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Turmuric (The Grandmothers Medicine): History, Cultivation, Extraction, Identification and Health Benefit

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Abstract: *Curcumin, a polyphenol derived from turmeric, has garnered significant attention for its diverse pharmacological properties. This review aims to provide basic information about cultivation, collection and extraction identification of curcumin from turmuric. We comprehensively evaluated the available literature on uses and benefits of turmeric in day to day life. Our findings highlight the promising potential of curcumin in wound healing, antiseptic and as an immunity booster. However, challenges such as low bioavailability and inconsistent clinical outcomes remain. Overall, curcumin represents a promising therapeutic agent with the potential to address various diseases.*

Keywords: Turmuric,Curcumin,cultivation,collection,extraction,identification,Wound Healing, polyphenol, Immunity Booster

I. INTRODUCTION

Turmeric (Curcuma longa) is extensively used as a spice, food preservative and colouring material in India. Turmeric is widely consumed in the countries of its origin for a variety of uses, including as a dietary spice, a dietary pigment, and an Indian folk medicine for the treatment of various illnesses. It is used in the textile and pharmaceutical industries and in Hindu religious ceremonies in one form or another. Current traditional Indian medicine uses it for biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism, and sinusitis. The old Hindu texts have described it as an aromatic stimulant and carminative. Powder of turmeric mixed with slaked lime is a household remedy for the treatment of sprains and swelling caused by injury, applied locally over the affected area. Safety evaluation studies indicate that both turmeric and curcumin are well tolerated at a very high dose without any toxic effects. Thus, both turmeric and curcumin have the potential for the development of modern medicine for the treatment of various diseases [roshan yadav,et al.2016].

Turmeric is the rhizome or underground stem of ginger like plant. The plant is an herbaceous perrineal, 60-90 cm high with a short stem tufted leaf. Its flowers are yellow, between 10-15 cm in length and they group together in dense spikes, which appear from the end of spring until the middle session. No fruits are known for this plant. The whole turmeric rhizome, with a rough, segmented skin. The rhizome is yellowish-brown with a dull orange interior that looks bright yellow when powdered. Rhizome measures 2.5-7.0 cm (in length), and 2.5 cm (in diameter) with small tuber branching off. Turmeric held a place of honour in Indian traditional ayurvedic medicine. In ayurvedic it was prescribed for the treatment of many medical problems ranging from constipation to skin diseases. It was used as digestive aid and treatment for fever, inflammation, wounds, infections, dysentery, arthritis, injuries, trauma, jaundice and other liver problems. In Unani turmeric is considered to be sefest herb of choice for all blood disorders since it purifies, stimulates and builds blood. To most people in India, from housewives to Himalayan hermits, turmeric affectionately called the 'KITCHEN QUEEN', the main spice of kitchen. Long term use in turmeric, tulsi and trifala can be likened to a short term Pancha Karma treatment. Turmeric is relatively broad spectrum antifungal[jaggi lal.et al.2012]

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FIG.1&2. TURMERIC.

Curcumin, also known as diferuloymethane, is a hydrophobic polyphenol derived from the rhizome of perennial herbs genus Curcuma which belongs to the ginger family (Zingiberaceae) and includes species like Curcuma longa, Curcuma amada, Curcuma zedoaria, Curcuma aromatic, Curcuma raktakanta. Among these species, Curcuma longa (turmeric) is the most popular. Generally, turmeric rhizomes contain 3-5% of three types of curcuminoid derivatives including curcumin (75%), demethoxycurcumin (10-20%) and bisdemethoxycurcumin (5%), curcumin being the most important bioactive compound.[Tian jiang et al.2021]

