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Curcuma longa: A review of therapeutic effects in traditional and modern medical references

Azam Rezvanirad, Mahnaz Mardani[2], Hedayatollah Shirzad[3*], Seyyed Mohammad Ahmadzadeh[4], Sedigheh Asgary[5], Azar Naimi[6], Ghafar Mahmoudi[7]

[1]Food and Drug Laboratory Research Center, Food and Drug Organization MOH & ME, Tehran, Iran
[2]Department of Health and Nutrition, Lorestan University of Medical Sciences, Khorramabad, Iran
[3]Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran
[4]Dezful University of Medical Sciences, Dezful, Iran
[5]Isfahan Cardiovascular Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran
[6]Pathologist and Technical Manager of Pediatric Imam Hossein Hospital laboratory, Isfahan University of Medical Sciences, Isfahan, Iran
[7]Faculty of Medicine, Department of Internal Medicine, School of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran

***Corresponding author: E-Mail: shirzadeh@yahoo.com @yahoo.com**

ABSTRACT

Turmeric with scientific name of *Curcuma longa* is a perennial and herbaceous plant from family Zingiberaceae that grows in East Asia, such as China, and India. Ample evidence from previous studies indicates that *C. longa* is effective on many diseases including diabetes, Alzheimer's disease, rheumatoid arthritis, and cancer. It also has hepatoprotective, gastrointestinal tract and cardiovascular system protective effects, and may stimulate immune system. Because *C. longa* contains antioxidant compounds such as curcumin, zingibran, alpha and beta-turmerin, arabinose, fructose, glucose, starch and desmetoxicurcumin. The therapeutic effects that have already been confirmed in with animal and human studies can be attributed to these compounds. Therefore, the effective compounds of *C. longa* on the above diseases should be investigated in clinical trials. This may help to produce effective and strong drugs to treat these diseases. This article was aimed to summarize and present the therapeutic effects of *Curcuma longa* in traditional and modern medical references.

KEY WORDS: *Curcuma longa*, curcumin, diseases.

1. INTRODUCTION

More than 80% of world population use traditional medicine, especially herbal medicines, to treat or prevent their diseases. These plants have been shown promising effects in various diseases (Mervat Sh Sadak, 2016; Bahmani, 2012, 2014,2015; Bahaa, 2016; Kh, 2015; Yasser, 2015; Fitri, 2016; Gad and Abdel-Moez, 2015; Khaled, 2016; Kartini Zailanie, 2015; Helmina Br. Sembiring, 2015; Rafieian-kopaei, 2013; Azadmehr, 2011; Mardani, 2014; Setorki, 2013; Akhlaghi, 2011; Alibabaei, 2014; Baradaran, 2012; Moradi, 2013; Rabiei, 2013, 2014; Sarrafchi, 2016; Shayganni, 2015). Nutraceuticals and medicinal plants other than nutritional role have beneficial effects in health (Rabiei, 2014; Bahmani, 2015; Parsaei , 2016; Mohsenzadeh 2016; Jivad, 2016; Parsaei, 2016; Samarghandian, 2016; Mohsenzadeh, 2016; Rahimian, 2013; Rahnama, 2015). Nowadays, nutraceutical and plant researches have been focused for preparation of new drugs and protection of bodies (Nasri, 2015; Rafieian-Kopaei, 2011; Rafieian-Kopaei, 2014; Mirhosseini, 2014; Khosravi-Boroujeni, 2012; Madihi, 2013). The knowledge about medicinal plants has been accumulated over thousands of years and it has been shown that a lot of nutraceuticals are present in herbal medicines as key components which act on diseases (Sewell and Setorki Rafieian-Kopaei, 2014; Setorki, 2011; Nasri, 2013; Kafash-Farkhad, 2013; Asadi, 2013; Parsaei, 2013; Amirmohammadi, 2013; Bahmani, 2014; Bahmani, 2014; Sharafati, 2011; Roohafza, 2013; Bahmani, 2013, 2014). A great attention is nowadays given to discover the link between dietary nutrients or medicinal plants and disease prevention (Rafieian-Kopaie, 2013). Large number of medicinal plants which had been in use since ancient time play a crucial role in the prevention and treatment of diseases (Asadi, 2013; Parsaei, 2013; Amirmohammadi, 2013; Sharafati, 2011; Roohafza, 2013; Bahmani, 2013, 2014). Turmeric or *Curcuma longa* is one of these plants which is a rhizomatous, perennial and herbaceous plant from family Zingiberaceae (ginger). It occurs in East Asia, such as China, and India. *C. longa* is one of the native plants of South Asia which is used as a food additive. It is called Zardchoubeh in Persian and Heldi in Indian (Nasri, 2014). *C. longa* rhizome contains 3-5 yellow-colored pigments from which an effective compound, curcumin, is produced. C. longa requires temperature about 25 °C and a considerable annual rainfall for a good thrive (Prasad, 2000) Plant is usually gathered for its rhizomes to prepare a spice. However, it is not usually used freshly and the rhizome is boiled for more than 30 minutes and then is dried in ovens, after which it is ground into powder (Prasad, 2000). One of the most important and active ingredients is curcumin. Most of the turmeric is prepared in India. It has been prepared and used in various contries, especially in Asia for thousands of years. Curcumin was initially used as a dye, however, it was later consumed for its medicinal and spice properties (Priyadarsini, 2014).

