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# Familiarity, utilization, and preferences concerning herbs and spices among Generation Z consumers

**Abstract.** This study aimed to assess the level of knowledge, use, and preferences regarding herbs and spices among young consumers in Poland. The research objective was accomplished by administering a survey to university students in Poland in 2024. The survey employed a questionnaire as its instrument. The data were analysed using basic statistical methods and factor analysis, utilising the principal component method. The Kruskal-Wallis test was employed to examine the relationship between sociodemographic factors and study variables. University students knew a lot about herbs, such as parsley, garlic, mint, dill, basil, oregano, black pepper, vanilla, and cinnamon. Garlic and black pepper were used the most, along with oregano, mint, and basil. These herbs and spices are mainly used in cooking to improve the smell, taste, and appearance of food. They are not often used for beauty or health purposes. However, students believed these herbs could help calm them, improve digestion, and ease cold symptoms. This research helps us understand what people want in the herb and spice markets. In this way, products can better match what younger consumers like and expect. This information can be used in marketing to promote "healthier eating" and to address health issues. This is especially important as Generation Z consumers begin to influence purchasing decisions and shape culinary trends, including those related to herbs.

**Keywords:** herbs and spices, preferences, use of herbs and spices, health benefits of herbs and spices, quality of fresh herbs

## INTRODUCTION

The market demand for herbs and spices is increasing, with primary interest from food and pharmaceutical companies [Sadowski and Kozłowska-Burdziak 2013]. Herbs are plant-based substances that add flavour to dishes [United States Department of Agriculture 2024]. These herbal plants can be used fresh or dried. The main difference between herbs and spices is the plant part from which they are derived. Herbs usually come from the leaves of plants, whereas spices are derived from the roots, bark, stems, shoots, buds, seeds, or fruits [Dog 2006]. Additionally, they can be obtained from many different plant species. There is a wide variety of culinary herbs and spices, with most originating from temperate zones and fewer from tropical and subtropical zones [ESA 2018]. The flavour of spices comes from volatile and fixed oils, as well as small amounts of resins, although organic acids, alcohols, alkaloids, phenols, sulfur, and esters may also play a role. Plant products also commonly contain proteins, carbohydrates, fibre, minerals, tannins, and vitamins [Rani et al. 2023]. The use of herbs and spices has a centuries-old tradition worldwide. Their role and importance to humans have changed over the centuries, starting from providing power and wealth in the Middle Ages to serving as substitutes for

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money and preserving food, flavouring dishes, and supplementing diets [Jiang 2019]. Currently, the significance of herbs is growing not only in the food sector but also in the cosmetic and pharmaceutical industries, where herbs are ingredients in many over-the-counter medicines, as well as cosmetic preparations and dietary supplements. The properties and uses of herbs have been described in more detail by many authors. Czernyszewicz and Król [2024] suggest that, due to their health-promoting properties and the presence of antioxidants and bioactive components, it is worth considering a broader inclusion of herbs and spices in the diet. The increasing demand for herbs and spices is also driven by consumers' growing interest in a healthy lifestyle and nutrition based on natural ingredients. Literature data confirm the growth of the spice market in terms of value and sales volume. The growth rate, estimated at 10% per year, is a good indicator of the potential of the spice market [Newerli-Guz 2017].

The literature lacks up-to-date information on the knowledge and preferences regarding herbs and spices among Polish Generation Z consumers. However, information is available on the preferences and behaviours of adults in the USA [Isbill et al. 2018, Jiang 2018], in Australia [Wilson et al. 2025], Polish seniors [Newerli-Guz 2018], and school-age children [Parker et al. 2018]. Although all the cited studies concern herbs and/or spices, they differ in the thematic scope of the issues studied. Therefore, this study aimed to assess the level of awareness, use, and preferences related to herbs and spices among young Generation Z consumers in Poland. This group of consumers is important because they will set future dietary trends in Poland. The following specific objectives were adopted:

– C1. Identifying the level of knowledge about herbs and culinary spices among young consumers,
– C2. Identifying the frequency and purpose of herb and spice use by young consumers,
– C3. Identifying young consumers' opinions on the health and culinary benefits of using herbs and spices,
– C4. Determining the hierarchy of quality characteristics of fresh herbs and spices among young consumers,
– C5. Socio-demographic determinants of young consumers' attitudes and opinions regarding herbs and spices.

## LITERATURE BACKGROUND

### The use of herbs throughout the ages

Herbs and spices have played important roles and have been widely used since ancient times, both for culinary and medicinal purposes [Herrera et al. 2020], as well as for cosmetics [Dog 2006]. Fennel, juniper, coriander, caraway, thyme, and garlic were mentioned in Egyptian papyri as early as 1555 BC. Dried mint leaves and garlic cloves were discovered in the tombs of ancient rulers. Hippocrates also used cinnamon, rosemary, and garlic for medicinal purposes [Rani et al. 2023]. Pepper was once used as currency, and cinnamon was more valuable than gold in ancient Egypt. Along with caraway, anise, and other spices, it was used for embalming the dead. Wars were waged and fortunes were made in the pursuit of controlling the spice trade. The literature particularly emphasizes the potential health benefits of culinary herbs and spices, which include improving digestion, having antibacterial, anti-inflammatory, and antioxidant properties, influencing the health of the respiratory and cardiovascular systems, having beneficial effects in cases of diabetes or Alzheimer's dementia, and reducing the risk of developing many chronic diseases, including cancers [Szajdek and Borowska 2004, Dog 2006, Kudełka and Kosowska 2008, Opara et al. 2014, Fifi et al. 2018, Jiang 2019, Rani et al. 2023, Grigore-Gurgu et al. 2025]. Additionally, they are less compared to medications. Phytochemicals present in herbs and spices are a healthy alternative for reducing fat, salt, and sugar in the diet and are considered vitamins of the 21st century. As summarised by Chaudhari et al. [2021], herbs and spices as part of the diet have a holistic impact on human health.

