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A SPICE WITH MULTIPURPOSE MEDICATIVE FEATURES: TURMERIC

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ABSTRACT:

One of the most valuable herbal medicinal herbs is called curcuma longa, often known as turmeric. This plant is a member of the Zingiberaceae family. Extensive study has shown that the majority of the medicinal properties of turmeric are attributable to a compound called curcumin. It is beneficial in situations such as inflammation, ulcers, and cancer due to the antioxidant activity it has among its many other beneficial aspects. In addition, it inhibits the growth of fungi and bacteria and protects the kidneys and the liver. As a result, it has the potential to combat a variety of cancers, diabetes, allergies, arthritis, Alzheimer's disease, and other chronic and difficult to treat disorders. This article's goal was to provide a concise synopsis of the recent and up-to-date information about the effects of curcumin. We looked through the most recently published articles on turmeric that were found in reputable international databases including PubMed/Medline, the Science Citation Index, and Google Scholar. Recent research has validated the use of turmeric in the treatment of a variety of illnesses, particularly those that are caused by oxidative stress, such as cancer, diabetes mellitus, and inflammatory disorders. In the fight against AIDS, it is also used as a hepatoprotective, nephroprotective, anticoagulant, and anti-HIV agent. Curcumin, which is found in the spice turmeric, shows a lot of promise as a potential medicinal agent. In addition to this, its toxicity is quite low. In light of the fact that there is currently a shift occurring on a global scale toward the use of non-toxic plant products that have traditionally been used for medicinal purposes, there is a pressing need to place an emphasis on the research and development of modern drugs derived from turmeric in order to combat a wide range of illnesses. Additional research must be conducted on turmeric in order to uncover hitherto unknown aspects and therapeutic uses that have the potential to improve the lives of people everywhere.

Keywords: Curcuma longa, Curcumin, Pharmacology, Phytochemistry, Therapeutic effects.

INTRODUCTION:

Since the beginning of civilization, people have relied on medicinal plants as a trustworthy source for the production of new pharmaceuticals and for the treatment of various ailments. In herbal medicine, curcuma longa L., often known as turmeric (which is a member of the Zingiberaceae family), is held in high esteem as a universal panacea due to its large range of pharmacological activity, as was discovered by an exhaustive review of the relevant published research.

There are tropical and subtropical places all over the globe where the plant that produces turmeric may be found. It is mostly farmed in China and India, although it is also grown in other Asian nations. The plant's stem is rather short for its height of up to one metre. In every region of the globe, turmeric is an indispensable spice that has a significant place in human history, notably among the people of the East (1). Because of the medicinal characteristics it has, in addition to its functions as a spice, it is also used in traditional medical practises in Asian nations such as India, Bangladesh, and Pakistan (2). Turmeric, or Zarchooveh as it is known in Iran, has been used for centuries due to the taste and therapeutic qualities it has (3). Traditional Chinese medicine asserts that its powder may treat gastrointestinal conditions, in particular biliary and hepatic disorders, diabetic wounds, rheumatism, inflammation, sinusitis, anorexia, coryza, and cough (4). Curcumin, which is yellow in colour and is the primary component of this plant, is responsible for giving turmeric its characteristic yellow hue (4). Recent research has validated turmeric's use as an anticancer agent, as well as an anti-diabetic agent, an antioxidant agent, a hypolipidemic agent, an anti-inflammatory agent, an antimicrobial agent, an anti-fertility agent, an anti-venom agent, a hepatoprotective agent, a nephroprotective agent, and an anticoagulant agent. It has also been shown that the plant has anti-HIV activity, which may be used to fight AIDS. Because it has so many different uses in medicine, turmeric is sometimes referred to as a "wonder spice." Turmeric's medicinal characteristics are responsible for this reputation.

PHYTOCOMPONENTSOFTURMERIC:

Turmeric includes 69.4 percent carbs, 6.3 percent protein, 5.1 percent fat, 3.5 percent minerals, and 13.1 percent . moisture. The essential oil that was

produced by steam distillation has the following components: sesquiterpenes (53 percent), zingiberene (25 percent), a-phellandrene (1 percent), sabinene (0.6 percent), cineol (1 percent), and borneol. The overall concentration of the essential oil was 5.8 percent (0.5 percent). The yellow colour comes from a compound called curcumin, which makes about 3–4 percent of the spice and is composed of curcumin I (94 percent), curcumin II (6 percent), and curcumin III (0.3 percent) (Figure 1). (5). In addition to curcumin, the demethoxy and bisdemethoxy variants of the compound have been extracted from turmeric. The melting point of curcumin is between 176 and 177 degrees Celsius, it produces a salt that is reddish-brown in colour when combined with alkali, and it is soluble in acetic acid, ethanol, alkali, ketone, and chloroform (2).