Curcuminoids including curcumin, bisdemethoxycurcumin and demethoxycurcumin are the most important components of turmeric. Curcumin is the best-studied and the most important component of turmeric and constitutes more than 3% of the turmeric powder. Other important components of volatile oils of turmeric include turmerone, atlantone, and zingiberene sugars, proteins, and resins. Notably, big variation exists in curcumin content of turmeric in different *Curcuma longa* (Turmeric processing, 2013; Chattopadhyay, 2004).

Turmeric has been traditionally used to treat a wide variety of disorders including indigestive and liver ailments disorders, throat infections, common colds, wound and skin sores (Aqili Khorasani, 1992).

It has high antioxidant activity and is used for cancer, rheumatoid arthritis, degenerative diseases, diabetes, cardiovascular disease, Alzheimer's disease, immune and liver disorders (Nasri, 2014).

This article was aimed to summarize and present the therapeutic effects of *Curcuma longa* in traditional and modern medical references.

Therapeutic effects of *C. longa:* Therapeutic effects of *C. longa* according to traditional medical references are summarized in table 1.

Table.1. Traditional therapeutic effects of *Curcuma longa*

Traditional effects of *C. longa*	Hepatic vasodilator and contributor to treating ascites and jaundice (Aqili Khorasani, 1992).
	Placing its powder on wound makes the wound dried and removes pain and swelling (Aqili Khorasani, 1992).
	Placing its powder on tooth relieves toothache (Aqili Khorasani, 1992).
	Rubbing it relieves joint pain and removes swelling (Aqili Khorasani, 1992).
	Its rhizome powder is used to treat roundworm (Sharma, 2005).
	Its rhizome powder is used to treat diarrhea (Ghazanfar, 1994; Kapoor, 1990).
	Its powdered rhizome is used to treat ague (Moken, 1984; Satoskar, 1986).
	Its powdered rhizome is used to treat liver disease (Ghazanfar, 1994; Kapoor, 1990; Moken, 1984; Satoskar, 1986).
	Its powdered rhizome ID used to treat stomach disease (Ghazanfar, 1994; Kapoor, 1990; Moken, 1984; Satoskar, 1986).
	Its powdered rhizome is used to treat urinary tract infections (Ghazanfar, 1994; Kapoor, 1990).
	Its powdered rhizome is used to treat white spots on the body (Ghazanfar, 1994; Kapoor, 1990; Moken, 1984; Satoskar, 1986).
	Its powdered rhizome is used to treat menstrual problems (Antony, 1991; Moken, 1984).
	Its powdered rhizome is used to treat intestinal colic (Kapoor, 1990).
	Its powdered rhizome is used to treat skin disorders (Ghazanfar, 1994; Kapoor, 1990; Moken, 1984). .

Pharmacological and therapeutic effects of *C. longa:* It has already been confirmed that *C. longa* is therapeutically effective on many diseases including diabetes, Alzheimer's disease, rheumatoid arthritis, and cancer, has hepatoprotective effects, affects gastrointestinal tract and cardiovascular system, and can strengthen immunity system. (Table 2)

C. longa effects on immunity system	A study demonstrated that *C. longa* causedincrease in the phagocytosis activity of macrophages, which contributed to improving Alzheimer's disease through increasing phagocytosis activity and inhibiting accumulation of amyloid (Satoskar, 1986; Antony, 1999). *C. longa* caused inhibition of producing proinflammatory cytokines through macrophages and lymphocytes (Gautam, 2007).
C. longa effects on cardiovascular system	In a study on 10 healthy volunteers, intake of 500 g *C. longa* a day for seven days caused oxLDL concentration to decrease by 33%, total cholesterol to decrease by 11%, and HDL-c to increase by 29% (Quiles, 1998). *C. longa* inhibits oxLDL and accumulates platelets which are effective agents of developing atherosclerotic plaques (Soni, 1992).
Hepatoprotective effects of *C. longa*	A study demonstrated that administration of rats with *C. longa* caused increase in the concentrations of catalase, superoxide dismutase, and glutathione peroxidase in liver, which protects liver against the damage due to increased lipids and ox-LDL (Reddy, 1994; Soni, 1997). *C. longa* can protect liver against various toxins such as pentobarbital, acetaminophen, thiostamide, carbon tetrachloride, galactosamine, and aflatoxin (Deshpande, 1998; Piper, 1998; Soni, 1992).
Effect of C. longa on cancer	A clinical work demonstrated that prescription of 8 and 10 g *C. longa* a day exerted considerable therapeutic effects on primary prostate cancer (Cheng, 2001), and

