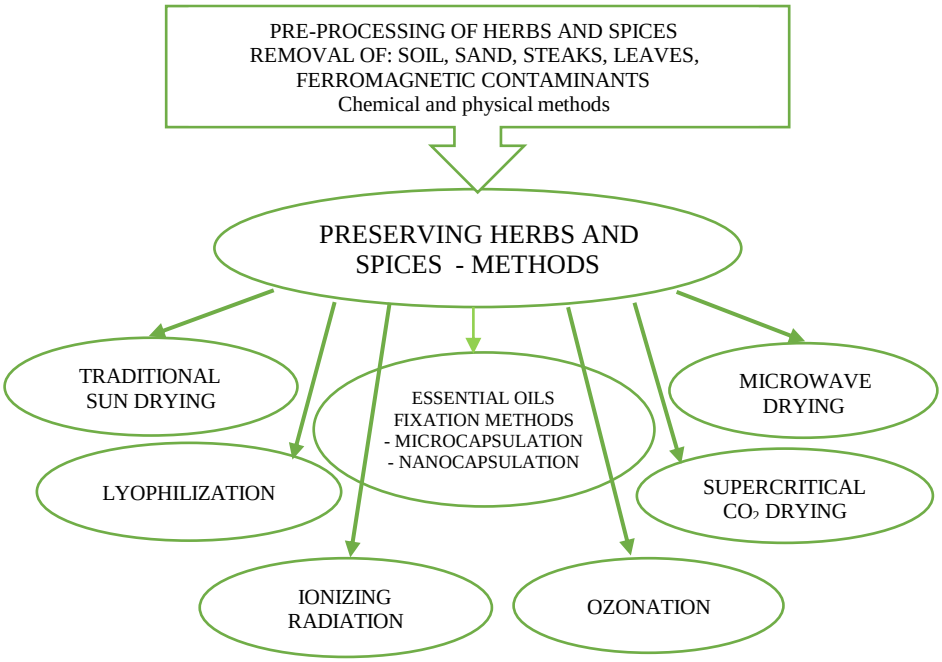

Figure 3. Selected methods of preserving herbs, spices and essential oils.
Sources: own study.

Other methods include hydrostatic pressure or treatment with high-pressure carbon dioxide (Thamkaew, 2021). These methods are not highly rated because they change the color of the raw material and affect the aroma, which involves the loss of a significant amount of essential oil. It is much more advantageous to use freeze-drying and microwave drying (Kubra et al., 2016). Ozonation of plant raw materials is also an effective method of removing

microbiological contaminants from most herbs (Mrozek-Szetela et al., 2020). In recent years, drying technology has been using methods that have the least impact on color and aroma. These include hybrid methods that combine several methods supported by solar energy, microwaves and other drying sources (Jin et al., 2018).

Physical methods of decontamination of spices, herbs and other plant raw materials include irradiation. Gamma rays are often used to inactivate microorganisms when microbial contamination is high. However, this technology is characterized by low consumer acceptance and legal restrictions in various countries (Schottrof et al., 2021).

One of the basic values of herbs and spices is to give food products specific sensory properties. However, essential oils are unstable and very susceptible to changes caused by external factors such as light, temperature, oxygen and humidity. In order to reduce these unfavorable changes, essential oils are extracted by hydrodistillation, solvent extraction, supercritical CO2 extraction or others. The extracts obtained in this way are subjected to microencapsulation or nanoencapsulation. Encapsulation methods involve coating solid, liquid or gaseous particles with special substances that isolate the contents of the capsule from the external environment. Natural or synthetic polymer films are used as coating material (Sousa et al., 2022). Microcapsules with essential oils and other bioactive ingredients obtained from plants are used in the food, cosmetics and pharmaceutical industries (Żukowska, Durczynska, 2024).

Discussion

Along with the development and progress of civilization in various areas, we observe a growing number of terms, especially in the sphere of science. It is believed that knowledge is the basis for development, and this applies to both the knowledge-based society and the knowledge-based economy (Carillo 2015). That is why it is so important, especially in science, to use terms that are unambiguously defined and do not mislead the participants of the scientific discourse.