In the rhizomes, the presence of the compounds tumerone a, tumerone b, curzerenone, curdione, as well as mono- and di-demethoxycurcumin, has been observed. Gas Liquid Chromatography was used to examine the essential oils of C. longa leaves, and the results showed that the oils included linalool, caryophyllene, geraniol, -pinene, -pinene, sabinene, myrcene, -phellandrene, 1,8-cineole, p-cymene, C8-aldehyde, and methyl (6).

A new sesquiterpene, (6S)-2-methyl-6- (4- hydroxyphe- nyl-3-methyl) two novel bisabolaneses- quiterpenes, -2-hepten-4-one (6S)-2-methyl-6-(4-hydroxyphenyl) -2-hep- ten-4-one, (6S)-2- methyl-6- (4-formylphenyl) -2-hepten-4-one, as well as two calebin derivatives including 4"-(4"'-hydroxyphenyl- 3"'-methoxy), - 2"-oxo-3"-butenyl-3-(4'-hydroxyphenyl) - propenoate, as well as 4-(4'-hydroxyphenyl) - 2"-oxo-3"-bute- nyl-3-(4'-hydroxyphenyl- 3'-methoxy) - propenoate, in addition to the five known bisabolanesesquiterpenes, was isolated from turmeric (7).

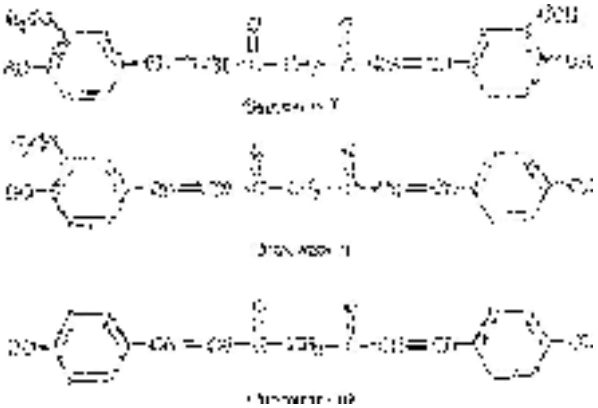

Figure1.*Variouscurcumins*

PHYTOPHARMACOLOGYOFTURMERIC:

There are a number of medicinal and pharmacologic actions associated with turmeric. The following is a listing of the most significant phytopharmacological and therapeutic qualities that turmeric has.

ANTIOXIDANTACTIVITY:

It has been shown that curcumin is an effective scavenger of oxygen free radicals. [Curcumin] It has an antioxidant activity that is on par with that of vitamins C and E. (4). It is able to prevent oxidation of lipids as well as haemoglobin. It has the ability to dramatically limit the production of reactive oxygen species (ROS) by activated macrophages. This includes the production of H2O2, superoxide anions, and nitrite radicals. Antioxidant properties are also shown by two of its derivatives, namely bis-demethoxycurcumin and demethoxycurcumin (4).

It has been shown that pretreatment with curcumin may reduce the oxidative stress and alterations in the heart that are caused by ischemia (5). An increase in cellular resistance to oxidative damage was seen as a consequence of an in vitro investigation that measured the impact of curcumin on an inducible stress protein (6).

CARDIOVASCULARANDANTI-DIABETICEFFECTS:

Antioxidant activity, a reduction in lipid peroxidation, efficacy against diabetes, and an inhibition of platelet aggregation are the primary mechanisms through which turmeric's cardioprotective properties are exerted. In a trial involving 18 atherosclerotic rabbits, the administration of turmeric extract at doses ranging from 1.6 to 3.2 mg/kg per day resulted in lowered plasma levels of cholesterol and triglycerides as well as decreased susceptibility of LDL to lipid peroxidation. It is possible that the impact that turmeric has on cholesterol levels is caused by a reduction in cholesterol absorption in the intestines and an increase in the conversion of cholesterol to bile acids in the liver. It is believed that the components of turmeric are able to suppress platelet aggregation by a combination of the potentiation of prostacyclins production and the inhibition of thromboxane formation.