### Benefits of using herbs and spices

Herbs and spices are used worldwide primarily as food additives, to improve sensory qualities, extend shelf life, and reduce or eliminate microorganisms. Herbs can also be used to treat various dis-

eases in both animals and humans [Studzińska-Sroka et al. 2018]. Many studies have demonstrated the health-promoting effects of herbs and spices, owing to their anti-inflammatory, antimutagenic, antioxidant, and immune-modulating properties [Rani et al. 2023]. The most robust evidence of effectiveness has been gathered for green tea and turmeric. In the case of turmeric, potential health benefits include cancer, cardiovascular diseases, metabolic disorders, and neurodegenerative disorders [Herrera 2020]. Herbs and spices affect cognitive functions and mood [Tapsell et al. 2006, Jiang 2019]. Moreover, they naturally produce a wide range of secondary metabolites – phytochemicals – which are used as medicines, fragrances, aromatic compounds, dyes, and agrochemicals with multifunctional pharmacological and therapeutic actions. Their significance is increasing in the prevention and treatment of diseases, such as arthritis, cancer, rheumatism, diabetes, immune, and metabolic problems [Pereira et al. 2019, Charneca et al. 2023, Rani et al. 2023]. Herbs such as cloves, rosemary, sage, oregano, and cinnamon are excellent sources of antioxidants because of their high content of phenolic compounds. According to the American National Health and Nutrition Examination Survey, 5–10% of adults in the United States use botanical supplements, such as spices, because of their health benefits. Increased use may partly result from the lack of side effects associated with spices, greater availability compared to traditional medicines, as well as the well-known health benefits of spices [Studzińska-Sroka et al. 2018, Jiang 2019]. In addition to providing antioxidants and other properties, herbs and spices can be used in the diet to partially or completely replace less desirable ingredients, such as salt, sugar, and saturated fats, for example, in marinades and dressings, casseroles, soups, curries, and Mediterranean cuisine [Tapsell et al. 2006, Markowska et al. 2015, Farapti et al. 2024]. However, according to research by Śmiechowska and Kaczmarczyk [2014], spice blends can also be a significant source of table salt, as a dish prepared with their addition can contribute 20–47% of dietary salt intake. Herbs and spices can also be contaminated with pathogenic microorganisms, especially when used as an addition to ready-to-eat foods that do not undergo further processing [Maćkiw et al. 2019]. Additionally, herbs and spices are used to preserve the natural characteristics of foods or to provide them with the attributes desired by consumers, extend shelf life, or decorate dishes [Markowska et al. 2015]. According to many researchers, there is a need for further studies to understand the mode of action of the "phytochemomics" of most herbs and spices, which may help improve their efficacy [Opara at al 2014, Herrera 2020]. Studies show that adding herbs and spices to dishes can improve the taste and willingness to consume certain vegetables among adolescents, who generally eat fewer fruits and vegetables compared to dietary recommendations [D'Adamo et al. 2016, Dougkas et al. 2018, Fritts et al. 2018, Parker et al. 2018], as well as the acceptability of foods with reduced fat [Peters et al. 2014] and sodium content [Ghawi et al. 2014, Farapti et al. 2024].

**Perception of the quality of herbs and spices**

The most important factors influencing the quality of herbs and spices are the conditions in which the raw materials are cultivated and harvested, as well as ensuring proper conditions for subsequent drying and storage processes, which help preserve valuable components [Newerli-Guz 2009, Sadowski and Kozłowska-Burdziak 2013, Majkowska-Gadomska et al. 2015]. Regarding cultivation conditions, key factors include soil fertility, amount of sunlight, rainfall levels, and the presence of pathogens. Herbs and spices are susceptible to environmental contaminants, including microbiological contamination, heavy metals, and pesticide residues, all of which pose a risk to consumer health [Carpena et al. 2024, Kanabus et al. 2026]. Microbiological contamination can be prevented by applying good practices during cultivation, harvesting, and processing [Cicero et al. 2022]. Basic tests that precede the assessment of the value of plant raw materials include analyses of water (moisture) content, ash, mineral, and organic impurities, for example, parts of foreign plants, while the rules for controlling contaminants in substances used for pharmaceutical purposes are specified in the Polish and European Pharmacopeia [Markiewicz 2016]. The cultivation method affects the concentration of active compounds, as studies have shown that organic herbs contain significantly higher levels of total polyphenols, flavonoids, and phenolic acids compared to conventional herbs, whereas conventionally grown herbs have a higher content of chlorophyll and carotenoids [Kazimierczak et al. 2017, Hallmann and Sabała 2020]. The drying process can also alter the quality of herbal products; therefore, standardisation of post-harvest activities is necessary to ensure the consistency of herbal products

[Król and Kiełtyka-Dadasiewicz 2015, Nowosad and Sujka 2021, Massarioli et al. 2023]. As consumer awareness grows, the authenticity and purity of herbal products are becoming increasingly important. Therefore, the perceived quality of herbs and spices is also influenced by the credibility of the source because of the high risk of adulteration [Newerli-Guz 2011]. Adulteration undermines trust in products and does not guarantee the appropriate concentration of active compounds, which are crucial to their medicinal, culinary, and sensory properties (such as aroma and taste), thus necessitating regular quality control of products [Czernyszewicz and Król 2024]. The evaluation of sensory properties allows the determination of aromatic profiles using chromatographic analysis, whereas the evaluation of chemical properties determines the concentration of active substances. The perceived quality of herbs and spices is influenced by their intended use and the expectations regarding their culinary (taste, aroma) or medicinal applications (e.g., safety and effectiveness of calming or antioxidant effects) [Newerli-Guz 2009, 2018]. An important element of the quality of fresh herbs and spices is freshness, which can be assessed by the intensity of the aroma and appearance (vivid colour, absence of pathogens and damage). The form in which the products are offered also matters; for example, whole fresh or dried plants contain more active ingredients than ground ones, which may also contain undesirable additives such as preservatives or artificial colourings [Bienia and Baran 2021]. Producer reputation [Newerli-Guz and Śmiechowska 2006, Newerli-Guz 2009, 2011, 2018 ] and opinions of other users concerning the effectiveness and quality of products also play a role in quality assessment. This may be due to the belief that well-established companies on the market pay more attention to the high quality of their products. In contrast to these findings, studies conducted in Indonesia showed that brand was an attribute of low significance [Suryaningrum et al. 2024].

