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Phytochemical Features of Turmeric in Folk and Traditional Medicine

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Abstract: The chemical composition of turmeric consists of approximately 70% carbohydrates, 13% moisture, 6% protein, 6% essential oils (phellandrene, sabinene, cineole, borneol, zingiberene and sesquiterpenes), 5% fat, 3% minerals (potassium, calcium, phosphorus, iron and sodium), 3-5% curcuminoids and trace amounts of vitamins (B1, B2, C and niacin). Extracts of C. longa and its constituent, curcumin, have demonstrated a relaxing effect on tracheal smooth muscle, indicating their bronchodilator effect in obstructive pulmonary diseases.

Keywords: Curcuma longa (C. longa), curcumin, chemical composition of turmeric, biologically active phytochemical compounds.

Introduction

Curcuma longa (C. longa) or turmeric is a plant with a long history of use in traditional medicine, especially for the treatment of inflammatory conditions with microbial properties. In recent years, many detailed studies (in vitro and in vivo tests) along with clinical trials have revealed its very valuable biological activities related to its anti-inflammatory, antioxidant and preventive properties, which are presented in numerous publications. At the molecular level, curcumin has been shown to inhibit cell proliferation, metastasis formation and apoptosis [1,2,3,4,5,39,40].

India is the main producer and exporter of turmeric in the world. It is widely used as a spice for flavoring and as a natural colorant, used in cosmetics and as a coloring agent, in addition to being a potential source of therapeutically important molecules. Turmeric powder contains 2-8% curcumin, which is the main bioactive phytochemical. The signature orange-yellow color gives curries, drinks and baked goods their distinctive vibrant color [35,36,37,38].

Fresh turmeric root, like ginger root, has a thin, inedible skin that peels off easily to reveal orange flesh. Raw turmeric is softer due to the water content in the root. It is used not only in cooking, but also as a dye for clothes. The leading commercial producers of turmeric are India, Indonesia, China, Philippines, Taiwan, Haiti and Jamaica [6,7,8,9,10,30,31,32,33,34].

A large number of studies on curcumin have been identified. These include studies on the antioxidant, anti-inflammatory, antiviral and antifungal properties of curcuminoids. Studies on the toxicity and anti-inflammatory properties of curcumin have included in vitro, animal, and human studies. A phase 1 human trial involving 25 people taking up to 8,000 mg of curcumin per day for 3 months found no toxicity from curcumin. Five other human trials using 1125-2500 mg of curcumin per day also found it to be safe. These human studies found some evidence of curcumin's anti-inflammatory activity. Laboratory studies have identified a number of different molecules involved in inflammation that are inhibited by curcumin, including phospholipase,

lipoxygenase, cyclooxygenase 2, leukotrienes, thromboxane, prostaglandins, nitric oxide, and others [11,12,13,14,20,21].

Compounds from C. longa were the most active ligands at hH 4 R. They showed calculated K i values of 4.26–6.26 μM (1.57–2.31 μg/ml) (1); 6.66–8.97 μM (2.26–3.04 μg/ml) (2) and 10.24–14.57 μM (3.16–4.49 μg/ml) (3) (95% DI). The calculated Ki value of crude turmeric extract was 0.50-0.81 μg/ml. Fractionated curcumin and crude extract outperformed pure curcumin with a K i value of 5.54 μM or 2.04 μg/ml [95% CI (4.47-6.86 μM), (1.65-2.53 μg/ml)] [14,15,16,22,23].

Extracts of C. longa and its constituent, curcumin, have demonstrated a relaxing effect on tracheal smooth muscle, indicating their bronchodilator effect in obstructive pulmonary diseases. The preventive effects of C. longa extracts and curcumin have been demonstrated in experimental animal models of various respiratory diseases through antioxidant, immunomodulatory and anti-inflammatory mechanisms. C. longa and curcumin have also demonstrated preventive effects against certain lung diseases in clinical studies. The effects of C. longa on pulmonary diseases have been shown to be mainly due to its constituent, curcumin. The pharmacological effects of C. longa extracts and curcumin on respiratory, allergic and immunological disorders indicate a possible therapeutic effect of the plant and curcumin on these diseases [17,18,19,24,25].

