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THE NUTRITIONAL AND HEALTH VALUE OF COFFEE, TEA AND HERBAL INFUSIONS®

Wartość odżywcza i zdrowotna kawy, herbaty i naparów z ziół®

Key words: coffee, tea, herbal infusions, caffeine, polyphenols, health-promoting effect.

Coffee and tea are among the most consumed beverages in the world, including in Poland. Coffee, apart from caffeine, contains biologically active substances such as: polyphenols, minerals and vitamin PP. Tea, right after water, is the most-consumed drink in the world. **There are several dozen biologically active compounds in tea, including: polyphenols, organic acids, alkaloids as well as vitamins and minerals.** The changing preferences of consumers also result in the growing popularity of herbal infusions. Many compounds such as: flavonoids, organic acids, saponins, tannins, essential oils, vitamins and minerals are responsible for the bioactive properties of herbs. However, it should be remembered that these drinks may also contain oxalates and acrylamide in coffee, tannins in tea, and heavy metals and pesticide residues in herbal infusions.

Słowa kluczowe: kawa, herbata, napary z ziół, kofeina, polifenole, działanie prozdrowotne.

Kawa i herbata należą do najchętniej spożywanych napojów na świecie, w tym również w Polsce. Kawa oprócz kofeiny zawiera substancje biologicznie aktywne, takie jak: polifenole, składniki mineralne oraz witaminę PP. Herbata, zaraz po wodzie, jest najchętniej spożywanym napojem na świecie. **W herbacie występuje kilkadziesiąt związków biologicznie aktywnych, są to m.in.: polifenole, kwasy organiczne, alkaloidy oraz witaminy i składniki mineralne.** Zmieniające się preferencje konsumentów skutkują również wzrostem popularności naparów z ziół. Za właściwości bioaktywne ziół odpowiadają liczne związki takie jak: flawonoidy, kwasy organiczne, saponiny, garbniki, olejki eteryczne, witaminy i składniki mineralne. Należy jednak pamiętać, że w napojach tych mogą również występować nieobojętne dla zdrowia człowieka szczawiany i akryloamid w kawie, garbniki w herbacie oraz metale ciężkie i pozostałości pestycydów w naparach z ziół.

INTRODUCTION

Coffee and tea are among the most frequently consumed beverages in the world, including in Poland. They are valued primarily for their unique taste and aromatic qualities. The characteristic aroma of coffee - considered one of the most recognizable scents in the world - is part of the morning ritual for many people. In addition to caffeine, coffee contains a number of biologically active substances, including polyphenols with antioxidant properties, minerals and vitamin PP [6]. However, it should be remembered that coffee also contains oxalates and acrylamide which are not indifferent to health [41]. Tea is - right after water - the most-consumed drink in the world. Its popularity is due to its unique taste and health-promoting properties. There are several dozen biologically active compounds in tea, including: polyphenols, organic acids, alkaloids as well as vitamins and minerals. Tea infusion also contains tannins and organic acids (malic, citric, oxalic,

pyruvic, fumaric), which increase the dietary value of tea, but if consumed in excess, these ingredients may have an anti-nutritional effect [37]. Concern for health and the changing preferences of consumers also result in the growing popularity of herbal infusions. The growing interest of consumers in herbal products may be influenced by the ever-expanding range of herbal teas with health-promoting properties. Many compounds such as: flavonoids, organic acids, saponins, tannins, essential oils, vitamins and minerals are responsible for the bioactive properties of herbs. Herbal teas can be a source of heavy metals and pesticide residues. The content of undesirable substances depends on the composition of the soil, the quality of water and air in the place of cultivation, technological processes used in processing the raw material and the use of pesticides. However, it should be remembered that the impact of drinking coffee, tea and herbal infusions on human health depends on the amount consumed, caffeine metabolism rate and other individual characteristics [20, 26].

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Therefore, the aim of this study was to analyze the articles in terms of the nutritional and health value of coffee, tea and herbal infusions.

