

A Review on Medicinal Benefit of Black Pepper, Ginger and Curcuma

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ABSTRACT: *Three of the most popular and widely used spices are black pepper, curcuma, and ginger. Phototherapeutic plants are becoming more popular as a result of their positive medicinal and pharmacological characteristics. Their biochemical makeup are responsible for the majority of their effects. Our goal is to provide the reader with the knowledge and information needed to comprehend the function of natural products in the drug development process and to evaluate the possible advantages and risks of plant-based medications when counseling patients who want to use them. In this article, a review of the use of black pepper, curcuma, and ginger in the treatment of colds and flu, as well as support for immunity, digestive issues, and positive effects on the cardiovascular and immunological systems, was conducted.*

KEYWORDS: *Ginger, Gingerols, Health, Medicinal properties, Zingiber officinale,*

1. INTRODUCTION

Plant-derived medicinal items are important in all fields of healthcare, not only because they are popular in healthcare (often used as self-medication), but also because they are important in many traditional medical systems throughout the world. This article is not intended to be a treatment advice, but rather a summary of the scientific concepts that support the use of herbal and other plant-derived medicine, including traditional preclinical and clinical data. Several hundred plant species found on the planet have been scientifically shown to have therapeutic properties. According to the World Health Organization's (WHO) most recent estimates, over 7000 chemical substances used in medicine are originated from plants. According to previous WHO estimates, over 30-40% of medications in Europe include plant-derived components, while vegetable-derived treatments account for approximately 24% of all medicines in the United States. Plants and herbs may be utilized in a variety of ways. Plant infusions are often utilized in teas, extracts, syrups, and other beverages. However, we must be certain that we will utilize the correct dosage of particular pharmaceutical ingredients in order to anticipate successful treatment (active). These assurances also allow us to name medicines made from standardized plant extracts, i.e. those for which the dosage of therapeutic components is known [1]–[3].

1.1. Black pepper, Curcuma, and Ginger:

Many medicinal plants have been researched in many well-known medical labs across the globe in recent years, and it has been determined that certain of them are indispensable in the treatment of immune-stimulating, or stimulating, human immune systems.

Plants including black pepper, curcuma, and ginger have been proven to boost the body's resistance to infections in recent studies. The essential oils of these three spices include compounds with a wide range of antibacterial action. They're also high in natural antioxidants, which help to neutralize free radicals. Antioxidant-rich foods lower the risk of cancer, heart disease, and joint degenerative illnesses, as well as slowing the aging process. The dried black pepper is shown in Figure 1 [4].



Figure 1: Represents the dried black pepper which helps in preventions of diseases.

Southern India produces black pepper from unripe, dried, and fermented fruits. Piperine is the chemical that gives black pepper its distinctive spicy flavor. It's an organic component found in the top layer of this famous spice's peel. In eastern medicine, black pepper was used to treat indigestion, discomfort, and infections. Black pepper also possesses antiemetic and antipyretic properties.

Curcuma has potent anti-inflammatory, antiviral, antibacterial, cleaning, anti-cancer, antioxidant, antiseptic, radioprotective, and cardioprotective properties. Curcuma has a blood cleansing effect and aids the pancreas and liver in their functions. The utility of these chemicals in the prevention and treatment of illnesses including rheumatoid arthritis, diabetes, and Alzheimer's disease is still being studied. Turmeric is used in folk medicine to cure a variety of illnesses, including gallbladder and kidney problems, as well as stomach ailments, since it promotes metabolism and aids digestion. Curcuma genus species have been used in medicine from at least the nineteenth century. Curcuma powder is seen in Figure 2 [5].



Figure 2: Shows the powdered curcuma also known as turmeric powdered.

Immunomodulatory, anti-cancer, anti-inflammatory, analgesic, antihyperglycaemic, and antiemetic properties are among the major pharmacological activities of Ginger and chemicals derived from its rhizome. Ginger has been shown to be effective in the treatment of heart disease and joint and bone inflammation. The study also discovered that Ginger has a low toxicity, indicating that its usage is safe. It comes in two forms: raw and powdered. 0.6 to 3.5 percent of the essential oil is extracted from the rhizomes of Ginger during the distillation process, with the precise chemical makeup depending on the plant's origin. Many nutrients in ginger vary significantly depending on how it is eaten. Figure 3 shows the rhizomes and the powder of ginger [6].



Figure 3: Represents the rhizomes also known as ginger and its powder.

1.1. Chemical Composition:

The makeup of various components in Black pepper varies depending on the plant type used to make the raw material. In addition to starch, cellulose, alkaloids, various essential oils, and approximately 7% piperine, black pepper includes roughly 2.6 percent essential oil, 13 percent water, 12 percent nitrogen compounds, and 7% lipids in its natural state. Piperine is not found in black pepper oil since it is a very volatile component. Acidic amides are the most physiologically active compounds. Black pepper is a tropical perennial plant that originated in India and is widely cultivated in southern India, Indonesia, the Malay Peninsula, Central America, and the Philippines. Black pepper blossoms are gathered in spiky blooms. Environmental variables have a major impact on the production of the black pepper crop. The intensity of precipitation turned out to be the most significant element. Black pepper comes in a variety of forms, including fresh, dried whole grains, and ground.

