








REVIEW PAPER

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Medicinal benefits from the use of Black pepper, Curcuma and Ginger

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ABSTRACT

Introduction. *Black pepper*, *Curcuma* and *Ginger* are three of the most popular and most frequently used spices. Due to their beneficial medical and pharmacological properties, they are increasingly appreciated phytotherapeutic plants. Most of their actions are attributed to their biochemical compositions.

Aim. Our intention is to equip the reader with the information and knowledge necessary to understand the role of natural products in the drug discovery process and to enable the assessment of potential benefits and harms of plant-based medicines when advising patients who wish to use them.

Material and methods. Analysis of literature.

Results. In this paper, we reviewed the use of *Black pepper*, *Curcuma* and *Ginger* documented in the treatment of colds and flu, support for immunity, but also use in digestive ailments and beneficial effects on the cardiovascular system and immune system.

Keywords. medicinal plants, phytotherapy, *Black pepper*, *Curcuma*, *Ginger*

Introduction

Knowledge about plant-derived medicinal products is essential in all areas of healthcare, not only because these forms of treatments are popular in healthcare (often used as a self-medication) but because of their importance in many traditional medical systems globally.

This article is not a guide to treatment but rather a presentation of the scientific principles summarizing traditional preclinical and clinical evidence underpinning the use of herbal and other plant derived medicine. Several hundred species of plants growing on the Earth are confirmed by science as having healing activity. Accord-

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ing to the latest reports of the World Health Organization (WHO), almost 7000 chemical compounds that are used in medicine are derived from plants. Based on other reports from the WHO, in Europe over 30-40% of medicines exist whose components come from plants and in the United States, preparations of vegetable origin constitute about 24% of all medicines. Herbs and other plants can be used in various ways. Usually, plant infusions are used in teas, extracts, syrups, etc. However, in order to expect effective therapy, we must be sure that we will use the right dose of specific medicinal substances (active). Such guarantees also give us the naming of preparations that are produced based on standardized plant extracts, i.e. those for which the dose of medicinal compounds is known.

Black pepper, Curcuma and Ginger

In recent years many medicinal plants have been studied in many recognized medical laboratories of the world, and it was recognized that some of them are irreplaceable in the treatment of immune-stimulating, or stimulating, human immune systems.

Scientific research in recent years has shown that plants such as *Black pepper*, *Curcuma* and *Ginger* increase the body's resistance to infections. These three spices contain substances with a broad spectrum of antimicrobial activity, mainly contained in the essential oils. They are also a rich source of natural antioxidants that neutralize free radicals. A diet rich in antioxidants reduces the risk of cancer, heart disease, degenerative diseases of the joints, and slows down the aging process.

Black pepper produced from unripe, dried and fermented fruits is native to southern India. The molecule piperine is responsible for the spicy characteristic taste of *Black pepper*. It is an organic compound located in the top layer of the peel of this popular spice. *Black pepper* was used in eastern medicine as a remedy for indigestion, various pain and infections. In addition, *Black pepper* has antiemetic and antipyretic effects. *Curcuma* is one of the strongest antioxidants with very strong anti-inflammatory, antiviral, antibacterial, cleansing, anti-cancer, antioxidant, antiseptic, radioprotective and cardioprotective effects. *Curcuma* has a purifying effect on blood, and supports the work of the pancreas and liver. Research is ongoing on the use of these substances in the prevention and treatment of diseases such as rheumatoid arthritis, diabetes, and Alzheimer's disease. In folk medicine turmeric is used, among others in the treatment of diseases of the gall bladder, kidneys and also in stomach ailments because of the fact that it supports metabolism and accelerates digestion. Various species of the *Curcuma* genus have been known in medicine since at least the 19th century. The main pharmacological activities of *Ginger* and compounds extracted from it's rhizome include immunomodulatory, anti-can-

cer, anti-inflammatory, analgesic, antihyperglycaemic and antiemetic activities. There are also great opportunities to use *Ginger* in the treatment of heart disease, and inflammation of joints and bones. The research also shows low toxicity of *Ginger*, which is related to the safety of its use. It is used in both raw and powdered form. From the rhizomes of *Ginger* during the distillation processes, 0.6 to 3.5% of the essential oil is obtained, whose exact chemical composition depends on the place of origin of the plant. *Ginger* contains many nutrients that change slightly depending on the form consumed.

Figure 1 below presents total global production of *Black pepper* and *Ginger* and their consumption in Poland. The chart was made on the basis of data for 2013 and 2016 from The Food and Agriculture Organization of the United Nations site.¹

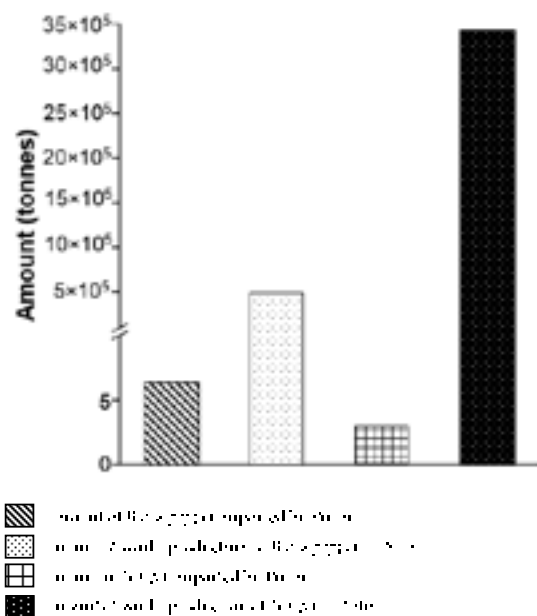


Fig. 1. *Black pepper* and *Ginger*: World production and consumption in Poland

Chemical composition

The composition of individual substances in *Black pepper* depends on the variety of the plant from which the raw material is obtained. *Black pepper* in its natural form contains about 2.6% essential oil, 13% water, 12% nitrogen compounds, 7% fats, in addition to starch, cellulose, alkaloids, other essential oils and about 7% piperine. *Black pepper* oil does not contain piperine, because it is a very volatile component. The main biologically active agents are acidic amides. *Black pepper* is a perennial plant originating in India grown in tropical areas, especially in southern India, Indonesia, the Malay Peninsula, Central America and the Philippines. The flowers of *Black pepper* are collected in spiky blooms. The *Black pepper* crop is significantly influenced by environmen-