CHARACTERISTICS AND NUTRITIONAL VALUE OF COFFEE

The name of the coffee probably comes from the Arabic word *kahwa*, which means „removing fatigue by force.” From a botanical point of view, the term „coffee” refers to the fruits and seeds of the plant of the genus *Coffea*, belonging to the Rubiaceae family [2]. The species of the greatest commercial and commodity importance include: *Coffea Arabica* (Arabica coffee) and *Coffea Canephora* (robusta coffee). Arabica, which accounts for over 60% of world production, has a mild flavor and almost twice as low caffeine content as robusta coffee. It also has much higher requirements for growing conditions, but also a higher content of valuable ingredients that shape its unique aroma. Robusta, on the other hand, is distinguished by a strong, distinct taste and greater resistance to disease [43].

Coffee contains over 1,000 biologically active substances. In addition to caffeine (1–2%), green coffee beans contain carbohydrates (59–61%), lipids (10–16%), proteins (10%), chlorogenic acids (7–10%), minerals (4%), aliphatic acids (2%), the alkaloid trigonelline (1%), and free amino acids (<1%). Roasted coffee beans have a slightly different composition: carbohydrates (38–42%), lipids (11–17%), proteins (8%), minerals (5%), chlorogenic acids (3–4%) and free amino acids. aliphatic (3%) and trigonelline (1%) [6]. Of the bioactive substances present in coffee, caffeine is probably the best known compound, but coffee is also rich in other substances that have various effects on the human body. These include chlorogenic and caffeic acid, lactones, diterpenes, vitamin B3, magnesium and potassium [27].

EFFECT OF DRINKING COFFEE ON HUMAN HEALTH

There is no clear answer in the literature as to whether coffee has beneficial effects on human health or whether it has harmful properties. Caffeine is the most consumed psychoactive substance in the world. Its content in one cup (150 ml) of coffee can vary from 30 mg to 175 mg. Most of the scientific publications from recent years indicate, however, that drinking coffee not only has no harmful effects on health, but also has beneficial effects for humans. The observed effect depends on the amount and type of coffee consumed, the appropriate drink preparation, frequency of consumption, individual sensitivity to caffeine, metabolic rate and other individual characteristics [3, 41].

The polyphenolic compounds contained in coffee (mainly chlorogenic, coffee and quinic acids) are characterized by a wide range of biological effects. They include: antitumor activity related to antioxidant activity, reduction of oxidative transformations of LDL cholesterol, which results in inhibition of the formation of atherosclerotic plaque, anti-inflammatory and antibacterial effects, delaying the degradation of vitamin C in the body, or the ability to bind heavy metals from food [43]. The antioxidants contained in coffee contribute to the reduction of oxidative stress and the level of inflammatory

markers, and also protect the integrity of DNA [4]. Therefore, it is assumed that coffee may play a role in the prevention of colon, liver and breast cancer [41].

Available literature data suggest that moderate caffeine consumption (400–600 mg / day) is not associated with an increased risk of developing cardiovascular diseases, arrhythmias, heart failure and hypertension in healthy coffee drinkers. On the other hand, moderate consumption of caffeine may show a protective effect, reducing the risk of cardiovascular diseases [40].

Epidemiological studies indicate that drinking coffee regularly can reduce the likelihood of obesity, especially among people who are genetically predisposed to obesity. Coffee drinking is associated with a lower Body Mass Index (BMI) and may reduce the genetic tendency to obesity [31]. It is believed that compounds contained in coffee also increase the feeling of fullness [4].

Drinking 3–4 cups of coffee a day has been shown to be associated with an approximately 25% reduction in the risk of developing type 2 diabetes, compared to people who do not consume coffee or drink less than 2 cups a day [35]. Possible mechanisms for this action include: thermogenic, antioxidant and anti-inflammatory effects, and effects on microbiome diversity. Caffeine and chlorogenic acid may also inhibit intestinal glucose absorption and reduce hepatic gluconeogenesis. The described beneficial metabolic effects may also be associated with the improvement of insulin secretion by the pancreas and peripheral insulin sensitivity, as well as modulation of the immune system cells [4].