## MATERIAL AND METHODS

The study was conducted in 2024. The research tool used was a survey questionnaire, and the research method was a diagnostic survey. The study involved 308 adults, mainly students from a university with a nature and agriculture profile in Poland. Their selection was based on their easy accessibility to the researcher. The importance of students' participation in scientific research is highlighted, among others, by Qian et al. [2022] and Gelinder et al. [2022]. Including students in such studies is part of a trend observed by Simonson et al. [2001]. This group of respondents holds significant importance in the modern economy. Members of Generation Z will gain increasing influence; therefore, companies, including food enterprises, must be prepared for their needs and take them into account in their business strategies. Although their current income is lower than that of older generations, their purchasing power should not be underestimated [Thangavel et al. 2022]. This group already has or will soon form households and is already making or will soon be making food purchasing decisions. Their consumption is more often based on ethics, dialogue, freedom, openness, and individual expression [Francis and Hoefel 2018]. In this study, students participated on a voluntary basis, and their participation was not related in any way to their studies; their behaviour during the study had no impact whatsoever on their grades in regular academic classes. The study was conducted using the direct survey method. Before the study began, students were asked to give their consent to participate. Before filling out the survey, they were informed of the purpose and essence of the study, as well as the nature of the questions. Paper surveys were handed out to a group of students and collected after being completed in writing. Completing the survey took about 10 minutes. A small group of older students studying in the part-time system (21 people) was also included in the study. The survey questions were divided into two sections. One section contained 10 questions related to the subject of the study, and the other 7 questions aimed to describe the respondents according to characteristics such as gender, age, education level, disposable income per family member, place of residence, main source of income, and general physical activity. The questions in the first section concerned the level of knowledge about 32 herbs and spices, frequency of use, purpose of use, health and culinary benefits from using herbs and spices, evaluation of the availability of fresh and dried herbs and spices, general assessment of the quality and availability of fresh herbs and spices at the place of daily shopping, and evaluation of their quality features. The purpose of using herbs and spices, as well as the health and culinary benefits,

were defined based on a literature review. The form contained closed or semi-open questions (with the option "other, which?") with single-choice answers, scaled on a 5-point knowledge scale and a 7-point frequency of use scale. Questions regarding health and culinary benefits and quality assessment were scaled on a 5-point Likert scale with a neutral midpoint. Descriptive statistics (% of indications) were used in the data analysis, as well as factor analysis using the principal components method with Varimax rotation and Kaiser normalization, following the prior execution of the Kaiser–Meyer–Olkin and Bartlett's tests. This analysis allows the number of variables (features) in a dataset to be reduced, whilst retaining as much of the information contained in the original data as possible. As a result, PCA helps to identify hidden patterns and the structure of the data, thereby facilitating the interpretation of complex datasets [Czopek 2026]. To examine the significance of relationships between socio-demographic variables and the studied variables, the non-parametric Kruskal–Wallis test was applied. Inference was conducted at a significance level of $\alpha < 0.05$. Statistical analysis was carried out using IBM SPSS 29. The study demonstrated high reliability of 0.948, as determined by Cronbach's alpha coefficient based on 120 standardized items. The characteristics of the study sample, taking into account socio-demographic features, are presented in Table 1.

Table 1. Characteristics of the respondent sample

| Main parameter | Detailed parameter | Percentage of respondents |
|---|---|---|
| Gender | woman | 69.7 |
| | man | 28.8 |
| | non-binary person | 0.8 |
| | I don't want to say | 0.8 |
| Age | 18–25 years old | 88.6 |
| | 26 or more years | 11.4 |
| Education | secondary or post-secondary | 41.7 |
| | incomplete higher education | 34.1 |
| | higher | 24.2 |
| Place of residence | village or settlement | 44.3 |
| | city with up to 10,000 inhabitants | 8.4 |
| | city with 10,000–100,000 inhabitants | 19.1 |
| | city with more than 100,000 inhabitants | 28.2 |
| Disposable income per family member | up to 2,000 PLN | 25.2 |
| | 2,000–4,000 PLN | 46.5 |
| | above 4,000 PLN | 28.3 |
| Main source of income in the family | wage labour in a manual worker position | 32.6 |
| | salaried employment in a non-manual position | 23.3 |
| | work in agriculture | 22.5 |
| | own non-agricultural business | 12.4 |
| | retirement or pension | 5.4 |
| | non-profit sources | 3.9 |
| Physical activity | very low | 3.1 |
| | low | 11.5 |
| | average | 54.2 |
| | high | 20.6 |
| | very high | 10.7 |

In the surveyed group, nearly 70% of respondents were women. The dominant age group was 18–25 years old, accounting for 88.9% of all participants. Almost 41% of respondents had completed secondary or post-secondary education, 34.1% had some higher education, and 24.2% had completed higher education. The participants lived mainly in rural areas or settlements (44.3%), nearly one in three (28.2%) in cities with more than 100,000 residents, and one in five (19.1%) in cities with a population of 10,000–100,000. Nearly half of the respondents (46.5%) had a disposable family income per person of 2,000 to 4,000 PLN, one in four had up to 2,000 PLN, while an income above 4,000 PLN was reported by 28.3%. The main source of income for the family was wage labour in a blue-collar position (32.6%), and for more than every fifth respondent, it was wage labour in a non-blue-collar position or agricultural work. Non-earned sources of income were reported by 3.9% of the respondents (Table 1). Most respondents described their physical activity as average (54.2%), 20.6% as high, and 10.7% as very high. Only 14.6% of respondents described their physical activity as low or very low.