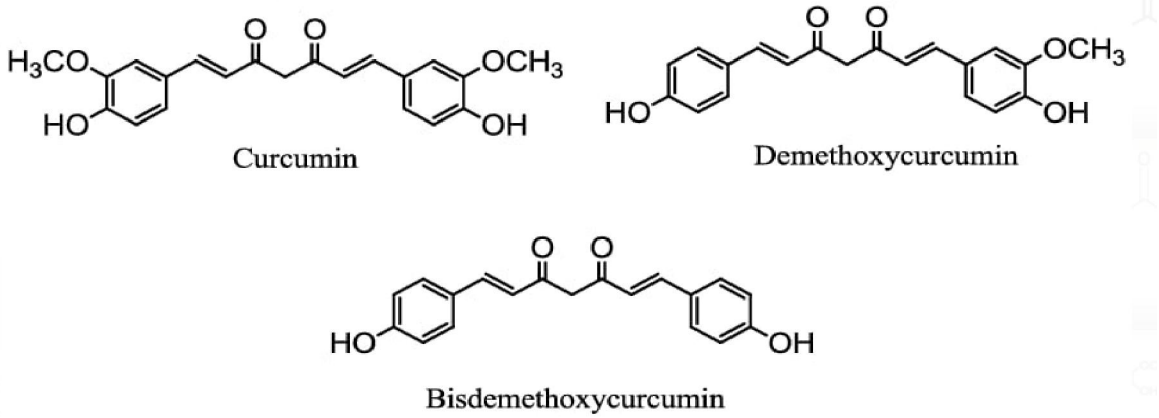

FIG.3. STRUCTURE OF CURCUMIN AND ITS ANALOGUE.

PLANT PROFILE OF TURMURIC:

FIG. 4.TURMURIC LEAVES

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FIG.5. TURMURIC RIBOSOMES

FIG.6.FLOWER OF TURMURIC.

Biological source:

- Crude drug: curcumin.
- Common Name: Halad, turmeric.
- Biological source: Turmeric obtained from the rhizome of Curcuma longa linn.
- Family: Zingiberaceae.

Scientific classification

- Kingdom : Plantae .
- Subkingdom : Tracheobionta.
- Superdivision : Spermatophyta .
- Division : Magnoliophyta.
- Subclass : Zingiberidae .
- Order : Zingiberales.
- Genus : Curcuma .
- Species : Longa .
- Scientific name : Curcuma longa. [Sayantani Chanda et al 2016]

Geographical source: It is commonly found in Cambodia, China, India, Nepal, Indonesia, Madagascar, Malaysia, Philippines and Vietnam

Botanical Description of Fruit

- Type: Tropical
- Edible Part: Fruit
- Shape Of Fruit:Oval With 5 Groves
- Fruits Per Tree(Annual): 200 Pound
- Texture:Crisp
- Taste: Sweet[roshan yadav,et al.2016].

Chemical Constituents: The main constituent groups are poly phenolic curcuminoids which include:curcumin (diferuloylmethan), demethoxycurcumin, bisdemethoxycurcumin, and cyclocurcumin. Curcumin (3–4%) is responsible for the yellow colour, and comprises curcumin I (94%), curcumin II (6%) and curcumin III (0.3%).

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FIG.7. PLANT OF TURMURIC.

HISTORY:

Marco polo (1280 AD) refers to turmeric as Indian saffron used for dying cloths. As far as documented evidence, it is used daily in India for at least 6000 years as medicine, beauty aids, cooking spice and a dye. Obstensibly it was used to worship the Sun during the solar period of India, a time when Lord Ram Chandra walked the Earth. It was mentioned in the Artharveda of India. Buddhist monks have used turmeric as a dye for their robes for at least 2000 years. It was listed in an Assyrian herbal circa 600 BC and was mentioned by Discorides in the herbal that was the western herbal rediscovered it 700 years ago via Marco Polo and it is used in traditional lethal poison of pit vipers.[jaggi lal.et.al.2012] The use of turmeric dates back nearly 4000 years to the Vedic culture in India, where it was used as a culinary spice and had some religious significance. It probably reached China by 700 A.D, East Africa by 800 A.D, West Africa by 1200 A.D, and Jamaica in the eighteenth century. In 1280, Marco Polo described this spice, marvelling at a vegetable that exhibited qualities so similar to that of saffron. According to Sanskrit medical treatises and Ayurvedic and Unani systems, turmeric has a long history of medicinal use in South Asia. Sushruta's Ayurvedic Compendium, dating back to 250 B.C, recommends an ointment containing turmeric to relieve the effects of poisoned food.[roshan yadavet.al. 2016].

CULTIVATION:

Turmeric can be cultivated in diverse tropical conditions, to upto 1,600 meters from the sea level and rainfall above 1500 mm. It is a nine-month crop sown in July and harvested in April. Turmeric thrives in well-drained, fertile, sandy and black, red or alluvial loams, rich in humus and uniform in texture. Rich loamy soils having natural drainage and irrigation facilities are the best. Turmeric cannot stand water stagnation or alkalinity[jaggi lal.et.al.2012]. The turmeric plant needs temperatures between 20°C and 30°C. Individual plants grow to a height of 1 m, and have long, oblong leaves. Turmeric is a tropical herb and is grown in both tropics and subtropics. It will grow luxuriantly in shade if not too dense, but it produces larger and better rhizomes in the open ground to the sun. Turmeric requires humid climate.[roshan yadavet.al. 2016].