tal factors that significantly affect its productivity. Yudianto et al. in their observations stated that the most important factor turned out to be the intensity of precipitation.² *Black pepper* is available in several forms: fresh, dried in the form of whole grains, or in ground form. Figure 2 below shows dried *Black pepper*.



Fig. 2. Dried *Black pepper*

Herbs and turmeric root have within their composition, among others: mineral salts (lime, iron, magnesium), fats, fiber, proteins, starch and essential oils. The *Curcuma* rhizome has an intense yellow color, derived from dyes, the so-called curcuminoids, which include compounds such as curcumin (diferulomethane, makes up about 70%), demethoxycurcumin (about 15%) and bis-dimethoxycurmarine (about 3%). The Figure 3 below shows *Curcuma* powder.



Fig. 3. *Curcuma* powder

It should be noted that the chemical composition and microstructure is influenced by the rate and method of freezing. Singha & Muthukumarappan on the basis of microscopic examination found that structural damage was more pronounced in slower frozen rhizomes than

fast frozen ones. In addition, degrees of fruition significantly affected the composition and color of *Ginger*.³ Table 1 below shows selected ingredients of rhizomes and powder of *Ginger*.

Table 1. Selected ingredients of rhizomes and powder of *Ginger*

Rhizomes		
Compound	Quantity	Ref
zingiberene	37.9%	(Koch et al. 2017) ⁴
sabinene	13.5-38.0%	
(E)-1-(3',4'-dimethoxyphenyl)buta-1,3-diene (DMPBD)	20.6-35.3%	(Verma et al. 2018) ⁵
terpinen-4-ol	9.0-31.3%	
γ -terpinene	1.1-4.8%	
β -phellandrene	1.0-4.4%	
6-gingerol	(268.3 mg/kg)	(Koch et al. 2017) ⁴
potassium	0.98 ppm and 1.38 ppm (white and yellow types)	(Ajayi et al. 2013) ⁶
calcium	0.68 ppm and 0.41 (white and yellow types)	
Ginger powder		
Compound	Quantity	Ref
potassium	43.963 mg/kg of dry mass	(Koch et al. 2017) ⁴
manganese	758.4 mg/kg of dry mass	
calcium	1-1.5%	(Uma Pradeep et al. 1993) ⁷
iron	54-62 mg/100 g	

Figure 4 below shows rhizomes and powder of *Ginger*.



Fig. 4. Rhizomes and powder of *Ginger*

Black Pepper

Black pepper is most often used in the form of ground powder. In the scientific literature there are many reports on the method and conditions during the milling process. Ghodki et al. in their work described the cryo-

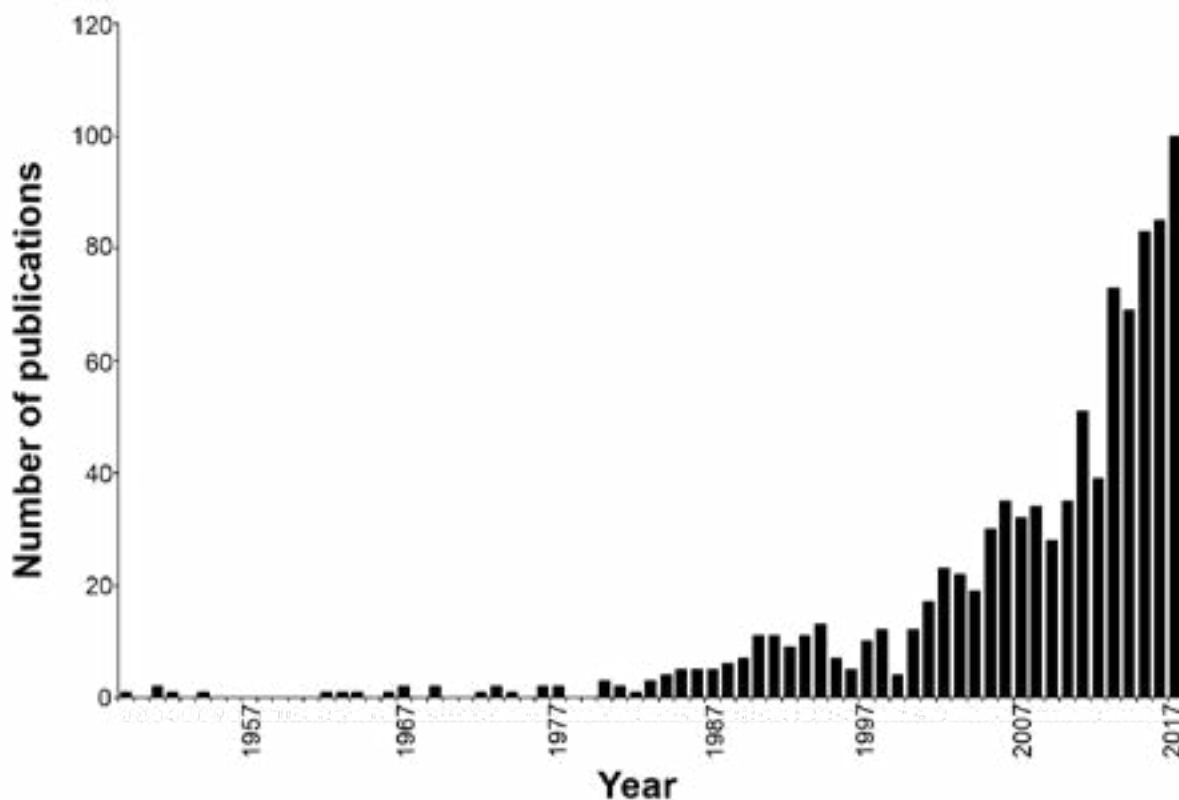


Fig. 5. Number of publications regarding *Black pepper* collected from Library of National Center for Biotechnology Information (NCBI) PubMed Data Base