	prescription of 150 mg C. *longa* a day improved pancreatic cancer considerably (Teiten, 2009).
Effects of C. longa on gastrointestinal problems	A clinical study indicated that administration of 116 patients with dyspepsia with 500 mg *C. longa* caused a significant improvement of dyspepsia (Dhillon, 2008). Besides that, another clinical study of 10 patients with gastric ulcer demonstrated that prescription of one g *C. longa* a day caused improvement of gastric ulcer (Thamlikitkul, 1989).
Effect of C. longa on diabetes	A study demonstrated that *C. longa* administration caused inhibition of glucose production in hepatic cells and treatment of diabetes (Prucksunand, 1989; Nishiyama, 2005). Another work showed that administration of diabetic rats with cucamin, an effective compound of *C. longa*, caused decrease in glycemia and glycosilated hemoglobin (Fujiwara, 2008).
C. longa effects on Alzheimer's disease	Some investigations have demonstrated that *C. longa* exerted anti-inflammatory effects and contributed to regulating immunity system and preventing cell damage process in Alzheimer's disease patients (Arun, 2002; Kim, 2005; Frautschy and Hu, 2001; Ringman, 2005).
C. longa effects on rheumatoid arthritis	Administration of 1200 mg *C. longa* a day caused improvement of morning stiffness, walking duration, and relief of joint pain and swelling compared to phenylbutazone (30 mg) (Deodhar, 1980; Satoskar, 2005).

Phytochemical analysis of *C. longa* and its effective compounds: Phytochemical investigations indicated that *C. longa* containedcurcumin, zingibran, alpha and beta-turmerin, arabinose, fructose, glucose and starch, desmetoxicurcumin, and bisdesmetoxy (Leung, 1980; Ammon and Wahl, 1991; Boon and Wong, 2004).

2. CONCLUSION

Medicinal plants contain bioactive and pharmaceutically effective compounds, antioxidants, flavons, flavonoids, phenols, anthocyanins, and tannins (Amirmohammadi, 2014; Eftekhari, 2012; Bahmani, 2012, 2013, 2014, 2015, Gholami-Ahangaran, 2012; Forouzan, 2012; Gholami-Ahangaran, 2012, 2013; Delfan, 2014, 2015; Asadi-Samani, 2014; Delfan, 2014; Saki, 2014; Asadbeigi, 2014; Karamati, 2014). Many of the pharmaceutical effects of these plants are due to the pharmaceutically bioactive compounds (Bahmani, 2013, 2014, 2015, Delfan, 2014; Ebrahimie, 2015).

Ample evidence from previous studies indicates that *C. longa* is effective on many diseases including diabetes, Alzheimer's disease, rheumatoid arthritis, and cancer, has hepatoprotective effects, affects gastrointestinal tract and cardiovascular system, and may strengthen immunity system. Because *C. longa* contains antioxidant compounds such as curcumin, zingibran, alpha and beta-turmerin, arabinose, fructose, glucose, starch, desmetoxicurcumin, and bisdesmetoxy, the therapeutic effects that have already been confirmed in studies with animals and humans can be attributed to these compounds.

Turmeric has high level of antioxidant activity which is able to combat the oxidative stress. Oxidative stress induced by free radicals is able to impose various diseases (Nasri, 2013).

Free radicals are atoms or group of atoms that have unpaired electron(s) and are highly reactive. Free radicals are from the environment or are formed through natural human physiology. There are numerous types of free radicals. They might be the result of smoking, alcohol consumption, inflammation, drugs, exercise, exposure to air pollutants and sunlight (Baradaran, 2014; Nasri, 2014; Samarghandian , 2014, 2015; Moghaddam , 2015, 2016; Rafieian-Kopaei, 2013; Karagiorgou, 2016).

Oxidative stress is involved in numerous complications including process of aging, certain cancers, anthersclerosis, and particularly in inflammatory diseases including arthritis, vasculitis, nephritis, intestinal ischema, lupus erythematous, respiratory diseases, ischemic diseases, and stroke, hemochromatosis, gastric ulcers, preeclampsia, neurological disorder, especially muscular dystrophy, Parkinson's disease and Alzheimer's disease and many other complications (Nasri, 2013, 2014; Baradaran, 2014; Rafieian-Kopaei, 2014; Baradaran, 2013; Karimi, 2015; Farkhondeh, 2015; Samarghandian, 2010, 2011, 2012, 2013, 2015, 2016; Farkhondeh, 2013, 2015; Hajzadeh, 2011, 2012; Samini, 2013). It has been suggested that free radicals have negative effect and antioxidant positive effects on various diseases and life span. Therefore, turmeric which has a high level of antioxidant activity has its positive effects, at least in part, through its antioxidant activity.

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