Regular coffee drinking is also associated with a lower risk of neurodegenerative diseases, including Parkinson’s and Alzheimer’s disease, as well as multiple sclerosis, depression, and suicide [31]. Moderate coffee consumption has also been observed to increase blood flow and blood supply to the body, as well as the effect of narrowing of the arteries in the head, thus reducing the tendency to migraine pain [43].

Several epidemiological and prospective studies have shown that coffee consumption is inversely correlated with overall mortality, mortality from cardiovascular disease, and mortality associated with type 2 diabetes, and cancer incidence. Coffee consumption has also been observed to be strongly associated with a reduced risk of certain gastrointestinal diseases, including fatty liver and liver cancer, and improved asthma control [31].

However, too much one-time consumption of caffeine (over 750 mg / day) may cause visual disturbances, tinnitus, a strong feeling of thirst, problems with falling asleep and ventricular contractions [23]. Long-term, excessive consumption of caffeine can lead to addiction and cause arrhythmia, feelings of anxiety, insomnia, over-excitability, headaches and stomach problems. Caffeine may also have an adverse effect in people with mental illnesses, aggravating symptoms and making treatment difficult [43]. It was also found that high caffeine consumption (> 540 mg / day) during pregnancy may cause a number of negative effects, such as an increased risk of miscarriage, premature delivery, fetal growth disorders and low birth weight [1]. Some authors also speculate that caffeine may increase the excretion of calcium in the urine, which in turn contributes to a reduction in bone mineral density and

an increased risk of fractures. Oxalates, present in coffee infusions in significant amounts, can pose a threat to health. The precipitation of calcium oxalate in the tissues leads to the formation of kidney stones, and the binding of metals by oxalic acid may result in a deficiency of calcium, magnesium, iron and manganese. Coffee is also a source of acrylamide, which has been designated a “potentially carcinogenic compound in humans” by the IARC (International Agency for Research on Cancer) [41].

COFFEE CONSUMPTION IN POLAND

According to GUS data, the consumption of coffee per capita in Poland is at the level of 2.16 kg per year [17]. Consumers, when making decisions regarding the choice of coffee, pay attention primarily to the quality of the product, because they value the taste of the coffee drink the most. Important determinants when choosing a coffee are also: convenience, ease of use, price and brand, as well as the country of origin. For Poles, stimulating properties are also very important, which is why they are most likely to drink coffee in the morning and at work. In addition to the coffee quality aspects, nutritional awareness and knowledge as well as the perception of potential health benefits are starting to play a key role in consumers' purchasing decisions [22].

CHARACTERISTICS AND NUTRITIONAL VALUE OF TEA

Tea, due to its taste and health-promoting properties, is one of the most popular beverages in Poland and in the world. The infusion consumed without sugar and other additives has practically zero energy value, but it plays an important role in keeping the body hydrated. There are six basic varieties of tea: black, green, white, red, yellow and Oolong. Different types of teas differ in taste, aroma and properties, which results from different processing methods. Nevertheless, all varieties are produced from the same plant of the *Camellia* species, of the Theaceae family. Two botanical varieties are used for the production of tea – Chinese (*Camellia sinensis*) and Assam (*Camellia assamica*). They differ in the size of shrubs and leaves and the area where they grow wild. *Camellia sinensis* shrubs reach a height of 2.75 m, are resistant to adverse climatic conditions and can be used for up to 100 years. *Camellia assamica* can reach a height of up to 18 m, and its characteristic feature is the presence of numerous silvery hairs on the underside of large leaves. Assam tea has a more intense aroma, it is drier and more tart [11, 21, 34].