Mineral salts (lime, iron, and magnesium), lipids, fiber, proteins, carbohydrates, and essential oils are all included in the constitution of herbs and turmeric root. The bright yellow hue of the *Curcuma* rhizome is due to pigments called curcuminoids, which comprise chemicals like curcumin (diferulomethane, approximately 70%), demethoxycurcumin (about 15%), and bis-dimethoxycurmarine (about 5%).

It's worth noting that the pace and technique of freezing have an impact on the chemical composition and microstructure. Structure damage was more apparent in slowly frozen rhizomes than rapid frozen ones, according to microscopic inspection. The composition and color of Ginger were also influenced by the degree of ripeness.

1.1.1. Black Pepper:

The most common form of black pepper is ground powder. Many reports on the technique and parameters used during the milling process may be found in the scientific literature. To guarantee the highest quality of spices, cryogenic grinding is employed. The physicochemical properties of ground Black pepper grains were investigated at temperatures of -120°C , -80°C , -40°C , 0°C , and 40°C . With the decrease of the crushing temperature, the mineral content of ground Black pepper rises. Cryogenic grinding, with a maximum grinding temperature of -21.27°C , is the finest method to ground black pepper. Many evaluations on the topic of Black pepper's harvests, chemical composition, uses, health and therapeutic advantages, and descriptions of antioxidant, antibacterial, anti-inflammatory, gastro-protective, and depressive characteristics can be found in the literature.

Furthermore, studies have been done on the biological function of black pepper. Piperine, a strong antioxidant, is the primary therapeutic ingredient in black pepper. It shows a robust response to free radicals. It aids in the protection of the circulatory system, the liver, and DNA damage, as well as having anticancer properties. Furthermore, the aging process is delayed. There are many studies in scientific journals that support the health benefits of black pepper use. Piper ethanolicnigrum causes overproduction of reactive oxygen species (ROS), DNA fragmentation, cell cycle arrest, and death. In in vivo experiments, the solution had cytotoxic and antiproliferative effects on MCF-7 cells as a consequence of its injection. The anticancer action is most likely due to excessive ROS generation, which causes oxidative stress, which affects critical proteins involved in G1/S cell cycle arrest and death. In animal experiments, piper nigrum has been shown to have anticancer properties.

The findings indicate that the research contributes to the production of reactive oxygen species (ROS), which has anticancer properties.

Guineensin extract, found in black and long black peppers, has anti-inflammatory properties and inhibits endocannabinoid absorption by cells. Guineensine was tested in mice models of acute and inflammatory pain, as well as endotoxemia, by the Reynoso-Moreno group. The anti-inflammatory properties of black pepper may be due to the significant pharmacological activity of guineinin. 22 Antimicrobial substances may be found in black pepper grains and the essential oil extracted from them. It has natural antioxidants that prevent rancid lipids from forming, which is what a natural preservative does. A diet high in antioxidant chemicals found in black pepper may help to reduce the risk of cancer, heart and blood vessel illness, and degenerative joint disease, as well as delay the aging process. The impact of black pepper extracts on bacteria cultures and their ability to inhibit toxin-producing metabolites (*Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus* and *Candida albicans*). According to these research, the majority of commercially available black pepper extracts show action against pathogenic bacteria.

Black pepper contains piperine, which has antibacterial properties as well as a beneficial effect on the digestive system. Its primary health benefit is the production of gastric juices, which contributes to improved digestion and, as a result, increased appetite. Strong warming qualities increase blood flow to the whole digestive tract, resulting in a favorable impact on nutritional absorption and the absorption of some chemicals. Furthermore, the extracts of black pepper have a diuretic and mildly laxative effect on the body, allowing you to rapidly eliminate toxic metabolic products. Because it affects the production of saliva and digestive enzymes, black pepper has long been used in traditional folk medicine to treat stomach issues including diarrhea, nausea, bloating, and digestive disorders [7], [8].

1.1.2. *Curcuma*:

The disk diffusion technique was then used to confirm the antibacterial capabilities of *Curcuma longa* leaves. Eight fungus and five bacterial species were chosen to represent a variety of human diseases. The essential oil was the most resistant to *Fusarium miniformes*, followed by *Bacillus subtilis*, while *Fusarium oxysporium* was the least resistant. The essential oil has considerable inhibitory effect against the test organisms, according to the findings. Curcuminoids may be synthesized by two more type III polyketide synthases, CURS2 and CURS3, which have been discovered and described. CURS2 chose feruloyl-CoA as a starting substrate, whereas CURS3 favored both feruloyl-CoA and pcoumaroyl-CoA in vitro. CURS2 seems to produce curcumin or demethoxycurcumin, while CURS3 appears to synthesis curcumin, bisthyroxycurcumin, and demethoxycurcumine.