The purpose of this article was to review the definition of the term "spices". It turns out that this concept is defined and understood in various fields of science and activity in very different ways. Most often, spices are defined as substances of plant origin (Table 1). However, in some fields of science and areas of the economy, inorganic and organic chemical compounds and substances of animal origin have also been allowed to use this concept.

The term “spices” is approached very broadly by Codex Alimentarius (1995) (Table1). The European Spice Association (ESA) in an addendum to the definition of spices adds that the category includes spices with functional ingredients, such as thickeners, emulsifiers, preservatives, colorants and anti-caking agents. However, this addition is inconsistent with the

definition of spice as a product of plant origin, since the substances listed are mostly strictly inorganic and organic chemical compounds. A list of these substances is included in the current list of food additives (Current EU approved additives and their E Numbers). Among the substances there is e.g. carminic acid, cochineal, carmine (E120) - an organic chemical compound, a natural carmine colorant extracted from dried, ground insects called cactus maggots (Dactylopius coccus) (Dapson, 2007). Also, Embuscado (2015) points out in his article that condiments do not have to be exclusively plant products but can contain other ingredients.

Nowadays, food technology, culinary and home cooking mostly use seasoning mixtures in which salt is one of the most important ingredients. Sodium chloride, known as table salt, is a product with a huge range of applications in many areas of the economy such as the food, pharmacy, cosmetology, paint and other industries. Given the scope of salt production and its use in the economy, it is difficult to assume that it can only be classified as a condiment. In 2023, total global salt production was estimated at 270 million tons (Shahbandeh, 2024). Salt as a condiment is used according to the quantum satis (as needed) principle. However, it is important to be aware that the amount of salt consumed is not indifferent to health, and excess salt can pose a threat to the cardiovascular system, kidney function and lead to the development of diseases. Therefore, the efforts of nutritionists and dietitians are aimed at reducing salt amounth in the daily human diet and food products, including spices, especially spice blends (Hendriksen et al., 2015; Śmiechowska, Drozd, 2021).

The problem with excess salt in spice blends also concerned the authenticity of the spices, as the spice blends contained more salt than herbs and vegetables, which is considered an adulteration (Śmiechowska, Drozd, 2021). Therefore, nutritionists pointed out that the proper effect of bioactive compounds contained in spices is abolished by excessive salt. The medical community views spices mainly in terms of their bioactive components, which have been used as therapeutic agents for centuries. In modern medicine, many spice-like plants are primarily used prophylactically, such as cinnamon and other bitters in the prevention of type 2 diabetes (Garza et al., 2024). Therefore, the medical, pharmaceutical and, in part, cosmetology communities use divisions of spices that target their medicinal properties, as discussed in detail in sections 3.4 and 3.5 of this paper. The issue of authenticity and methods of identifying adulteration is a very difficult task in the case of spices, especially spice blends. The harmfulness of spice adulteration has already been demonstrated for such popular spices as pepper and cinnamon (Newerli-Guz, Śmiechowska, 2022).

Adulteration is a serious problem in herbs and spices. The European Commission has published the results of the first coordinated control plan on the authenticity of herbs and spices launched by Directorate-general for Health and Food Safety and carried out by 21 EU Member States, Switzerland and Norway. Based on the analyses, the overall rate of suspicious samples was 17% (329 out of a total of 1885 samples analyzed) (Herbs and spices, 2019-2021). The most adulterated of the tested samples was oregano. As many as 48% of the tested samples were contaminated. The matter is serious because adulterated herbs and spices may pose various

types of threats to the food produced and may also cause health consequences (Embuscado, 2019; Newerli-Guz, Śmiechowska, 2022).

The International Organization of Spice Trade Associations (IOSTA) which plays an important role on the international spice market, among others, developed and published guidelines for spice and herb growers explaining how to prevent contamination and other problems affecting the cultivation and trade of spices (Fisher, 2019).