Tea contains numerous biologically active compounds that have a multidirectional effect and affect the characteristic taste, aroma and color of infusions. These include, among others: flavonoids, essential oils, purine alkaloids, amino acids, vitamins and minerals (including fluorine). Tea infusion also contains tannins and organic acids (malic, citric, oxalic, pyruvic, fumaric), which increase the dietary value of tea, but if consumed in excess, these ingredients may have an anti-nutritional effect [37]. Caffeine, which is called theine in tea, is milder than the caffeine in coffee. The numerous polyphenolic compounds contained in tea reduce the speed of caffeine absorption, thanks to which its stimulating effect appears later

and lasts longer. Polyphenols are the main component of tea, responsible for its health-promoting properties [34].

THE EFFECT OF TEA DRINKING ON HUMAN HEALTH

In recent years, there has been a growing interest in the beneficial effects of tea on human health. Studies show that drinking tea regularly can be a preventive factor against the development of cardiovascular, cancer and neurodegenerative diseases. The antioxidants present in tea are responsible for anti-inflammatory, antibacterial and anti-aging effects, and reduce the risk of obesity and type 2 diabetes. In most cases, tea consumption does not cause any side effects [10, 11, 21].

Due to the content of alkaloids, tea infusion can stimulate the nervous system, reducing the feeling of drowsiness and fatigue. With a sufficiently short brewing time, you can get a refreshing effect, as almost all theine content is transferred to the brew in the first 2–3 minutes of brewing. Extending the infusion time results in an increase in the content of polyphenolic compounds and tannins in the infusion, which bind theine, thanks to which the drink has a calming and soothing effect [7].

When assessing the impact of tea on cancer risk, the temperature of the infusions should be taken into account. Based on the available evidence, drinking very hot beverages ($> 65^{\circ}\text{C}$), including tea, is classified as “possibly carcinogenic to humans” – Group 2A in the IARC (International Agency for Research on Cancer) classification. Some studies have found an association between drinking hot tea and an increased risk of developing esophageal cancer [24]. Nevertheless, many compounds with potential anti-cancer activity have been identified in tea. Black tea polyphenols reduce the risk of cancer formation due to the ability to activate antioxidant and detoxifying enzymes and modulate xenobiotic metabolism enzymes, they also protect DNA against damage, inhibit angiogenesis and proliferation, and induce apoptosis of cancer cells.

Moreover, green tea polyphenols prevent tumor formation by inhibiting the expression of anti-apoptotic proteins, inducing the expression of pro-apoptotic proteins, activating caspases involved in the apoptotic process, inhibiting the uncontrolled proliferation of cancer cells, angiogenesis and metastasis formation [38]. Among the substances with a potential chemopreventive effect, catechins present in large amounts in green tea are of particular interest, of which epigallocatechin gallate (EGCG) has the strongest antioxidant potential. Catechins can reverse or delay the process of carcinogenesis in its initial stages. Studies in animal models have shown that EGCG may have a preventive effect on substances responsible for causing cancer of the esophagus, intestines, liver, lungs and skin. Green tea catechins are also assigned a role in blocking already existing cancer cells, especially cancers of the breast, skin and gastrointestinal tract (oral cavity, esophagus, pharynx, pancreas, stomach and colon) [9].

In recent years, there has been increasing interest in the effects of tea drinking on obesity prevention. Research shows that the polyphenols in black and green tea reduce appetite and lipid absorption, and inhibit the activity of pancreatic

enzymes, thereby reducing the absorption of nutrients in the intestine. It is presumed that these compounds also increase the excretion of lipids in the faeces, stimulate lipid metabolism in the liver, and promote thermogenesis and lipolysis. Thanks to the ability to inhibit the proliferation of pre-adipocytes and lipogenesis, they prevent the spread of adipose tissue. Moreover, caffeine contained in tea affects the activity of the central nervous system, increasing energy expenditure [15, 33, 38]. Thanks to these activities, regular drinking of tea can be a factor in preventing the development of obesity.