## RESULTS AND DISCUSSION

Research shows that the largest percentage of respondents (13.5%) are not familiar with fennel (Florence fennel) at all, as well as anise (11.3%) and fenugreek (15.8%). The largest share of respondents know only the name of nigella, coriander, and fennel, as well as saffron, fenugreek, cardamom, and anise; they recognize what fennel, nigella, coriander, lavender, and sage look like, as well as saffron, fenugreek, cardamom, and mustard; they know what coriander, rosemary, and sage taste like, as well as thyme and nigella, and also nutmeg, cardamom, and mustard. They are especially familiar with parsley, garlic, and mint, as well as dill, basil, and oregano, as well as black pepper, vanilla, and cinnamon (Tables 2 and 3). Curry, ginger, bay leaf, sesame, vanilla, and cloves are also very well known. In the study by Żwirska et al. [2015], the most widely known spices with medicinal properties were garlic and ginger, and the main source of knowledge about spices was information on packaging. A small percentage of people indicated that their source of information was from the seller. Meanwhile, a survey conducted among adults in the Midwestern United States [Isbill et al. 2018] showed that most (>50%) participants were familiar with, knew, or used 8 out of the 10 spices listed in the study. Spices constitute a specific group of food products, consumed in small amounts, but on a daily basis. In studies by Newerli-Guz [2009], it was shown that over 90% of consumers mainly use pure spices in the kitchen, 67.3% declare using spice mixes, and 22.1% indicate using herbs, both dried and fresh. The research shows that respondents use primarily garlic and black pepper “very often” or “often,” as well as oregano, mint, and basil (Table 4). The highest percentage of respondents “definitely never” use valerian, saffron, and anise, while “never” use fenugreek and valerian. In American studies, the majority of adult respondents (54%) use one or more spices daily. The participants believed that ginger (64%), garlic (58%), and cinnamon (56%) may promote good health and well-being. Furthermore, most participants listed 7 ut of 10 spices as effective in preventing specific diseases, including ginger (72%), garlic (68%), and cinnamon (67%) [Isbill et al. 2018]. In contrast, a cross-sectional study conducted among Australian adults showed that 64.3% of them use herbs and spices 1–2 times a day. Herbs and spices are commonly used in Australian households, mainly during lunch and dinner, with basil, pepper, and garlic being the most popular [Wilson et al. 2025]. The respondents in the presented study use herbs and spices often or very often, primarily for meal preparation and to enhance the aroma of dishes, while they use them very rarely for cosmetic and therapeutic purposes or other reasons not listed in the survey options (Table 5). In studies conducted by Newerli-Guz [2018] among senior consumers, the declared use of herbs and spices was rather traditional, associated with flavoring food. All senior respondents used herbs and spices for culinary purposes, while slightly less than half used them for the prevention and treatment of specific ailments. The most decisive factor for purchasing spices was the advertisement of these products, followed by new culinary ideas and the lack of a particular spice at home. When purchasing spices, important factors were the brand and the price of the product. Senior respondents preferred products from well-known and recognized brands. Some respondents grew their own spices and made preserves with them [Newerli-Guz 2018].

Table 2. Level of knowledge of herbs among respondents (% of indications)

| Species | I don't know at all | I only know the name | I know what it looks like | I know what it tastes like | I know very well |
|---|---|---|---|---|---|
| basil | 1.5 | 3.8 | 3.0 | 13.5 | 78.2 |
| black cumin | 2.3 | 14.3 | 15.8 | 18.0 | 49.6 |
| garlic | 1.5 | 1.5 | 1.5 | 7.5 | 88.0 |
| coriander | 3.8 | 14.3 | 15.8 | 27.8 | 38.3 |
| dill | 0.0 | 0.8 | 4.5 | 12.8 | 82.0 |
| marjoram | 2.3 | 4.5 | 3.0 | 15.8 | 74.4 |
| mint | 0.0 | 0.8 | 3.8 | 7.6 | 87.9 |
| lavender | 0.8 | 3.0 | 14.3 | 14.3 | 67.7 |
| sage | 1.5 | 9.8 | 17.3 | 19.5 | 51.9 |
| thyme | 2.3 | 6.8 | 11.3 | 18.8 | 60.9 |
| rosemary | 3.0 | 6.8 | 9.8 | 20.3 | 60.2 |
| chamomile | 0.8 | 4.5 | 9.8 | 11.3 | 73.7 |
| oregano | 0.8 | 1.5 | 4.5 | 12.8 | 80.5 |
| parsley | 0.8 | 0.0 | 5.3 | 6.8 | 87.2 |
| fennel | 13.5 | 12.8 | 15.8 | 15.8 | 42.1 |
| chili pepper | 1.5 | 1.5 | 4.5 | 15.0 | 77.4 |