Both curcumin and turmeric lower the amount of glucose in the blood of diabetic rats. Additionally, problems associated with diabetes mellitus are

reduced by the use of turmeric. More clinical research has to be done in this area so that appropriate doses may be determined for activities like protecting the cardiovascular system and decreasing cholesterol or glucose levels (7).

INFLAMMATORYANDEDEMATICDISORDERS:

Curcumin is an effective anti-inflammatory compound that has been shown to inhibit the enzymes COX-2 and lipoxygenase specifically. Studies conducted in both vitro and in vivo animals have shown that it is effective in reducing acute as well as chronic inflammation. In mice, administering dosages of curcumin ranging from 50 to 200 mg/kg was sufficient to prevent edoema. Curcumin was virtually as effective as cortisone and phenylbutazone when given in quantities that were comparable, and a decrease in edoema of fifty percent was accomplished at a dosage of forty-eight milligrammes per kilogramme of body weight (mg/kg). In rats, paw inflammation and edoema were reduced when a lower dosage of 20-80 mg/kg was administered. Curcumin also prevented formaldehyde-induced arthritis in rats when given at a dosage of 40 mg/kg, and it showed no signs of acute toxicity even when given at doses of up to 2 g/kg/day (8). In a study conducted on animals, rheumatoid arthritis was induced by streptococcal cell wall. An intraperitoneal injection of turmeric extract containing 4 mg total curcuminoids/kg/ day for four days prior to the induction of arthritis inhibited joint inflammation in both the acute (75 percent) and chronic (68 percent) phases of the disease. A 30-fold greater dosage of the curcuminoid preparation was given to rats four days prior to the development of arthritis in order to examine the effectiveness of an oral preparation. The results showed that the joint inflammation was decreased by 48 percent (9).

GASTROINTESTINALEFFECTS:

The digestive system is protected against harm by some of turmeric's beneficial properties. Additionally, turmeric prevents the development of ulcers in rats that have been treated to gastrointestinal insults such as stress, alcohol, Indomethacin, reserpine, and pyloric ligation by increasing the amount of mucus that is produced by the stomach wall. In addition to this, it reduces the activity of intestinal spasms and enhances the production of bicarbonate, gastrin, secretin, and pancreatic enzymes. In an open, phase II experiment with 25 patients who had endoscopically diagnosed stomach ulcers, patients were given

600 mg of powdered turmeric five times daily. The results revealed that 48 percent of patients had totally recovered from their ulcers. There were no reports of any adverse effects or abnormal blood results (7). Mice with artificially induced colitis had much less mucosal damage when treated with curcumin. Ten days before inducing colitis with 1, 4, 6-trinitrobenzene sulphonic acid, administration of curcumin at a dose of 50 mg/kg resulted in a significant reduction of diarrhoea, neutrophil infiltration, and lipid peroxidation in colonic tissue. This was the case even though the colitis was still induced. Additionally, all indications of inflammation decreased, and improvements were seen in patients' complaints (10). Curcumin was shown to be effective in reducing inflammation in animal models of artificially induced pancreatitis in rats. Curcumin was also able to block the inflammatory mediators in cerulean or ethanol-induced pancreatitis, which resulted in an amelioration in disease severity as determined by histology, pancreatic trypsin, serum amylase, and neutrophil infiltration (11).

ANTI-CANCEREFFECT:

The impact of turmeric on the development of cancer has been investigated in a number of animal experiments. Curcumin has been shown to suppress carcinogenesis at three different phases, including angiogenesis, tumour promotion, and tumour development, according to the findings of a number of research. Curcumin was proven to decrease both the proliferation of cancer cells and the formation of tumours in two separate investigations involving colon and prostate cancer. Both turmeric and curcumin have the ability to inhibit the mutagenic and carcinogenic properties of a variety of common chemical agents. The anticarcinogenic effects of turmeric and curcumin have been linked to their direct antioxidant and free-radical scavenging effects, as well as their ability to indirectly increase glutathione levels. This assists in the hepatic detoxification of mutagens and carcinogens, and it also inhibits the formation of nitrosamines. It has also been shown that curcumin may prevent DNA mutations caused by exposure to ultraviolet light (8-12).