Compounds in tea such as catechins, theaflavins, polysaccharides and caffeine are thought to reduce the risk of developing type 2 diabetes by affecting glucose metabolism and insulin secretion. Epidemiological studies have shown that daily tea consumption correlates with a reduced incidence of type 2 diabetes. The anti-diabetic role of tea is associated with the alleviation of oxidative stress, inhibition of α -amylase and α -glucosidase activity, improvement of tissue sensitivity to insulin, prevention of hyperglycemia and strengthening of the body's immunity. The substances contained in tea may also help to alleviate hyperglycemic complications and reduce the damage to nerve cells caused by diabetes [14]. Studies in an animal model have shown that epigallocatechin gallate, present in e.g. in green tea, it reduces blood glucose, triglycerides and cholesterol levels [36]. Tea polyphenols are also believed to regenerate damaged pancreatic islets [38].

For years, tea has also been seen as a prophylactic agent against neurodegenerative diseases. Studies have shown that regular tea consumption has a positive effect on cognitive functions and is associated with a reduced risk of cognitive impairment in the elderly [25]. Polyphenolic compounds present in tea exhibit anti-inflammatory and antioxidant properties, modulate cell signaling pathways, and regulate the secretion of the stress hormone and catecholamines [13]. They have also been shown to reduce the levels of toxic β amyloid in the brain, preventing Alzheimer's disease, and exert neuroprotective effects against Parkinson's disease through anti-aggregation properties. In addition, caffeine contained in tea is thought to have a protective effect against Alzheimer's and Parkinson's diseases through its stimulating effect on the central nervous system [38].

Tea ingredients are also characterized by antibacterial and warming properties, thanks to which the tea infusion can alleviate the symptoms of food poisoning, diarrhea and other digestive disorders [11]. It has also been shown that the epigallocatechin gallate present in tea plays a role in the prevention of tooth decay [9].

TEA CONSUMPTION IN POLAND

According to data from the Central Statistical Office of Poland (GUS), annual tea consumption by one inhabitant of Poland, both in 2016 and 2017, amounted to 0.6 kg [17].

The tea market in Poland has changed significantly in recent years. This was due to the changing behavior and preferences of consumers, manifested, inter alia, in increased interest in green teas and the search for the highest quality products. Many shops specializing in selling a wide range of teas were established [21]. The most important factors influencing consumer shopping preferences are taste, aroma,

price and brand. In Poland, black teas are still the most popular, but green teas are bought more and more often due to their taste and reports of beneficial effects on health [8].

CHARACTERISTICS AND NUTRITIONAL VALUE OF HERBAL INFUSIONS

For years, the belief about the extraordinary health-promoting properties of herbal plants has been common. One of the ways to use them is to prepare infusions, which are defined as "water extracts from ground herbal raw materials". They are obtained from various parts of herbal plants (eg leaves, flowers, small seeds, herbs) by pouring boiling water over them and infusing under a cover for 10–15 minutes [19]. The Polish herbal industry includes over 200 species of plants, the most popular of which are: nettle, chamomile and St. John's wort. In Poland, lemon balm and mint teas have also been very popular for years, while the interest in white mulberry infusions and purge has recently increased [26].

The health-promoting properties of herbal infusions are the result of the presence of numerous bioactive substances in herbal plants. These include: flavonoids, anthocyanins, organic acids, tannins, essential oils, saponins, mucilages, vitamins and minerals. In each plant, these substances occur in a different composition and proportions, which depends primarily on the species and part of the plant, but also on the method of cultivation, harvesting and processing [19].