Table 3. Level of knowledge of herbs and spices among the study group (% of indications)

| Species | I don't know at all | I only know the name | I know what it looks like | I know what it tastes like | I know very well |
|---|---|---|---|---|---|
| curry | 0.8 | 3.8 | 4.5 | 13.5 | 77.4 |
| anise | 11.3 | 20.3 | 18.8 | 21.8 | 27.8 |
| cinnamon | 0.0 | 0.0 | 4.5 | 14.3 | 81.2 |
| nutmeg | 0.8 | 8.3 | 15.8 | 26.3 | 48.9 |
| mustard seed | 0.0 | 6.0 | 20.3 | 18.0 | 55.6 |
| cloves | 0.0 | 5.3 | 9.0 | 15.0 | 70.7 |
| ginger | 0.0 | 0.8 | 6.8 | 12.8 | 79.7 |
| cardamom | 5.3 | 21.1 | 22.6 | 18.8 | 32.3 |
| fenugreek | 15.8 | 22.6 | 24.1 | 15.8 | 21.8 |
| turmeric | 2.3 | 10.7 | 11.5 | 17.6 | 58.0 |
| caraway | 0.8 | 10.5 | 17.3 | 13.5 | 57.9 |
| bay leaf | 0.0 | 1.5 | 8.3 | 13.5 | 76.7 |
| black pepper | 0.0 | 1.5 | 3.0 | 3.8 | 91.7 |
| sesame | 0.0 | 6.0 | 3.8 | 12.0 | 78.2 |
| saffron | 7.5 | 24.1 | 31.6 | 15.8 | 21.1 |
| vanilla | 0.0 | 2.3 | 2.3 | 12.8 | 82.7 |

Table 4. Frequency of use of herbs and spices (% of indications)

| Species of herb or spice | Definitely never | Never | Rather never | Hard to say | Rather often | Often | Very often |
|---|---|---|---|---|---|---|---|
| anise | 32.6 | 14.4 | 22.7 | 22.7 | 5.3 | 2.3 | 0.0 |
| basil | 2.3 | 1.5 | 4.5 | 7.6 | 27.3 | 22.0 | 34.8 |
| curry | 3.8 | 1.5 | 11.4 | 19.7 | 22.0 | 19.7 | 22.0 |
| cinnamon | 3.0 | 3.0 | 9.1 | 22.7 | 22.0 | 14.4 | 25.8 |
| black cumin | 12.9 | 9.1 | 21.2 | 25.8 | 12.9 | 9.1 | 9.1 |
| garlic | 0.8 | 0.8 | 2.3 | 4.6 | 9.9 | 26.7 | 55.0 |
| fennel | 22.1 | 10.7 | 16.8 | 16.8 | 19.1 | 9.9 | 4.6 |
| nutmeg | 12.1 | 8.3 | 18.2 | 23.5 | 25.8 | 9.8 | 2.3 |
| mustard seed | 15.9 | 10.6 | 18.2 | 24.2 | 18.2 | 7.6 | 5.3 |
| cloves | 9.1 | 3.8 | 18.2 | 23.5 | 21.2 | 17.4 | 6.8 |
| ginger | 6.8 | 4.5 | 10.6 | 23.5 | 22.0 | 18.2 | 14.4 |
| cardamom | 18.2 | 12.9 | 28.0 | 21.2 | 11.4 | 4.5 | 3.8 |
| caraway | 14.4 | 9.1 | 23.5 | 28.0 | 9.8 | 7.6 | 7.6 |
| coriander | 12.3 | 10.0 | 20.8 | 28.5 | 11.5 | 10.0 | 6.9 |
| dill | 3.8 | 6.8 | 5.3 | 14.4 | 25.8 | 23.5 | 20.5 |
| fenugreek | 27.7 | 18.5 | 20.0 | 20.0 | 8.5 | 3.8 | 1.5 |
| turmeric | 11.4 | 7.6 | 15.9 | 16.7 | 18.2 | 17.4 | 12.9 |
| lavender | 21.2 | 10.6 | 18.2 | 25.0 | 13.6 | 6.1 | 5.3 |
| bay leaf | 1.5 | 3.8 | 6.1 | 18.2 | 22.0 | 23.5 | 25.0 |
| marjoram | 3.0 | 3.0 | 6.8 | 11.4 | 28.0 | 25.8 | 22.0 |
| melissa | 6.1 | 8.3 | 8.3 | 16.7 | 19.7 | 20.5 | 20.5 |
| mint | 2.3 | 4.5 | 1.5 | 9.8 | 22.0 | 26.5 | 33.3 |
| oregano | 3.8 | 3.8 | 1.5 | 9.1 | 18.9 | 22.7 | 40.2 |
| chili pepper | 5.3 | 3.0 | 4.5 | 14.4 | 27.3 | 21.2 | 24.2 |
| black pepper | 0.8 | 0.8 | 2.3 | 3.1 | 13.7 | 18.3 | 61.1 |
| parsley | 1.5 | 3.8 | 3.0 | 11.4 | 25.0 | 16.7 | 38.6 |
| nettle | 12.9 | 7.6 | 15.2 | 22.7 | 15.2 | 16.7 | 9.8 |
| rosemary | 11.4 | 3.0 | 17.4 | 20.5 | 18.2 | 19.7 | 9.8 |
| chamomile | 9.1 | 8.3 | 16.7 | 18.9 | 22.0 | 12.1 | 12.9 |
| sesame | 11.4 | 5.3 | 19.7 | 19.7 | 22.7 | 15.9 | 5.3 |
| saffron | 31.8 | 15.5 | 27.1 | 17.1 | 3.1 | 4.7 | 0.8 |
| sage | 18.5 | 13.1 | 24.6 | 20.8 | 16.9 | 3.1 | 3.1 |
| valerian | 35.4 | 19.2 | 20.8 | 15.4 | 4.6 | 3.8 | 0.8 |
| thyme | 9.9 | 7.6 | 15.3 | 22.1 | 16.8 | 18.3 | 9.9 |
| vanilla | 4.5 | 3.0 | 9.8 | 33.3 | 15.2 | 19.7 | 14.4 |

Other studies, however, indicate that more and more Americans are considering the use of spices and herbs for medicinal and therapeutic purposes, particularly to address various chronic diseases, alleviate symptoms, and in the treatment and management of common health problems [Jiang 2019]. Research indicates that the daily consumption of herbs and spices may potentially contribute to improved health [Herrera et al. 2020]. According to consumers surveyed by Newerli-Guz [2009], the composition, and therefore the taste of a spice, was the most important factor influencing purchase decisions. For this reason, 96.2% of respondents believed that spices enhance the flavour of dishes when used in appropriate amounts; the remaining part of the surveyed population used them without giving it much thought [Newerli-Guz 2009].