CURCUMIN EXTACTION PROCESS:

Extraction by soxhlet apperatus:

1. The rhizomes of turmeric were dried in oven at 105 °C for 3 h. Dried rhizomes were triturated using mortar and screened through a sieve with mesh 80 to obtain uniform powder with particle size of 0.18 mm.
2. 15 g ground turmeric powder was weighed and embedded in a thimble and put in the Soxhlet apparatus which was gradually filled with acetone as the extraction solvent.
3. The extraction experiment was carried out at 60 °C within 8 h.
4. Upon completion of the extraction, the acetone was separated from the extract using rotary evaporator (Stuart RE300) under vacuum at 35 °C.
5. The residue (oleoresin) was dried and weighed.[Foozie Sahne.et.al2016]

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IDENTIFICATION TEST OF CURCUMIN:

Test for Alkaloid:

The extract was mixed with 3 ml of dilute hydrochloric acid and then filtered thoroughly. The filtrate was tested carefully with following test.

1. **Mayer's Test:** To a 1 ml or 2 ml of filtrate, few drops of Mayer's reagent are added by the side of the test tube. The white or creamy precipitate indicated presence of alkaloids.
2. **Wagner Test:** 1 ml or 2 ml of the filtrate extract was treated with Wagner's reagent; formation of brown reddish precipitate shows presence of alkaloids
3. **Dragendroff's Test:** To a few ml of filtrate, 1–2 ml of Dragendorff's reagent was added formation of prominent yellow precipitate indicates the presence of alkaloids.

Test for Glycosides:

1. **Fehling's test:** To 2 ml test solution, added equal quantity of Fehling's solution A and B and solution was heated gives the positive result of glycoside. A brick red precipitate was observed. indicate presence of glycoside.
2. **Legal's Test:** To 2 ml or 1 ml test solution, pyridine and alkaline sodium nitroprusside was added ,get a blood red or pink colour indicate presence of glycoside.
3. **Keller-Killani Test:** To 2 ml glacial acetic acid containing a drop of FeCl3 treated with extract .Formation of a brown colour ring indicates the presence of glycoside.
4. **Borntrager's Test:** Firstly extract was boiled with dilute sulphuric acid, filtered and to the filtrate chloroform was added and shaken well. The organic layer was separated to which ammonia is added slowly. It also shows positive result, by pink to red colour in the ammonical layer.

Test for Flavonoids:

1. **Shinoda Test:** 2 ml test solution added with few fragments of Magnesium ribbon, dropwise conc. H2SO4 was added. The results shows pink scarlet or crimson red colour.
2. **Alkaline Reagent Test:** The test solution, was treated with sodium hydroxide solution, which gives a yellow or red colour.
3. **Zn Test:** 2 ml extract were mixed with Zn dust and conc. HCl, after a few minutes red colour observed and it means presence of flavonoid.

Test for Tannins:

1. **Ferric Chloride Test:** The extract solution mixed with drops of ferric chloride solution. Presence of gallic tannins, blue colour was observed and green black for catecholic tannins.
2. **Gelatin Test:** A white precipitate is obtained by mixing of 2 ml test solution and 1% Gelatin solution containing 10% sodium chloride.

Test for Saponins

1. **Foam Test:** Researchers tries to find out the presence of Saponins as follows: 5 ml extract was shaken with 20 ml distilled water and then heated to boil. Frothing shows the presence of saponins.

Test for Triterpenoids

1. **Salkowski Test:** The test solution was added with 2 ml chloroform and few drops of conc. Sulphuric acid (3 ml), and shaken well. Formation of reddish brown colour at lower layer indicates presence of steroids and yellow colour shows the presence of triterpenoids.

Test for Phenol

1. **Ferric Chloride Test:** 4 drops of Alcoholic FeCl3 solution were added in the test extract. Appearance of bluish black colour indicates the presence of phenol.

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Test for Fats and Fixed Oils

1. **Stain Test:** Between the two filter papers small amount of the extract was pressed, the stain on the filter paper indicates the presence of fixed oils.
2. **Saponification Test:** Small quantity to the extract solution with a drop of phenolphthalein was treated with few drops of 0.5 N alcoholic potassium hydroxide and heated on a water bath for 1–2 h. The results shows formation of soap or partial neutralization for the alkali indicates the presence of fats and fixed oils.