THE EFFECT OF DRINKING HERBAL INFUSIONS ON HUMAN HEALTH

Due to the valued aromatic values and a number of beneficial properties, plants with healing potential are widely used in human nutrition to improve both physical and mental health [12]. The health-promoting, antioxidant properties of herbal infusions are mainly due to polyphenolic compounds, including flavonoids, as well as carotenoids and vitamins C and E. Antioxidants, even in small amounts, neutralize free radicals and prevent or significantly delay the oxidation reactions of sensitive ingredients such as lipids. Moreover, antioxidant activity is associated with the reduction of DNA damage and protection against the harmful effects of UV radiation [12]. Flavonoids are attributed to a wide spectrum of pro-health properties, such as anti-inflammatory, antiatherogenic, antimicrobial, diuretic and antidepressant properties. Regular consumption of food that is a source of polyphenolic compounds, and thus also herbal infusions, reduces the risk of developing cardiovascular diseases and cancer [28]. The National Cancer Research Institute (NCRI) has researched over 30,000 plants with anti-cancer activity. Herbs may also be recommended in the treatment of diabetes-related disorders. It is believed that in nature there are about 1,200 herbal plants capable of modulating blood glucose levels. The substances contained in herbal infusions can effectively inhibit insulin resistance and oxidative stress, and prevent postprandial hyperglycemia [12].

One of the most widely used and versatile herbs is peppermint (*Mentha piperita* L.). Mint leaves are a source of many vitamins and minerals, as well as menthol, which determines the health-promoting effect. Mint has

traditionally been used to alleviate digestive problems. It has a stimulating effect on the secretory activity of the stomach and liver, increasing the production of gastric juice and bile. In addition, it improves digestion and intestinal peristalsis, and prevents flatulence. It is also credited with relieving migraine headaches. Mint infusion has warming, sedative, antispasmodic, anti-inflammatory, carminative, anti-ulcer and anesthetic properties, and also reduces blood pressure [18].

Recently, herbal teas from white mulberry leaves (*Morus alba* L.) have been very popular among consumers. White mulberry is a source of many biologically active compounds, including polyphenols, vitamin C, calcium, iron, zinc and magnesium. Already in antiquity, it was used to treat infections of the upper respiratory tract, eyes and parasitic diseases, and as a means of lowering cholesterol and blood glucose levels. Thanks to the content of numerous antioxidant substances, it neutralizes free radicals responsible for the aging of the body, the development of cardiovascular, neurodegenerative and cancer diseases. Studies have shown that compounds present in white mulberry, such as quercetin, anthocyanins and astragaloside, are cytotoxic to human leukemia cells. However, white mulberry gained the greatest recognition thanks to its proven effectiveness in supporting the treatment of type 2 diabetes. Due to the inhibition of enzymes responsible for the metabolism of complex sugars, the process of glucose absorption slows down and the risk of postprandial hyperglycemia is reduced. The antidiabetic compounds present in white mulberry, unlike their synthetic counterparts, do not cause side effects such as flatulence, diarrhea or somnolence in patients [16].

There are more and more types of Cistus teas on the market, which have become very popular recently. Due to the high content of flavonoids, catechins, rutin, gallic acid or diterpenes, *Cistus incanus* L. is characterized by a very high antioxidant activity and is a potential rich source of natural antioxidants. The pro-health properties of cleansing also include antibacterial, antifungal, antiviral and strengthening properties [29].

One of the most popular herbal teas is lemon balm (*Melissa officinalis* L.). Already in antiquity, lemon balm was used in the treatment of central nervous system diseases, mental disorders, cardiovascular and respiratory diseases, cancer, as well as a memory enhancing agent, facilitating falling asleep and acting as an antidepressant. Current pharmacological studies show that *M. officinalis* exhibits a wide spectrum of pro-health properties, including antioxidant, hypoglycemic, hypolipemic, anti-inflammatory, spasmolytic, antimicrobial, antitumor, antidepressant, anxiolytic and neuroprotective properties. Regular consumption of lemon balm infusion may be one of the strategies for preventing neurodegenerative diseases such as Alzheimer's disease, dementia, epilepsy, and stroke [39].

One of the most famous medicinal plants is the common chamomile (*Matricaria chamomilla* L.). The positive effects of drinking chamomile teas include improving appetite and digestion, helping to eliminate gas, alleviating anxiety and colic, and above all, anti-inflammatory [5]. Research also shows anti-parasitic, anti-cancer and anti-aging properties. Chamomile is also characterized by anti-diabetic properties - it lowers blood glucose levels and reduces the intensity

of oxidative stress. Studies have shown that short-term consumption of chamomile tea had a beneficial effect on glycemic control in patients with type 2 diabetes [42].