genic grinding method, which is used to ensure the best quality of spices. The study looked at the physicochemical characteristics of ground *Black pepper* grains at temperatures of -120°C, -80°C, -40°C, 0°C and 40°C. The content of the mineral content of ground *Black pepper* increases with the reduction of the crushing temperature.⁷ Whereas Ghodki & Goswami in their research found that the best way to grind *Black pepper* is cryogenic grinding with a maximum grinding temperature -21.27°C.⁹ In the literature, there are many reviews on the subject of crops, chemical composition, applications, health and therapeutic benefits of various herbs and descriptions of antioxidant, antimicrobial, anti-inflammatory, gastro-protective and antidepressant properties of *Black pepper*.^{10,11} Figure 5 represents the increased interest in applications of *Black pepper*.

In addition, works have described the biological role of *Black pepper*.¹⁷ The main healing agent in *Black pepper* is *piperine*, which is a powerful antioxidant. It demonstrates a strong action against free radicals. It helps in the protection of the circulatory system, the liver and protection against DNA damage, showing anticancer activity. In addition, aging processes are slowed. There are many reports in scientific publications confirming the beneficial effects of eating *Black pepper*.¹⁸ The de Souza Grinevicius group investigated the association of overproduction of reactive oxygen species (ROS), DNA fragmentation, cell cycle arrest and apoptosis induced

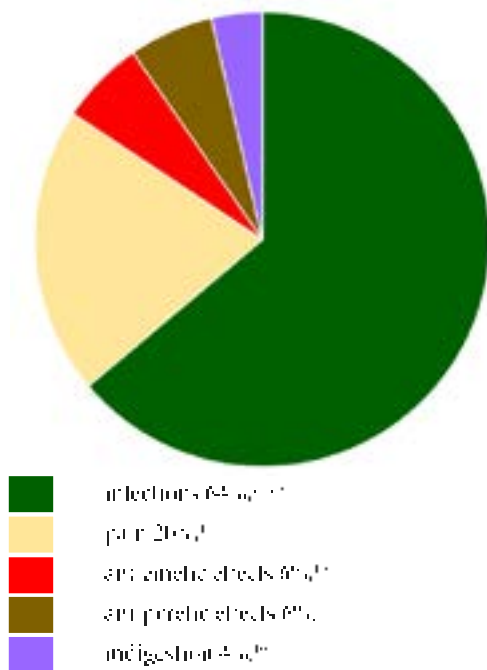


Fig. 6. Application of *Black pepper*

by *Piper ethanolic nigrum*. As a result of the administration of the solution, cytotoxic and antiproliferative effects were found on MCF-7 cells in *in vivo* studies. The demonstrated antitumor activity is most likely associ-

ated with ROS overproduction, causing oxidative stress affecting the key proteins involved in G1/S cell cycle arrest and triggering apoptosis.¹⁹ The Deng et al. group came to a similar conclusion in its scientific research, which also evaluated the anti-cancer action of *piper nigrum* in animal studies. The results of the research show contributions to the generation of reactive forms of ROS oxygen, which results in anticancer effects.²⁰ Whereas Gunasekaran et al. in the study looked at the effects of *piperine* against hepatocellular carcinoma. The study showed that *piperine* may be a pro-oxidant that alleviates hepatocellular carcinoma.²¹ In addition, the Guineensin extract found in black and long *Black pepper* has anti-inflammatory activity, inhibiting the uptake of endocannabinoids by the cells. The Reynoso-Moreno group evaluated guineensin in mouse models of acute and inflammatory pain and endotoxemia. The strong pharmacological action of guineinin may be responsible for the antiinflammatory effects of *Black pepper*.²² Grains of *Black pepper* and the essential oil obtained from them contain compounds that have antimicrobial activity. It is a source of natural antioxidants that stop rancid fats, which is the task of a natural preservative.²³ In addition, a diet rich in *Black pepper* antioxidant substances can be helpful in reducing the likelihood of cancer, heart and blood vessel diseases and degenerative joint disease, and can also help to slow down the aging process. Ahmad et al. in their research investigated the effect of *Black pepper* extracts on cultures of different bacteria and activity against toxin producing metabolites (*Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus* and *Candida albicans*). Based on these studies, it has been found that the majority of generally available extracts of *Black pepper* have activity against pathogenic microorganisms.²⁴ In addition to antimicrobial activity, the *piperine* contained in *Black pepper* positively affects the digestive processes. Its main advantage for health is the secretion of gastric juices, which contributes to the improvement of digestion, thereby increasing appetite. Strong warming properties improves the blood supply to the entire digestive system, which contributes to a positive effect on the absorption of nutrients contained in food, improves the absorption of certain substances. In addition, the extracts of the *Black pepper* act on the body in a diuretic and slightly laxative way, which allows you to quickly get rid of harmful products of metabolism from the body. *Black pepper* in traditional folk medicine has long been used as a drug for stomach problems such as diarrhea, nausea, bloating or digestive disorders, because its consumption influences the production of saliva and digestive enzymes. In addition, *Black pepper* soothes inflammation. The research group of McNamara et al. characterized the action of *piperine* on the human vanilloid receptor TRPV1,