To improve the safety of herbs and spices, the EU also launched the "Securing the spices and herbs commodity chains in Europe against deliberate, accidental or natural biological and chemical contamination" (SPICED) project under the 7th Framework Programme. The overall objective of the EU project SPICED was aimed at securing the spice and herb food chains from primary production through to consumer-ready food against major natural, accidental or deliberate contaminations. Within SPICED, the focus was on low-moisture food ingredients such as dried herbs and spices (SPICED, 2017). The results of the SPICED Project constitute an important and timely contribution to the protection of the environmental and food safety aspects of spices and herbs, by supporting the effective environmental protection of consumers against possible risks arising from accidental or intentional contamination of spices and herbs (Székács et al., 2018). Therefore, it is logical that divisions and characterizations of raw materials and products, including spices, are created for the needs of various fields of science and broad economic activity, with a particular focus on the food industry. Slightly different against this background are the activities of some authors who create names and definitions for their own purposes. Sometimes they are critical in nature such as the approach to the definition of herbs and spices by Martínez-Graciá et al. (2015), who pointed out that spices are made not only from the green parts of plants but include other elements such as seeds, flowers, fruits, roots and even plant bark. This definition is very accurate, as herbs indeed involve elements of above-ground plant parts. In addition, still Low Dog (2006) and Jiang (2019) will separate among the herbs the so-called culinary herbs, which are used mainly for imparting sensory qualities to dishes. The culinary division of herbs and spices is intended to identify those that affect the flavor and aroma of dishes. Its purpose is to facilitate work in gastronomy and home cooking, and can also be used in the development of new spice blends for specific dishes (Table 3).

The terms herb and spice are often used interchangeably, but we should be aware that they are not the same concepts. Herbs and spices differ in the way they are obtained (because they are come by from different parts of the plant) and in the way they are processed (because we treat fresh, delicate leaves differently than seeds, stems, rhizomes and roots). In this group of food products, in addition to herbs and spices, there are also spice (culinary) herbs. Spice herbs can be defined as herbaceous plants intended for culinary purposes.

In reviewing this study, the authors drew attention to another aspect that has not yet been raised by other authors. Namely, herbs and spices intended for medical and pharmaceutical purposes should meet the requirements for raw materials and medicinal products. On the other

hand, herbs and spices intended for direct consumption, for culinary purposes and in food processing should meet the requirements like all food products, since different requirements and standards are applied for medical products and food products.

What distinguishes spice herbs from herbs intended for medicinal purposes? Culinary herbs are subject to the same controls as all other food products in accordance with Regulation (EC) No 178/2002 (Regulation 178/2002, 2002) and Regulation (EC) No 852/2004 (Regulation 852/2004, 2004) and Commission Regulation (EU) 2023/915 (Commission Regulation 2023/915, 2023). In turn, herbs intended for medicinal purposes are subject to the same control as all medicinal products (Bent, 2008; European Pharmacopoeia).

Conclusions

The multitude of spices, herbs, and the possibilities of their use in food preparation, cosmetics and medicine and other fields make them more recognizable all over the world.

This article was created for review purposes. It presents the existing great voluntariness in defining spices and herbs. The presented definitions have been found in official documents and in scientific papers, where they have been formulated by modern researchers.

The collected literature data allowed to indicate differences in the existing definitions and divisions and confirmed the great diversity of this group of products. The most commonly used divisions of herbs and spices are presented in this review, along with those proposed by the authors. The article was intend to put in order those terms for educational purposes.

Their proper naming, characterization and assignment to particular types is very important. Especially for authors of scientific articles in which research results obtained in a modern way should be properly interpreted. Attention to nomenclature and knowledge of the possible divisions of this group of products may become crucial for researchers dealing with plant products. They must be very methodical and at the same time critical of scientific work in this field.

Nowadays, most articles about plant-based products, including herbs and spices, concern their beneficial effects on the human body and the possibility of their use in various branches of industry.

Herbs and spices intended for medical and pharmaceutical purposes should meet the requirements for medicaments, the same products for food processing and consumption, should meet the standards for food.

Among the many advantages of these products, we should not overlook their negative features. We should be aware that spices may also contain different anti-nutritional ingredients in the form of secondary metabolites such as oxalates or phytates (Ghosh Das, Savage, 2012; Borquaye et al., 2017) and can cause adverse effects on human health, including allergies.

Acknowledgments

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