However, the potential dangers of chemical contamination of herbs should not be underestimated. Herbal teas can be a source of heavy metals and pesticide residues. The content of undesirable substances depends on the composition of the soil, the quality of water and air in the place of cultivation, technological processes used in processing the raw material and the use of pesticides. Therefore, it seems justified to control the composition of herbal raw materials in terms of the content of impurities and to monitor the levels of heavy metals in order to obtain the desired quality of herbal teas and ensure safety for consumers [20, 26].

HERBAL TEA MARKET AND HERBAL PRODUCTION IN POLAND

The tea and tea market has been changing dynamically in recent years. New products are constantly appearing in the assortment of stores, including: one-component herbal teas, herbal mixtures and the so-called functional teas [30].

It is estimated that about 130 species of herbal plants are cultivated in Europe, especially in Mediterranean countries, but also in Western and Central Europe. The cultivation area in the European Union countries covers about 70 thousand ha, and the main producers include: Poland (about 14 thousand ha of crops), as well as Spain, France, Germany and Austria. The market of herbal products in Poland in 2007 was estimated at approximately EUR 250 million [32].

CONCLUSIONS

Coffee and tea are among the most consumed beverages in the world. They are valued primarily for their unique taste and aromatic qualities. Exposure to stress, increasing pace of life and exhausting work make people eagerly reach for various types of drinks containing caffeine, such as coffee and tea. Caffeine has a stimulating effect, reducing fatigue, improving concentration, work efficiency and general well-being. In addition to caffeine, coffee contains a number of biologically active substances – including antioxidant polyphenols, minerals and vitamin PP. There are several dozen biologically active compounds in tea, including: polyphenols, organic acids, alkaloids as well as vitamins and minerals. The bioactive properties of herbs are due to numerous compounds such as: flavonoids, organic acids, saponins, tannins, essential oils, vitamins and minerals. However, it should be remembered that the impact of drinking coffee, tea and herbal infusions on human health depends on the amount consumed, the rate of caffeine metabolism and other individual characteristics. The heavy metals present in some herbal teas or the oxalates and acrylamide in coffee can pose a health risk. Therefore, it seems reasonable to continue research on the importance of coffee, tea and herbal infusions in human diet and the frequency of consumption of these drinks.

PODSUMOWANIE

Kawa i herbata to najchętniej spożywane napoje na świecie. Cenione są przede wszystkim za niepowtarzalne walory smakowe i aromatyczne. Narażenie na stres, zwiększające się tempo życia i wyczerpująca praca powodują, że ludzie chętnie sięgają po różnego rodzaju napoje zawierające w swoim składzie kofeinę, takie właśnie jak kawa i herbata. Kofeina wykazuje działanie pobudzające, zmniejsza uczucie zmęczenia, poprawia koncentrację, efektywność pracy oraz ogólne samopoczucie. Oprócz kofeiny kawa zawiera substancje biologicznie aktywne – w tym polifenole o działaniu antyoksydacyjnym, składniki mineralne oraz witaminę PP. W herbacie występują związki biologicznie aktywne, m.in.: polifenole,

kwasy organiczne, alkaloidy oraz witaminy i składniki mineralne. Za właściwości bioaktywne ziół odpowiadają natomiast flawonoidy, kwasy organiczne, saponiny, garbniki, olejki eteryczne, witaminy i składniki mineralne. Wpływ picia kawy, herbaty i naparów z ziół na zdrowie człowieka jest uzależniony od spożywanego ilości, szybkości metabolizmu kofeiny w organizmie oraz innych cech osobniczych. Zagrożenie dla zdrowia mogą stwarzać metale ciężkie obecne w niektórych herbatkach ziołowych, czy też zawarte w kawie szczawiany i akrylamid. Zasadnym wydaje się dalsze prowadzenie badań nad wpływem picia kawy, herbaty i naparów z ziół na zdrowie człowieka w zależności od częstotliwości spożywania tych napojów.

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