In contrast, the DC composition had greater neuroprotective and anti-inflammatory effectiveness. Furthermore, it is risk-free to use. 42 Curcuma, an antioxidant present in the spice, has been proven to prevent carcinogenesis in animal models and to be anti-inflammatory. The discovery of two novel chemicals in this chemical research revealed the chemical composition of Curcuma, and a biological test indicated that terpenoids with NO inhibitory action found in natural Curcuma food seasoning may possibly be a health promoter for humans. Kurkumin, which is found in the root of turmeric, is a potent anti-oxidant. Turmeric contains anti-cancer, anti-inflammatory, antibacterial, and cleaning effects as a consequence of this. Turmeric has been shown to be effective in the treatment and prevention of cancers of the skin, esophagus, and abdominal cavity tumors. Turmeric has the ability to cause cancer cells to self-destruct via the apoptosis mechanism. Curcuma inhibits tumor development, metastasis, and cancer cell spread at the molecular level. 47 Furthermore, the chemical components in curcumin prevent the development of alpha-toxins and nitrosamine, two highly carcinogenic chemicals [9], [10].

1.1.3. *Ginger*:

Ginger is a member of the Zingiberaceae family and is said to have originated in India's north-east area. Ginger has been grown in China, Nigeria, Sierra Leone, Indonesia, Bangladesh, Australia, Fiji, Jamaica, Nepal, Haiti, Mexico, and Hawaii for thousands of years as a spice and for medicinal reasons. Ginger is one of the most

essential culinary ingredients, as well as a therapeutic ingredient in alternative medicine. Colds, headaches, nausea, stomach trouble, diarrhea, arthritis, rheumatological conditions, and muscle pain have all been linked to it, as well as its usage as a carminative and antifatulent. Ginger has antibacterial, anti-inflammatory, antipyretic, antioxidative, hypoglycemic, hepatoprotective, diuretic, and hypocholesterolemic properties, according to scientific research.

The presence of volatile elements such as zingiberene, curcumene, farnesene, bisabolene, -sesquiphellandrene, 1,8-cineole, linalool, bornyl acetate, geraniol, and geranyl acetate, as well as non-volatile components such as gingerols, shogaols, paradols, and zingerone, is thought to be responsible for other significant chemicals discovered in ginger include ginger protease, capsaicin, gingediol, galanolactone, gingesulfonic acid, galactosylglycerols, ginglycolipids, diarylheptanoids, neral, and phytosterols.

In the Chinese, Ayurvedic, Arabic, Tibetan, Unani, and other folk medical systems, ginger has been well-documented as being extremely helpful against symptoms of gastrointestinal disorders such as constipation, indigestion, nausea, and vomiting. Ginger is a stimulant and carminative that is often used to treat dyspepsia and colic. Ginger has been proven in preclinical tests to increase saliva production and enhance bile discharge from the gall bladder. It also works as a gastroprotective, anti-ulcerative, anti-emetic, and preventative for epigastric pain, dyspepsia, stomach soreness, abdominal spasm, and gastrointestinal cancer. The positive benefits of ginger on the gastrointestinal system are discussed in the following sections [11].

2. DISCUSSION

Imbirze has a distinctive scorching flavor and fragrance with a refreshing note due to the presence of a significant quantity of essential oils. Medicinal Ginger is a cultivated plant that is not found in the wild. A creeping rhizome from which flower branches develop is part of its morphological structure. Ginger's root contains beneficial properties that are utilized in herbal medicine and have a good impact on one's health. Antibacterial, antiviral, antiparasitic, and antioxidant properties are all present. Ginger has bioactive compounds with anti-inflammatory effects, making it a plant with a lot of medicinal promise. The root of Ginger, regardless of the type or form eaten, includes many nutrients, minerals, and amino acids that may be utilized in lacustrine or as dietary supplements. For many years, black pepper has been popular in the kitchen. In addition to the flavor, piperine has been shown to have a beneficial impact on human health. The piperine, which has a beneficial impact on the body, is the most useful component found in pepper grains; nevertheless, its concentration is low in Black pepper, making it impossible to anticipate acceptable benefits from intake. It's also worth noting that consuming too much black pepper may irritate the digestive tract. Curcuma has a bile-forming, choleric, and antibacterial action, which protects the bile ducts against infection. It is often used to treat indigestion and digestive problems. It may be used as an adjuvant in the treatment of bile duct and gall bladder irritation. It is not, however, recommended for usage during pregnancy or nursing, or in children under the age of 12. (contains alcohol). So far, no negative side effects have been linked to the usage of turmeric in the diet.

3. CONCLUSION

For one month, daily consumption of turmeric extract, black pepper, and ginger may reduce inflammation in patients with chronic knee osteoarthritis, similar to the effect of Naproxen capsules; thus, a prepared herbal formulation with fewer side effects can be used as a safer alternative to chemical drugs. Future research should include more variable adjustments and a longer follow-up period, according to the authors. Given the benefits of each herbal component on decreasing inflammation, the combination of turmeric extract, black pepper, and ginger may help patients with persistent knee osteoarthritis alleviate their clinical symptoms. Given the limitations of diverse research and the lack of agreement on the impact of these plants on inflammatory markers, clinical trials including various types of supplementation at various dosages in various illnesses are required.

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