where *piperine* showed pronounced agonist activity. The results show that *piperine* is mediated by TRPV1 mediated gastrointestinal function.²⁵ *Black pepper* also has antibacterial properties, helpful in the treatment of intestinal diseases caused by various types of bacteria. In addition, *Black pepper* can contribute to the breakdown of fat cells, due to the presence of nutrients in the outer layer of the grains. Ebihara et al. in their studies determined the effect of olfactory stimulation with volatile *Black pepper* oil on risk factors for pneumonia. The study concluded that the use of nasal inhalation with BPO *Black pepper* oil may contribute to the activation of the isletic or orbital-frontal cortex, which improves the reflex swallowing movement.²⁶ It should be noted that the use of *piperine* may exert an immunotoxic effect, which has been confirmed in studies in mice by several scientists. Dogra et al. concluded that a dose of 1.12 mg *piperine* per kg body weight does not have any immunotoxic activity and can be considered an immunologically safe dose.²⁷ When it comes to the use of *piperine* extract with drugs, it is possible to increase the effect of drugs. Rao et al. investigated *piperine* effects on liver function in animal studies. There are more and more studies describing the impact of *Black pepper* and *piperine* on drug metabolizing enzymes.²⁸ Based on the results of Rao et al. high-dose *piperine* extract have significant impact on liver damage.²⁹

Curcuma

Parveen et al. extracted the ethereal oil from the leaves of the *Curcuma longa* L. Kasur cultivar bred in Pakistan. The antimicrobial properties of *Curcuma longa* leaves were then verified using the disk diffusion method. Several different human pathogens were selected among eight fungi and five bacterial strains. The essential oil showed maximum resistance to *Fusarium miniformes*, followed by *Bacillus subtilis* and showed the least resistance to *Fusarium oxysporium*. The results showed that the essential oil shows significant inhibitory activity on the test organisms.³⁹ Katsuyama et al. studied Curcuminoids isolated from *Curcuma longa*. Two additional type III polyketide synthases, named CURS2 and CURS3, have been identified and characterized, which are able to synthesize curcuminoids. *In vitro* analysis showed that CURS2 preferred feruloyl-CoA as the starter substrate, and CURS3 preferred both feruloyl-CoA and p-coumaroyl-CoA. These results suggest that CURS2 synthesizes curcumin or demethoxycurcumin, and CURS3 synthesizes curcumin, bis-thyroxycurcumin and demethoxycurcumin.^{40,41} Krishnaraju in his research produced a new demethylated cobrologic composition (DC) containing at least 95% of all demethylated kamkinoids (67.8% bis-methyl cletumin, 20.7% demethlonodimethoxocycloin, 5.86% bis-dimethoxycurmarine, 2.58% demethyl sucrose) (PCT) IN05 / 00337, dated 13 October 2005),

starting from *Curcuma longa* extract containing 95% of all curcuminoids (C95). The DC composition is characterized by better neuroprotective and anti-inflammatory efficacy in comparison. In addition, it is safe to use.⁴² *Curcuma*, an antioxidant found in the spice, inhibits carcinogenesis in animal models and has been shown to be an antiinflammatory agent.⁴³ In the search for reagents that inhibit NO production and study the chemical composition of natural food of plant origin, *Curcuma* chemical ingredients used as a spice were studied. As a result of this study, 2 new terpenoids and 14 known analogues were isolated. It has been found that all compounds have NO inhibitory activity in murine microglial BV-2 cells. The discovery of two new compounds in this chemical study further revealed the chemical composition of *Curcuma* and a biological test suggested that the natural *Curcuma* food seasoning containing terpenoids with NO inhibitory activity could potentially be a promoter for humans health.⁴⁴ Kurkumin, contained in the root of turmeric, is a very strong, natural antioxidant. As a result, turmeric has anti-cancer, anti-inflammatory, antibacterial and cleansing properties. The use of turmeric can be useful in the treatment of various types of cancer inter alia, skin, esophagus and tumors of the abdominal cavity and in the prevention of their formation.^{45,46} Turmeric is capable of causing cancer cells to self-destruct through the process of apoptosis. *Curcuma* helps in stopping tumor growth, metastasis and spread of cancer cells at the molecular level.⁴⁷ In addition, the chemical compounds contained in the curcumin block the formation of alpha-toxins and nitrosamine - two very carcinogenic substances. Hong et al. checked the effect of turmeric root oil on anti-proliferative activity against some human cancer cell lines (MCF7, Ca Ski, A549, HT29 and HCT116). Strong cytotoxicity was demonstrated for HT29 cells (IC 50 value $4.9 \pm 0.4 \mu\text{g} / \text{ml}$), weak cytotoxicity to A549, Ca Ski and HCT116 cells (with IC 50 values 46.3 ± 0.7 , 32.5 ± 1.1 and $35.0 \pm 0.3 \mu\text{g} / \text{ml}$, respectively) and no inhibitory effect on MCF7 cells.⁴⁸ Strong cytotoxicity was demonstrated for HT29 cells (IC 50 value $4.9 \pm 0.4 \mu\text{g} / \text{ml}$), weak cytotoxicity to A549, Ca Ski and HCT116 cells (with IC 50 values 46.3 ± 0.7 , 32.5 ± 1.1 and $35.0 \pm 0.3 \mu\text{g} / \text{ml}$, respectively) and no inhibitory effect on MCF7 cells.⁴⁹ The HP CR-SR essential oil showed more significant cytotoxicity on tumor cell lines than on individual herbs of *Curcuma Rhizoma* and *Spargania Rhizoma*. In summary, the oil from HP CR-SR differs from any of the *Curcuma Rhizoma* and *Sparganii Rhizom*, or simply their superposition, and the HP CR-SR oil presented a more significant anticancer and antioxidant effect compared to the *Curcuma Rhizoma* and *Sparganii Rhizoma* oils.⁵⁰ Huang et al. looked at TNBC breast cancer, which because of its weak sensitivity to conventional therapies is extremely difficult to cure, and the impact