Table 5. Purpose of using herbs and spices (% of indications)

| The purpose | Very rarely | Rarely | Hard to say | Often | Very often |
|---|---|---|---|---|---|
| meal preparation | 0.8 | 1.5 | 0.8 | 18.2 | 78.8 |
| preparation of beverages | 11.5 | 16.8 | 22.1 | 22.9 | 26.7 |
| food preservation | 21.4 | 19.1 | 19.1 | 20.6 | 19.8 |
| improvement of dish aroma | 2.3 | 1.5 | 9.1 | 23.5 | 63.6 |
| cosmetic procedures | 38.6 | 19.7 | 21.2 | 14.4 | 6.1 |
| air freshening | 35.1 | 21.4 | 22.9 | 16.8 | 3.8 |
| therapeutic goals | 37.7 | 17.7 | 15.4 | 20.0 | 9.2 |
| medicinal purposes | 25.8 | 11.4 | 21.2 | 24.2 | 17.4 |
| decorative axes | 31.5 | 16.9 | 22.3 | 21.5 | 7.7 |
| other | 63.2 | 5.3 | 10.5 | 15.8 | 5.3 |

Table 6. Rotated component matrix concerning the purposes of using herbs and spices

| Variables | Component* | |
|---|---|---|
| | 1 | 2 |
| meal preparation | 0.009 | 0.861 |
| preparation of beverages | 0.469 | 0.442 |
| food preservation | 0.311 | 0.418 |
| improvement of dish aroma | 0.083 | 0.854 |
| cosmetic procedures | 0.765 | 0.138 |
| air freshening | 0.755 | 0.157 |
| therapeutic goals | 0.813 | 0.089 |
| medicinal purposes | 0.796 | 0.129 |
| decorative axes | 0.727 | 0.104 |

* factor extraction method – principal components, rotation method – Varimax with Kaiser normalization

After applying factor analysis, two groups of purposes for using herbs and spices were identified, which explain 58% of the variance in the results. The first component included purposes not related to food, such as cosmetic, therapeutic, medicinal, decorative goals, and those related to air freshening. The second component comprised purposes directly associated with food, such as meal preparation, food preservation, and enhancing the aroma of dishes (Table 6). Among the many health benefits of using herbs and spices, young respondents “strongly agree” or “agree” that these products have

a calming effect, improve digestion, help with intestinal problems, and are used in fighting colds (Table 7). Nearly one in five respondents "disagree" or "strongly disagree" that herbs and spices can be used for obesity issues and in anti-cancer therapy (18.9%). A cross-sectional survey conducted among 703 adults in the Midwest United States showed that nearly half of the participants were interested in learning about the health benefits of using spices (48%) and in using spices as complementary and alternative medicine (51%) [Isbill et al. 2018]. In studies conducted by Żwirska et al. [2015], only every second respondent had knowledge about the health-promoting values of herbal spices. The culinary benefits of using herbs and spices, according to the vast majority of respondents, are associated with improving the taste, aroma, and appearance of dishes (Table 8).

Table 7. Health benefits of using herbs and spices (% of indications)

| Health benefits of using herbs and spices | I definitely do not agree | Do not agree | I don't know | I agree | I definitely agree |
|---|---|---|---|---|---|
| improvement of well-being | 3.8 | 2.3 | 24.2 | 37.1 | 32.6 |
| calm | 2.3 | 2.3 | 12.1 | 47.0 | 36.4 |
| for cough | 1.5 | 5.3 | 14.4 | 49.2 | 29.5 |
| against colds | 1.5 | 3.0 | 15.2 | 43.9 | 36.4 |
| for headache | 3.8 | 7.6 | 33.3 | 35.6 | 19.7 |
| for toothache | 5.3 | 8.3 | 29.5 | 37.1 | 19.7 |
| for intestinal problems | 2.3 | 1.5 | 14.4 | 45.5 | 36.4 |
| improved digestion | 3.8 | 1.5 | 12.1 | 38.6 | 43.9 |
| for skin problems | 3.8 | 5.3 | 22.7 | 41.7 | 26.5 |
| for hair problems | 3.0 | 6.8 | 22.7 | 39.4 | 28.0 |
| for problems with obesity | 9.1 | 9.8 | 37.1 | 25.8 | 18.2 |
| for problems with diabetes | 7.6 | 4.5 | 35.6 | 34.1 | 18.2 |
| against inflammation | 4.5 | 3.8 | 23.5 | 43.2 | 25.0 |
| for wound healing | 5.3 | 4.5 | 28.0 | 37.1 | 25.0 |
| for cardiovascular diseases | 6.1 | 4.5 | 36.4 | 32.6 | 20.5 |
| in anti-cancer therapy | 9.8 | 9.1 | 43.9 | 22.7 | 14.4 |
| providing vitamins | 3.0 | 2.3 | 18.2 | 45.5 | 31.1 |
| delivery of bioactive compounds | 5.3 | 2.3 | 33.3 | 34.8 | 24.2 |
| for therapeutic baths | 7.6 | 3.8 | 27.5 | 35.1 | 26.0 |
| in aromatherapy | 6.1 | 3.8 | 20.5 | 35.6 | 34.1 |
| for other health problems | 5.3 | 3.2 | 36.2 | 33.0 | 22.3 |