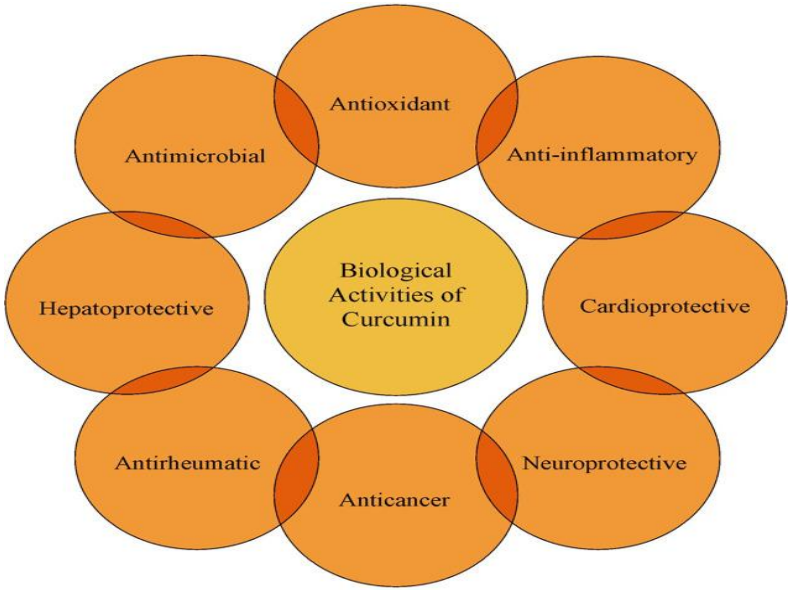
Test for proteins and amino acids:

1. **Millon's Test:** 2 ml test solution is added with Millon's reagent gives a white precipitate, which on heating changes to red.
2. **Ninhydrin Test:** To 2 ml test solution, ninhydrin solution was treated and then boiled. Formation of blue colour indicates the presence of amino acid. Again 2ml test solution, 0.2% ninhydrin solution was treated with amino acids and proteins, then boiled shows a violet colour.

Test for Carbohydrates: The extract was dissolved in 5–10 ml of distilled water and filtered through Whatmann No.1 filter paper and the filtrate is used for the following test of carbohydrates.

1. **Molish Test:** Firstly 2 ml solution was placed in a test tube then 1 drop of Molish Reagent was added. 2 ml of conc. HCl was added from the sides of the test tube. A violet ring was observed in the test tube. Formation of a violet ring at the junction of the two liquids indicates presence of carbohydrates.
2. **Fehling Test:** Dilute HCl was hydrolysed with 2 ml of extract and extract also neutralized with alkali and heated with Fehling's solution A and B, formation of red precipitate it indicates the presence of reducing sugar.
3. **Benedict's Test:** The filtrate were treated with Benedict's reagent and heated gently, appearance of orange red precipitate indicates the presence of reducing sugar.
4. **Iodine Test:** 5 drops of Iodine solution were treated with 2 ml of extract, gives blue colour indicates the positive test. [Sayantani Chanda et al 2016]

VARIOUS PHARMACOLOGICAL ACIVITIES OF CURCUMIN.



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II. CONCLISION

This review paper has comprehensively explored the historical background, cultivation practices, extraction techniques, and identification methods for curcumin. The historical significance of curcumin as a natural remedy has been highlighted, tracing its roots back to ancient civilizations. The cultivation aspects, including geographical distribution, soil requirements, and agronomic practices, have been discussed to understand the factors influencing curcumin content in turmeric plants. Curcumin, the primary bioactive compound in turmeric, has emerged as a promising therapeutic agent with a wide range of pharmacological activities. Numerous preclinical and clinical studies have demonstrated its potent anti-inflammatory, antioxidant, and anticancer properties. However, the low bioavailability of curcumin remains a major challenge limiting its therapeutic potential. To overcome this limitation, researchers have explored various strategies, including nanoformulation and combination therapies. While significant progress has been made, further research is necessary to fully elucidate the mechanisms of action of curcumin and optimize its delivery to target tissues. The future of curcumin as a therapeutic agent is promising. With ongoing research to enhance its bioavailability and target specific diseases, curcumin may become a valuable addition to the therapeutic arsenal. Future studies should focus on identifying novel drug delivery systems, optimizing combination therapies, and conducting well-designed clinical trials to establish the efficacy and safety of curcumin in various clinical settings. By addressing the challenges associated with its bioavailability and toxicity, curcumin can be harnessed to its full potential as a safe and effective therapeutic agent.

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