of curcumol on the development of cancer cells. It was found that curcumol contained in curcumin inhibited the growth of MDA-MB-231 cells and triggered apoptosis-independent apoptosis mediated by the p73A-PU-MA/Bak signaling pathway.⁵¹ Based on these results, it can be concluded that the development of new drugs on TNBC may involve the use of extracted curcumol. *Curcuma*, due to its choleric properties and the secretion of gastrin, secretin and pancreatic enzymes, has mild anti-inflammatory, antibacterial and antispasmodic activity. Turmeric ingredients curcumin and essential oils stimulate the secretion of bile necessary for digestion of fats. Because of this it works to help in digestive disorders and ailments such as bloating, stomach flu, diarrhea and irritable bowel syndrome. It is also used in the treatment of stomach ulcers caused by *H. pylori*, which *Curcuma* affects. In addition, turmeric has an important property of cleansing the liver from toxins, especially associated with alcohol consumption and the use of drugs and strong drugs. Turmeric naturally stimulates the production of enzymes responsible for the metabolism of toxins. It is used in conditions of liver damage and insufficiency, also in inflammatory conditions of the liver and bile duct. In addition, it has protective properties on liver cells and is used as an auxiliary in its regeneration. In addition, curcumin prevents the accumulation of adipose tissue, purifies the blood and reduces cholesterol. Samuhasaneeto et al. in a study in rats found that curcumin could prevent the activation of NF- κ B, which affects genetic hepatitis. *Curcuma* also prevented the activation of kappa B factors in rats administered alcohol.⁵² In subsequent surveys on the shrubs of Tranchida et al. found that the administration of *Curcuma longa* extract increases some of the defense mechanisms, acting on choline metabolism, preventing the development of fatty liver.⁵³

The complete chloroplast genome (cp) of *Curcuma flaviflora*, a medicinal plant in Southeast Asia, has been sequenced. The size of the genome was 160 478 bp, with a content of 36.3% GC. A pair of inverted repeats (IR) of 26 946 base pairs was separated by a large single copy (LSC) of 88008 bp and a small single copy (SSC) of 18.578 bp. The cp genome contained 132 annotated genes, including 79 genes encoding the protein, 30 tRNA genes, and four rRNA genes. And 19 of these genes were duplicated in the inverted regions of the repetitions.⁵⁴ In rat studies, Tranchida et al. in 2015, she stated that curcuminoids contained in *Curcuma* can positively affect fatty acid metabolism, hexosamine biosynthesis pathway and alcohol oxidation. Supplementation with *Curcuma longa* extract seems to be beneficial in these metabolic pathways in rats.⁵⁵ Dall'Acqua et al. showed that supplementation with *Curcuma* extract for healthy animals causes changes in urine composition by reducing the concentration of allantoin. On this basis, it

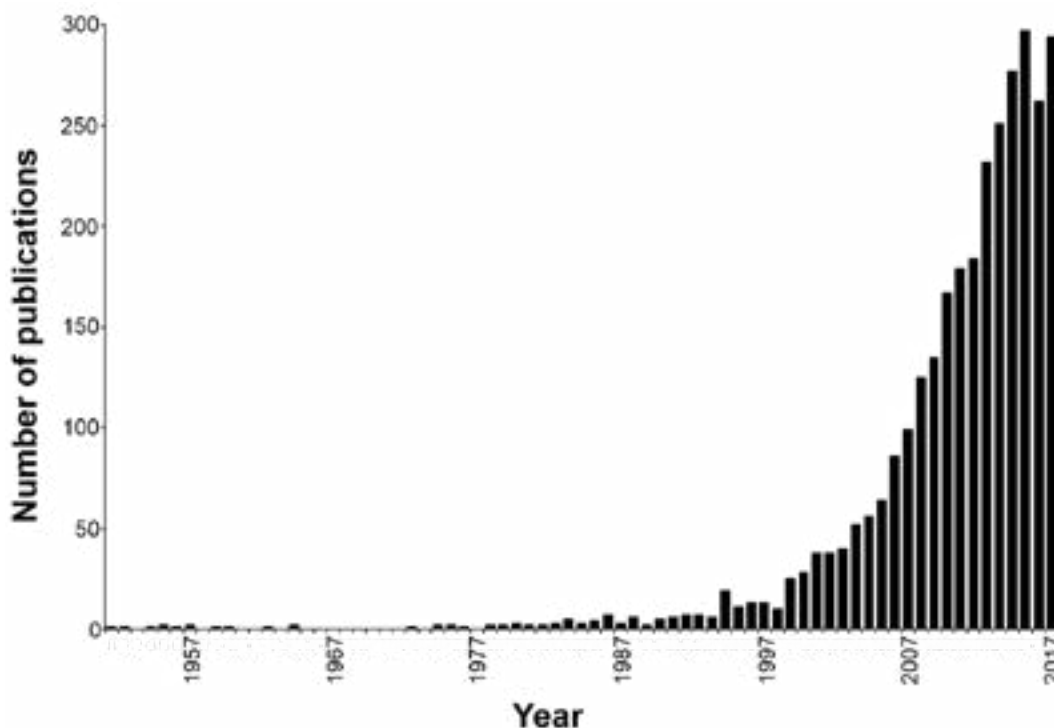
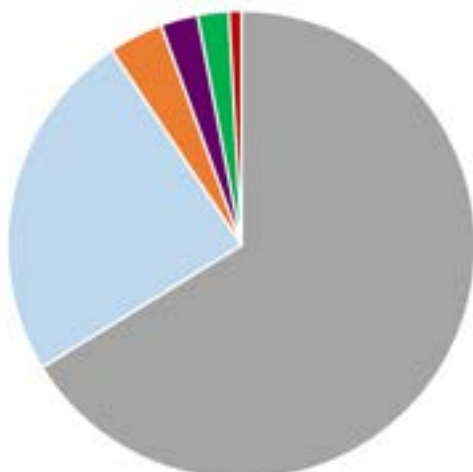