The chemical composition of turmeric consists of approximately 70% carbohydrates, 13% moisture, 6% protein, 6% essential oils (phellandrene, sabinene, cineole, borneol, zingiberene and sesquiterpenes), 5% fat, 3% minerals (potassium, calcium, phosphorus, iron and sodium), 3-5% curcuminoids and trace amounts of vitamins (B1, B2, C and niacin). Among the curcuminoids (Figure 1A), approximately CUR accounts for 77%, DMC accounts for 17%, and BMC accounts for 3–6% [8]. Curcumin (1,7-bis-(4-hydroxy-3-methoxyphenyl)-hepta-1,6-diene-3,5-dione) is a natural lipophilic polyphenol that exhibits significant pharmacological effects in vitro and in vivo through various mechanisms. actions. Numerous studies have identified and characterized the pharmacokinetic, pharmacodynamic and clinical properties of curcumin. Curcumin has anti-inflammatory, antioxidant, antinociceptive, antiparasitic, antimalarial effects, and is used as a wound healing agent. However, poor absorption of curcumin in the small intestine, rapid metabolism, and rapid systemic elimination cause poor bioavailability of curcumin in humans. A number of curcumin formulations have been developed to address these issues [26,27].

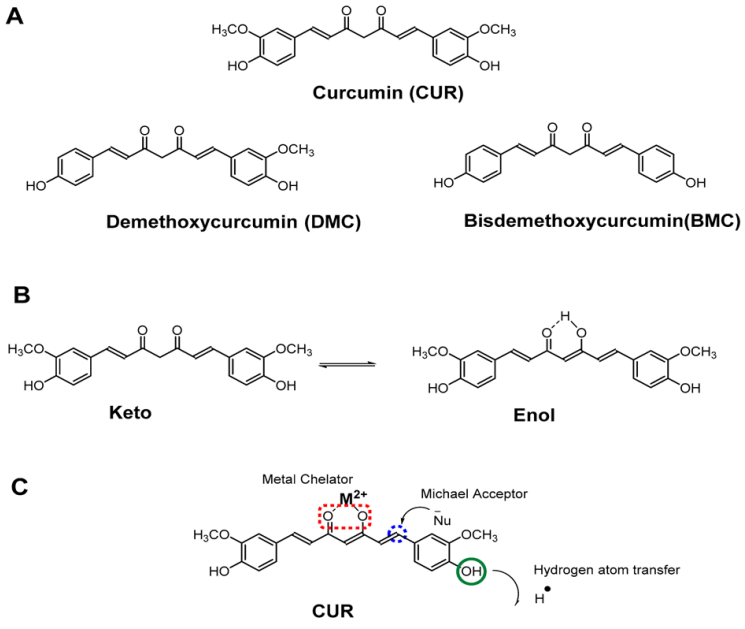

Fig. 1 (A) Chemical structure of curcuminoids (B) Keto-enol tautomers of curcumin and (C) Sites of chemical reactivity in curcumin that contribute to its activity and bioavailability [28,29].

Conclusions. In recent decades, evidence on curcumin (CUR) as a potential therapeutic and nutraceutical has increased. This is evident from the development of a large number of curcumin formulations. This increased interest has stimulated the growth of in vivo, in vitro clinical trials to evaluate the bioefficacy of CUR and curcuminoids. To support this research, sample preparation and analytical techniques have been developed to screen, isolate and quantify curcuminoids from various matrices and detect impurities. Accurate analysis of curcuminoids in various plant matrices, formulations, and biological samples has become an important aspect for accurately assessing the efficacy, bioavailability, and pharmacokinetic profiles of CCMs.

Curcumin has been shown to be safe in six human trials and has demonstrated anti-inflammatory activity. It may exert its anti-inflammatory activity by inhibiting a number of different molecules that play a role in inflammation.

Through this study, certain compounds of C. longa were identified as potential ligands and reasonable leading structures in hH 4 R. The mechanism of anti-inflammatory action of curcumin was further elucidated, and the role of extracts in traditional herbal medicine was enhanced.

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