ANTIMICROBIALACTIVITY:

It has been shown that turmeric may prevent the multitudinous types of bacteria, parasites, and harmful fungus from replicating. According to the

findings of a research conducted on chicks that were infected with Eimera maxima, meals that included 1 percent turmeric resulted in a decrease in intestinal lesion and enhanced weight growth (11). In a different experiment with animals, topical treatment of turmeric oil prevented the growth of dermatophytes and other harmful fungus in guinea pigs seven days after the application of turmeric (13). It has also been discovered that curcumin has some efficacy against the parasite Plasmodium falciparum as well as the predominant strain of Leishmania (14).

Effects of turmeric that are both hepatoprotective and renoprotective It has been shown that turmeric has renoprotective and hepatoprotective characteristics that are comparable to silymarin's. Research conducted on animals has shown that turmeric may protect the kidneys and the liver against a number of different toxins that can be harmful to the liver. The antioxidant capabilities of turmeric, in addition to its capacity to reduce the production of pro-inflammatory cytokines, are primarily responsible for the protective benefits that it has on the liver and the kidneys (3-5). Aflatoxin generation has also been shown to be responsible for fatty alterations, biliary hyperplasia, and necrosis; however, turmeric and curcumin have been shown to counteract these effects (3). Sodium curcuminate, which is a salt of curcumin, also has the ability to exert choleretic effects. These effects include increasing the biliary excretion of bile salts, cholesterol, and bilirubin, in addition to increasing the solubility of bile. As a result, it may be used to both prevent and treat cholelithiasis (4).

ALZHEIMERANDTURMERIC:

Studies on epidemiology have revealed a lower incidence of Alzheimer's disease (AD) in people who have used nonsteroidal anti-inflammatory medicines (NSAIDs) for a long period of time. This may highlight the function that brain inflammation plays in Alzheimer's disease. Additionally, it has been shown with elevated levels of cytokines and activated microglia. Curcumin has been demonstrated to have an action similar to that of NSAIDs, and it also lowers oxidative damage. The impact of dosages of dietary curcumin ranging from 160 ppm to 5000 ppm on inflammation, oxidative damage, and plaque pathology was investigated in order to determine whether or not it may have an influence on the pathology associated with Alzheimer's disease. Oxidized proteins and IL-1, which is a proinflammatory cytokine that is typically high in the brains of these

animals, were both dramatically reduced by either dosage. This seasoning has promise for the treatment and prevention of Alzheimer's disease because of its effectiveness and apparent lack of toxicity (15,16).

PHOTO-PROTECTORACTIVITY:

This effect is a result of the antioxidant activity that it has. An significant portion of the lipids that make up the outermost layer of the skin are unsaturated. As a consequence of this, they are susceptible to assault by free radicals. These free radicals may enter the skin and hasten the damage they inflict, which is accelerated by the sun's UV radiation. The lipids in the skin may get degraded after prolonged exposure to these radiations, which may result in the skin's texture becoming more uneven. Extract of turmeric has been demonstrated to be efficient in reducing inflammation and shielding epidermal cells from the deterioration induced by exposure to ultraviolet B radiation, according to research conducted in the laboratory (7). It has been shown that curcumin, when taken in tiny quantities from turmeric, may protect against chromosomal damage induced by gamma radiation (7).

CONCLUSION:

The spice turmeric is the only known source of a diverse range of chemical components, all of which are responsible for a number of biological processes. Despite the fact that a large number of studies have been conducted on turmeric, further research is required to uncover its other potential therapeutic applications in the fight against illness. A drug development project should be done to create contemporary medications. In spite of the fact that unprocessed extracts of the plant's leaves or rhizomes can be used for medicinal purposes, the creation of effective modern drugs is only possible after exhaustive research into the plant's pharmacotherapeutics, bioactivity, mechanism of action, and toxicities, as well as after appropriate standardisation and clinical testing. In light of the fact that there is currently a shift occurring on a global scale toward the utilisation of non-toxic plant products that have traditionally been used for medicinal purposes, there is a pressing need to place an emphasis on the research and development of modern drugs derived from C. longa in order to combat a wide range of illnesses. It is necessary to do further research on C. longa in order

to uncover hitherto unknown aspects and therapeutic applications that have the potential to improve the lives of people.

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