Table 8. Culinary benefits of using herbs and spices (% of indications)

| Culinary benefits | I definitely do not agree | I don't agree | I don't know | I agree | I definitely agree |
|---|---|---|---|---|---|
| improving the taste of dishes | 0.8 | 0.0 | 1.5 | 15.9 | 81.8 |
| improvement of the aroma of dishes | 0.0 | 0.8 | 5.3 | 16.7 | 77.3 |
| improving the appearance of dishes | 1.5 | 2.3 | 9.1 | 28.0 | 59.1 |
| improving the shelf life of dishes | 3.0 | 6.8 | 31.1 | 24.2 | 34.8 |
| reduction of salt consumption | 3.1 | 9.9 | 31.3 | 28.2 | 27.5 |
| limitation of microbial growth | 4.5 | 7.6 | 48.5 | 18.9 | 20.5 |
| other | 9.4 | 0.0 | 62.5 | 15.6 | 12.5 |

This is partially confirmed by research conducted by Parker et al. [2018], which found that the way food was prepared and its taste were the most common reasons why children did not eat vegetables at school. Therefore, it was recommended to change the taste, appearance, and method of preparation of meals with vegetables. Black pepper and curry were the most frequently mentioned favourite spices/herbs, and recipes based on garlic were preferred compared to simple recipes in sensory evaluations of peas, black beans/corn, and a mix of cauliflower, carrots, and broccoli [Parker et al. 2018]. The urveyed students "disagree" or "strongly disagree" that herbs and spices can reduce salt consumption or limit the growth of microorganisms. However, the research conducted by Farapti et al. [2024] suggests that the use of herbs and spices is an effective method of managing a low-sodium diet, especially among older adults, and that taste preferences play a more important role in food choices than taste sensitivity. After applying factor analysis, two groups (components) of culinary benefits were identified, which explain over 77% of the variability in the results. The first component included benefits related to food storage and improved dietary value, such as reduced salt usage, longer shelf life, and limitation of microbial growth, among others. The second component encompassed culinary benefits directly related to the organoleptic properties of dishes, such as improving the taste, aroma, and appearance of foods (Table 9). According to the young consumers surveyed, fresh herbs and high-quality spices should above all be characterized by freshness, proper aroma, and lack of damage (Table 10). On the other hand, the variety of species available, appropriate packaging, convenient store location, and price definitely do not or do not significantly affect the high quality of herbs and spices. After applying factor analysis, two groups of herb and spice quality attributes were identified, which explain over 54% of the variability in the results. The first component included attributes resulting from the properties of the product, such as freshness, proper aroma, lack of damage, and absence of chemical residues. The second component encompassed attributes stemming from the sellers' marketing activities, such as a wide selection of varieties, appropriate size, suitable packaging, price, and convenient store location (Table 11).

Table 9. Rotated component matrix concerning the culinary benefits of using fresh herbs and spices

| Variables | Component* | |
|---|---|---|
| | 1 | 2 |
| improving the taste of dishes | 0.249 | 0.908 |
| improvement of the aroma of dishes | 0.250 | 0.933 |
| improving the appearance of dishes | 0.329 | 0.824 |
| improving the shelf life of dishes | 0.783 | 0.330 |
| reduction of salt consumption | 0.725 | 0.310 |
| limitation of microbial growth | 0.891 | 0.154 |
| other | 0.765 | 0.235 |

* factor extraction method – principal components, rotation method – Varimax with Kaiser normalization

Table 10. Characteristics of high-quality fresh herbs and spices (% of indications)

| Quality characteristics of fresh herbs and spices | Definitely has no impact | Has no impacts | I have no opinion | Has a big impact | Has a very big impact |
|---|---|---|---|---|---|
| wide selection of species | 3.1 | 11.7 | 26.6 | 31.3 | 27.3 |
| freshness | 0.8 | 1.5 | 8.5 | 34.6 | 54.6 |
| appropriate size/quantity | 1.5 | 3.8 | 21.5 | 46.2 | 26.9 |
| proper aroma | 1.5 | 1.5 | 6.9 | 40.0 | 50.0 |
| appropriate packaging | 3.1 | 10.1 | 21.7 | 36.4 | 28.7 |
| price | 3.1 | 6.9 | 19.2 | 33.8 | 36.9 |
| no damage | 1.5 | 2.3 | 13.1 | 32.3 | 50.8 |
| convenient location in the store | 4.7 | 7.0 | 31.8 | 23.3 | 33.3 |
| no chemical residues | 0.8 | 1.6 | 13.7 | 29.0 | 54.8 |

Table 11. Rotated component matrix concerning the characteristics of high-quality fresh herbs and spices

| Variables | Component* | |
|---|---|---|
| | 1 | 2 |
| wide selection of species | 0.211 | 0.609 |
| freshness | 0.838 | 0.105 |
| appropriate size/quantity | 0.364 | 0.444 |
| proper aroma | 0.830 | 0.222 |
| appropriate packaging | 0.318 | 0.520 |
| price | 0.128 | 0.755 |
| no damage | 0.473 | 0.454 |
| convenient location in the store | –0.035 | 0.830 |
| no chemical residues | 0.763 | 0.126 |

* factor extraction method – principal components, rotation method – Varimax with Kaiser normalization