Fig. 7. Number of publications on *Curcuma* collected from Library of National Center for Biotechnology Information (NCBI) PubMed Data Base over the years starting from 1945

can be concluded that the extract has an effect on oxidative stress in animals in *in vivo* studies.⁵⁶ The impact of high ambient temperature has a negative effect on poultry production in many countries. One of the most practical ways to eliminate these effects is to modify your diet. Grupa Akbarian et al. studied herbal extracts and their effect on reducing the side effects associated

with increased temperature in broiler chickens. Turmeric extract from xantho- rhohydra at a dose of 400 mg / kg, has positively affected the alleviation of some changes in the blood composition.⁵⁷ In addition, Ramkissoon et al. showed positive effects on aging, diabetic complications and diseases related to oxidative stress.⁵⁸

Figure 7 presents the number of papers regarding the use of *Curcuma*.



- anti-inflammatory 54.0%
- antioxidant 24.0%
- antibacterial 14.0%
- antibiofilm 4.0%
- antiseptic 2.0%
- antimicrobial 2.0%

Fig. 8. Application of *Curcuma*

Ginger

Ginger spice has a calcium content of 1-1.5% and an iron content of 54-62 mg/100 g.⁷ Both root and powdered *Ginger* have warming properties, improve blood circulation and support the natural cleansing of the body. Due to the content of *Ginger* that increase the body's resistance, it is often used to treat colds. The nutrients contained in *Ginger* are very easily absorbed by the body, which makes it effective. Sebiomo et al. published a study comparing the effectiveness of *Ginger* and a conventional antibiotic on two selected pathogenic bacteria (*Staphylococcus aureus* and *Streptococcus pyogenes*). The plant extracts were prepared by weighing the plant leaves and root (20, 40, 60, 80 and 100 g) into 100 mL of water and ethanol (at g/100 ml) to determine the extract concentrations. The study concluded that *Ginger* has much stronger antibacterial properties than antibiotics.⁵⁹ Awad & Awaad found in their research that *Ginger* results in a significant strengthening of the immune system of fish in prevention and control of microbial diseases. The mechanism of action of medicinal plants

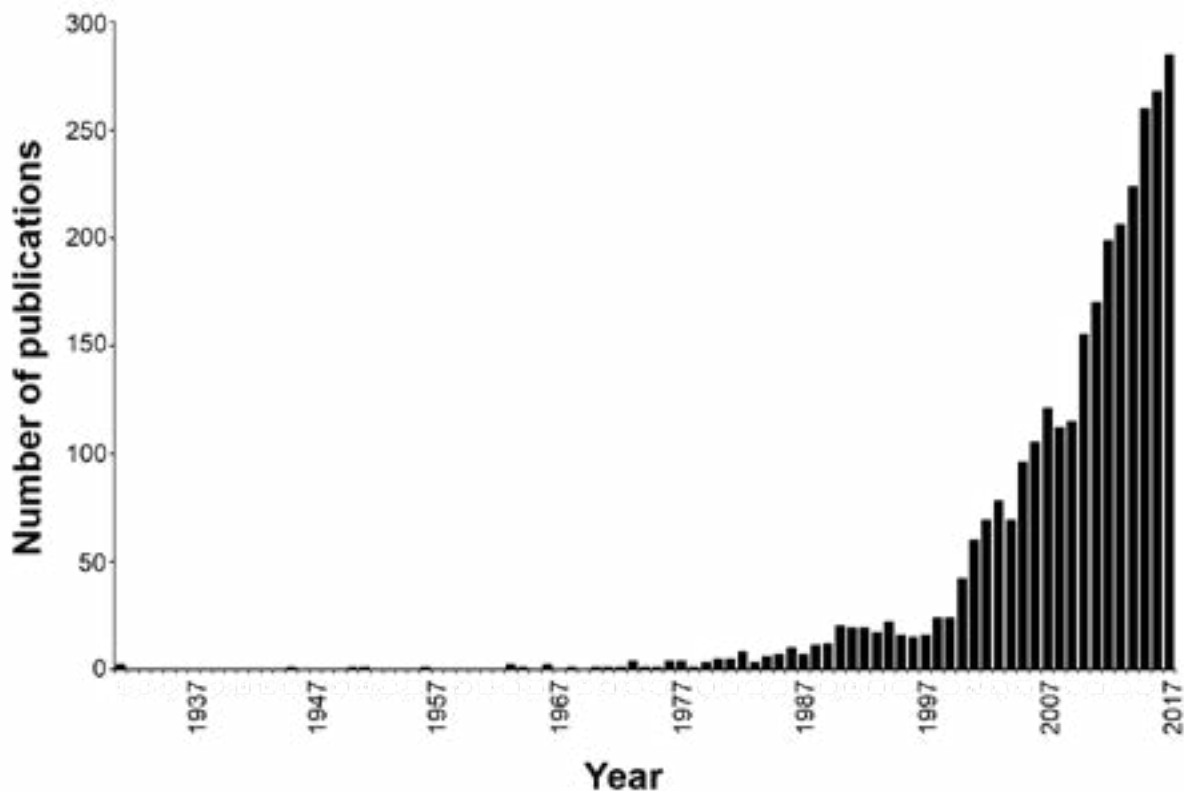


Fig. 9. Number of publications on *Ginger* collected from the National Center for Biotechnology Information (NCBI) PubMed Data Base

consisted in the stimulation of the cellular and humoral immune response, which was monitored by raising immunological parameters.⁶⁰ Figure 9 and 10 present the number of publications in studies of ginger and its applications respectively.

Ginger extract, intensely consumed as a spice in food and beverages around the world, is an excellent source of many bioactive phenols, including non-volatile acute compounds such as gingerole, paradole, shogaole and *Ginger*. Strong anti-inflammatory and analgesic properties can be used for joint and muscle pain thanks to anti-inflammatory substances that are used in various types of ointments and warming patches. In addition, *Ginger* oil can bring relief to sore muscles. Grzanna et al. reported that *Ginger* inhibits prostaglandin synthesis by inhibiting cyclooxygenase-1 and cyclooxygenase-2. An important extension of this early work was the observation that *Ginger* also suppresses leukotriene biosynthesis by inhibiting 5-lipoxygenase. This pharmacological property distinguishes *Ginger* from non-steroidal anti-inflammatory drugs. The pharmacological characteristics of *Ginger* entered a new phase with the discovery that the *Ginger* extract from *Zingiber officinale* (Zingiberaceae family) and *galanga alpina* (Zingiberaceae family) inhibits the induction of several genes involved in the inflammatory response process.⁶⁹ Altman & Marcussen, on the basis of research, found that *Sida cordifolia* L. and *Zingiber officinale* had a protec-

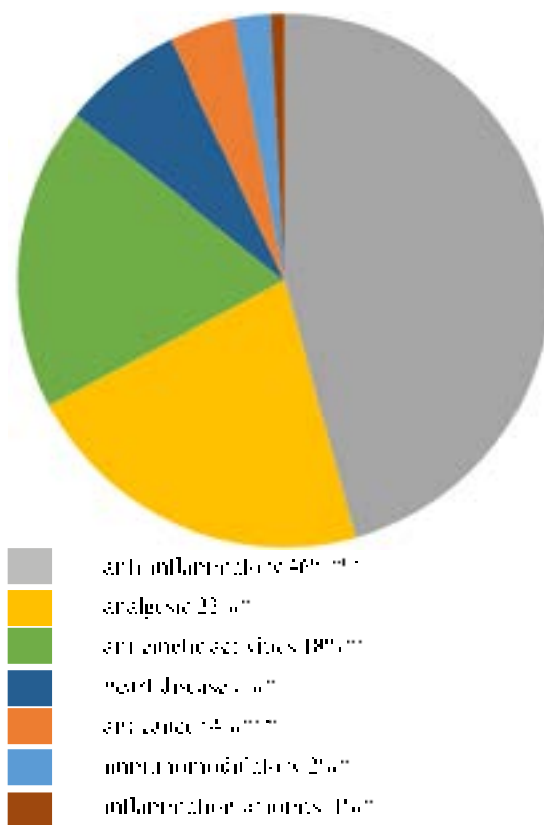


Fig. 10. Main areas of ginger use from the National Center for Biotechnology Information (NCBI) PubMed Data Base

tive effect on the cartilage. *Ginger*, due to its anti-inflammatory properties helps to combat knee pain and osteoarthritis.⁷⁰ Black & O'Connor investigated the effect of *Ginger* on muscle pain, inflammation and dysfunction caused by eccentric effort. It was found that 2 g of *Ginger* can alleviate the daily progression of muscle pain.⁷¹ In addition, *Ginger* is effective in relieving menstrual pain. In the study by Ozgoli et al., people from the *Ginger* group took 250 mg of *Ginger* powder capsule four times a day, while people from another group were taking 250 mg mefenamic acid or 400 mg ibuprofen, respectively. They found that *Ginger* is as effective as mefenamic acid and ibuprofen in relieving pain in women with primary dysmenorrhea.⁷² Metronidazole (MTZ) is the drug of choice in the treatment of lambliaosis; its chemical composition has serious hazards and becomes less sensitive. The aim of this study was to look for natural extracts alternative to MTZ. In-vivo effects of dichloromethane extracts of *Ginger* and cinnamon in doses of 10 and 20 mg / kg / day divided into 6 groups (5 rats each). The potential therapeutic effect of *Ginger* and cinnamon extracts on *G. lamblia* infection in albino rats as a promising alternative therapy for commonly used antiplatelet agents has been confirmed.⁷³ The oil contained in the *Ginger* rhizome positively affects digestive work, which may be helpful in digestive disorders, food poisoning or indigestion, because it exhibits choleric and diastolic effects and may be helpful in stimulating gastric juices. In addition, *Ginger* is known for the relief of nausea and antiemetic (*Zingiberis rhizoma*). According to traditional Chinese medicine, nausea is one of the commonly used herbs for *Ginger*. The efficacy of *Ginger* in the treatment of nausea and vomiting was studied in the Ernst and Pittler study which looked more closely at six previous studies. It was reiterated that the positive effect of *Ginger* is greater than the placebo effect (*Ginger* and placebo groups for *Ginger* (1g) taken before operation (absolute risk reduction 0.052 (95% confidence interval -0.082 to 0.186)).⁷⁴ In addition, Borrelli et al. found that *Ginger* can be an effective way to treat nausea and vomiting during pregnancy. In efficacy studies, dosages ranged from 500 to 1,500 mg per day and the duration of treatment ranged from 3 days to 3 weeks. The comparisons included placebo and vitamin B6.⁷⁵ Pharmacological studies in humans require confirmatory testing to exclude the interaction of *Ginger* preparations with platelet aggregation. Preclinical safety data do not exclude potential toxicity, which should be monitored especially after ingestion of *Ginger* for a long time.⁷⁶ *Ginger* is also used in the weight loss process. *Ginger* has a sensitizing effect on glucose and stimulates the gastrointestinal tract. In the study of Mansour et al. evaluated the effect of a hot *ginger* beverage on energy expenditure, the feeling of appetite and satiety, and metabolic risk factors in overweight men. The results show en-