Studies by Newerli-Guz [2009, 2011] indicate that spices, in particular, can be classified as products that stand out in the market due to strong promotion of brands with a distinctive image, where the brand is an important selection factor and buyer behaviour during purchase is characterized by high brand loyalty. On the Polish market, branded spices – especially those from the company Kamis – were purchased most often, despite their significantly higher prices compared to private label spices [Newerli-Guz 2009]. The analyses conducted showed that the factor most strongly differentiating knowledge, use, and preferences regarding herbs and spices is the gender of the respondents. Other socio-demographic characteristics had a limited impact on significant differences in respondents' answers. Research by other authors indicates that when planning activities to encourage the consumption of vegetables through the use of herbs and spices, it is crucial to take into account the socio-demographic characteristics of the target group [Nikolaus et al. 2017]. The gender of the respondents significantly differentiated the knowledge and frequency of use of many types of herbs and spices, their purpose of use – including meal preparation, making beverages, enhancing the aroma of dishes, and for medicinal purposes – as well as the evaluation of health benefits such as improving digestion, preventing skin and hair problems, anti-inflammatory effects, wound healing, and aromatherapy. This characteristic significantly influenced and differentiated the assessment of the choice of fresh herbs and spices at the point of food purchase and had a significant impact on the evaluation of the quality of fresh herbs in terms of features such as freshness, absence of damage, and convenient store location. The age of respondents significantly differentiated opinions regarding familiarity with certain herbs and spices, including mustard, frequency of use of anise, black cumin, mustard, cardamom, caraway, coriander, lavender, marjoram, parsley, and valerian, the use of herbs for therapeutic purposes, opinions on health benefits, including vitamin supply, as well as the availability of dried herbs and spices at the place where daily shopping is done. In Australian studies, high consumption was positively correlated with age, the number of adults living in the household, and cooking dinner, but negatively correlated with the level of education and having culinary qualifications [Wang and Worsley 2014]. According to the research by Nikolaus et al. [2017], younger respondents (aged 18–29) and respondents who identified as Asian/Pacific Islander or as belonging to another racial group used 19 out of 20 herbs and spices more frequently than their older and respectively White/Caucasian, African American, or Latino counterparts. Furthermore, the use of herbs and spices when cooking vegetables at home was significantly more common among women [Nikolaus et al. 2017]. In the presented studies, education significantly differentiated opinions regarding familiarity with fennel, frequency of parsley use, the use of herbs for decorative purposes, assessment of the health benefits of using herbs and spices in terms of supplying bioactive compounds. Disposable income significantly influenced the knowledge and frequency of use of certain herbs, as well as their use for preventing toothache and for inflammatory conditions. Place of residence significantly differentiated the assessments regarding the quality of fresh herbs and spices available at the location of daily food shopping, as well as the evaluation of the impact of product placement within the store on the quality of fresh herbs and spices. The source of income significantly

differentiated opinions regarding the purpose of using herbs and spices for regulating intestinal problems and improving digestion, as well as the knowledge of mustard. Subjective assessment of physical activity significantly influenced the frequency of using coriander, fenugreek, lavender, and saffron, the perceived health benefits of using herbs and spices for relieving tooth pain and in cancer therapy, as well as the evaluation of the impact of convenient store location on the quality of fresh herbs and spices.

## CONCLUSIONS

1. The research conducted in this study allows us to conclude that young consumers from Generation Z are very familiar with herbs such as parsley, garlic, and mint, as well as dill, basil, oregano, black pepper, vanilla, and cinnamon. Curry, ginger, bay leaf, sesame, vanilla, and cloves are also very well known (C1). Of the 33 herbs, the highest percentage of young respondents were unfamiliar with fennel, anise, and fenugreek.

2. Young consumers use garlic and black pepper "very often" or "often", as well as oregano, mint, and basil. In contrast, they "definitely never" or "never" use valerian, saffron, anise, or fenugreek. They mainly use herbs and spices to prepare meals and enhance the aroma of dishes, while they very rarely use them for cosmetic or therapeutic purposes (C2).

3. Among the many health benefits of using herbs and spices, young Generation Z consumers are convinced that these products have a calming effect, improve digestion, help with intestinal problems, and are used to fight cold (C3). According to the vast majority of respondents, the culinary benefits of using herbs and spices are mainly associated with enhancing the taste, aroma, and appearance of dishes. However, they are not convinced that the use of herbs and spices can reduce salt consumption or limit microbial growth.

4. Two groups of features influence young consumers' opinions about the quality of fresh herbs and spices: those resulting from the product's properties, such as freshness, proper aroma, lack of damage, and absence of chemical residues, and those resulting from sellers' marketing activities, such as a wide selection of varieties, appropriate size, suitable packaging, price, and convenient location in the store. In their opinion, high-quality fresh herbs and spices should primarily be characterised by freshness, proper aroma, and lack of damage (C4).

5. The strongest factor differentiating knowledge, use, and preferences regarding herbs and spices is young consumers' gender (C5). Other sociodemographic characteristics had a lesser impact on significant differences in respondents' answers.

When analysing the results, it is important to consider the limitations related to the study, which mainly stem from the fact that it only included young people studying at one of the agricultural universities in Poland. Therefore, the results apply primarily to the surveyed population of Generation Z students. The academic profiles of the surveyed students may further influence their assessments and views on natural products. Older age groups were not included, which may only reflect the impact of age as a variable on knowledge, use, and preferences regarding herbs and spices to a limited extent. Another limitation is the use of a convenient sampling method, which, by its nature, introduces potential bias and limits the ability to generalise the results.

The conducted research allows for a better understanding of the demand side of the herbs and spices market, enabling a more effective adaptation of these products' offerings to the needs and expectations of young buyers. In contrast, the obtained results concerning the frequency of use of different types of herbs and spices and their quality characteristics may indicate directions for the development of herbal production in Poland and for the herbal industry as a whole, providing valuable guidance for producers and importers of these products. Information about the sought-after quality features of fresh herbs, especially those concerning chemical residues, may suggest a focus on organic production methods. The gathered information can be used in marketing campaigns aimed at promoting "healthier eating" and addressing certain health and other issues in which herbs are used, such as in cosmetics.

Further in-depth research should include people from other age groups, especially older individuals, and examine the culinary and health aspects of using herbs and spices in more detail to use them more consciously and widely for the benefit of consumers' health.

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