hanced thermogenesis and reduced hunger with consumption of *Ginger*, suggesting the potential role of *Ginger* in weight management. Additional studies are needed to confirm these findings.⁷⁷ In addition, studies indicate that *Ginger* facilitates the digestion of fat. The generation of heat in the body has a positive effect on the stimulation of the metabolic system. Some studies have shown antitumor activity of *Ginger* on cancer cells *in vitro* and *in vivo*. *Ginger* is not only a large amount of antioxidants that fight free radicals and show cytotoxicity to cells. About 3% of the weights of *Ginger* are very aromatic essential oils. Padama et al. in their studies, they checked the *in vitro* cytotoxic activity of the salt extract obtained from the *Ginger* extract on the HEP-2 cell line. The present results show that the extract exerts a dose-dependent suppression of cell proliferation; the involvement of free radicals has been confirmed by increasing the production of superoxide, reducing the formation of nitrates and depleting glutathione in cells treated with *Ginger*. Further screening of active ingredients by means of gas chromatography and mass spectrometry analysis revealed the presence of clavatul, geraniol and pinostrobin in the extract. The results of this study suggest that *Ginger* may be useful as a potential anti-cancer agent.⁷⁸ Research group Jeong et al. suggests that gingerol a natural component of *Ginger*, has anti-inflammatory and anti-cancer activity.⁷⁹ Numerous studies show a positive effect of *Ginger* in combating breast, ovarian, prostate and intestine cancer, without affecting the development of healthy cells. *Ginger* in addition to anti-inflammatory, antioxidant and anti-proliferative activity, which indicates properties as a chemotherapeutic agent. Karna et al. in studies, it shows that *Ginger* extract (GE) exerts significant growth-inhibiting and death induction effects in the prostate cancer cell spectrum.⁸⁰ *Ginger* was reportedly used in folk medicine to treat and prevent arterial hypertension and other cardiovascular diseases. This suggests that a possible mechanism by which *Ginger* induces its antihypertensive properties may be by inhibiting ACE activity and preventing lipid peroxidation in the heart.⁶⁴ *Ginger* is a powerful antioxidant and can alleviate or prevent the formation of free radicals. It is considered a safe herbal remedy with minor side effects/side effects. Further research is needed on animals and humans regarding the kinetics of *Ginger* and its components and the effects of their consumption for a long time.⁸¹ Essential oils from *Ginger* root can also be used as a good natural preservative in fish food, due to their antioxidant and antibacterial properties.⁸² Gurbuz & Salih at work evaluated the potential impact of various sumac seeds from sumac (*Rhus coriaria L.*) and *Ginger* (*Zingiber officinale*) seeds on fatty acids in egg yolks and cholesterol in blood and yolks from hens. However, dietary supplementation with sumac and *Ginger* powder decreases cholesterol and blood cholesterol

levels in laying hens. Supplementation of sumac and *Ginger* affected with HDL showed a significant effect ($p < 0.05$) in the treatment groups. The results of this study suggest that feeding sumac and *Ginger* has a tendency to reduce cholesterol levels in both yolk and blood in hens.⁸³ Chitra et al. in their research, they used Poloxamer 188 polymer and plant extract *Z. officinale* to prepare silver nanoparticles (AgNP) by green synthesis and to study the anti-bacterial activity of AgNP using three human pathogens *Escherichia coli*, *Klebsiella pneumonia* and *Staphylococcus aureus*. AgNP protected poloxamer 188 inhibits bacterial growth more efficiently than pure *Z. officinale* and AgNP extract from *Z. officinale* extract.⁸⁴ In the Yuan & Gao study, they re-hatred and analyzed *Bacillus pumilus* bacteria causing rhabdomyolysis, which allowed for a better understanding of the genetic diversity of phages.⁸⁵

Ginger cultivation, which also affects its chemical composition, is also important in this respect. Gupta Ghasemzadeh et al. noted that the increase in CO₂ concentration in the atmosphere due to climate change and agricultural practices may have an impact on biotic changes resulting in plant growth, allocation and chemical composition.⁸⁶

Conclusion

The content of a large amount of essential oils in *Imbirze* gives it a characteristic burning taste and aroma with a refreshing note. Medicinal *Ginger* is not present in the wild state, it is a cultivated plant. Its morphological structure includes a creeping rhizome from which flower shoots grow. The root of *Ginger* has valuable properties that are used in herbal medicine and have a positive effect on health. It has antibacterial, antiviral, antiparasitic and antioxidant effects.

Ginger contains bioactive ingredients that have pro-health properties, which certainly makes it a plant with a high therapeutic potential. Regardless of the choice of the *Ginger* variety or the form consumed, the root contains many nutrients, minerals, amino acids that can be used in lacustrine or as food supplements.

Black pepper in the kitchen has been popular for many years. In addition to the taste, due to the content of *piperine*, it can exert a positive effect on human health. The most valuable substance contained in the grains of pepper is the *piperine*, which has a positive effect on the body, however, in the *Black pepper* its content is small and it is difficult to expect satisfactory effects from consumption. It should also be emphasized that excessive consumption of *Black pepper* can irritate the digestive system.

Curcuma has a bile-forming, choleric and antimicrobial effect, thus preventing infections in the bile ducts. It is often used in indigestion and digestive disorders. As an auxiliary, it can be used in inflammation of

the bile ducts and gall bladder. However, it is not recommended for use during pregnancy and breastfeeding or in children under 12 years of age (contains alcohol). So far, no side effects associated with the use of turmeric in the diet have been observed

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