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"Cucumin:Unraveling the Multifaceted Healing Potential of Turmeric's Active Ingredients"

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Abstract :

Curcuma longa, a member of the ginger family (*Zingiberaceae*), has rhizomes below the ground. *C. longa* contains multiple active components that exhibit antiinflammatory, antimicrobial, antioxidant, antifungal, antibacterial, antiviral, antiischemic, and antineoplastic properties. The active substance of turmeric - curcumin (diferuloylmethane), possesses multiple therapeutic properties. In recent years, many detailed research (tests in vito and in vivo) along with clinical trials have revealed its very valuable biological activities related to its anti-inflammatory, antioxidant and cancer preventive properties, which are presented in numerous publications. Its systemic bioavailability and makes use of curcumin as a therapeutic remedy (to date) difficult. The primary aim of presently conducted research is to achieve increased solubilization and bioavailability of this promising nontoxic agent. Pharmacologically, curcumin does not show any dose-limiting toxicity when it is administered at doses of up to 8 g/day for three months. It has been demonstrated that curcumin has beneficial effects on several ocular diseases, such as chronic anterior uveitis, diabetic retinopathy, glaucoma, age-related macular degeneration, and dry eye syndrome. The purpose of this review is to report what has so far been elucidated about curcumin properties and its potential use in ophthalmology.

Introduction :

Turmeric, scientifically known as Curcuma longa, is a perennial plant belonging to the ginger family, Zingiberaceae. It is native to the Indian subcontinent and Southeast Asia, where it has been cultivated for thousands of years. Turmeric is renowned for its vibrant golden-yellow color, distinct earthy flavor, and potent medicinal properties.historically, turmeric has played a significant role in traditional medicine, particularly in Ayurveda and Traditional Chinese Medicine, where it is revered for its therapeutic benefits. The primary bioactive compound responsible for its unique color and health-promoting properties is curcumin.

In culinary practices, turmeric is a staple spice, commonly used to add color and flavor to various dishes, especially in South Asian cuisines. It is an essential ingredient in curry powders and pastes, imparting a warm and slightly bitter taste to foods.Apart from its culinary uses, turmeric is also well-regarded for its medicinal

properties. Curcumin, its main active compound, has been the subject of extensive scientific research for its potential anti-inflammatory, antioxidant, and antimicrobial effects. It is believed to support the immune system, promote digestive health, and may even have neuroprotective benefits.Due to its popularity as a natural remedy, turmeric supplements and extracts have become widely available in the form of capsules, tablets, and powders.

Furthermore, turmeric has been used for traditional dyeing purposes, especially in clothing and religious ceremonies. Its bright yellow color symbolizes purity and prosperity in many cultures.Overall, turmeric's rich history and diverse applications make it one of the most cherished and versatile spices in the world, bridging the gap between culinary delight and natural wellness.

Properties of Turmeric :

Scientific Name: Curcuma longa.

Biological Source: Turmeric is a flowering plant. The part of the plant used for culinary and medicinal purposes is the rhizome, which is an underground stem. It is from the rhizome that the spice and medicinal compound are derived.

Family: Turmeric belongs to the Zingiberaceae family, commonly known as the ginger family. This family includes other well-known plants like ginger (Zingiber officinale), cardamom (Elettaria cardamomum), and galangal (Alpinia galanga).

Geographical Source: Turmeric is native to the Indian subcontinent, specifically India and Southeast Asia. It has been cultivated and used extensively in these regions for thousands of years. Today, it is grown in various tropical regions around the world, including parts of Asia, Central America, and the Caribbean.

Cultivation and Collection:

Turmeric thrives in well-draining, loose, and fertile soil with good moisture retention capacity. The ideal soil conditions for the cultivation of turmeric are as follows:

Soil Type: Turmeric prefers loamy or sandy loam soil, which allows for proper aeration and drainage. The soil should not be heavy clay, as it can lead to waterlogging and hinder root growth.

pH Level: The optimal soil pH for turmeric cultivation is between 5.5 and 7.5. Slightly acidic to neutral soil conditions are most suitable for the plant's healthy growth and nutrient absorption.

Organic Matter: Turmeric plants benefit from soil rich in organic matter, such as compost or well-rotted manure. Organic matter enhances soil structure, improves water retention, and provides essential nutrients to the plants.

Moisture: Turmeric requires consistent moisture throughout its growing period. However, waterlogging should be avoided, as it can lead to root rot and other diseases. Proper drainage is crucial to prevent excess water from accumulating around the roots.

Sunlight: Turmeric is a tropical plant that thrives in warm climates and requires abundant sunlight. It should be grown in an area that receives full to partial sunlight.

Temperature: Turmeric prefers temperatures between 20°C to 30°C (68°F to 86°F). It can tolerate slight temperature fluctuations, but frost and extreme cold temperatures should be avoided, as they can damage the plants.

Wind Protection: While turmeric prefers a warm and sunny environment, it is essential to protect the plants from strong winds, as they can damage the foliage and hinder growth.

Drainage: Proper drainage is critical for turmeric cultivation. The plant's rhizomes can rot if left in waterlogged soil for an extended period. Raised beds or ridges can be used to improve drainage.

Climate: Turmeric thrives in tropical to subtropical climates. It requires warm temperatures between 68°F to 95°F (20°C to 35°C) and a considerable amount of rainfall or irrigation during its growing season. The plant cannot tolerate frost or extremely cold temperatures, and it's best to avoid planting in areas with temperatures below 50°F (10°C).

Propagation: Turmeric is propagated primarily through rhizomes, which are underground stems. To propagate turmeric, you can use healthy rhizomes obtained from mature plants. When selecting rhizomes, make sure they are free from diseases and damage.

Planting Time: In tropical regions, turmeric can be planted throughout the year as long as the temperature and moisture conditions are suitable. However, it's generally recommended to plant turmeric at the beginning of the rainy season to take advantage of the increased moisture and to provide the plant with a good start.
In temperate regions, where frost is a concern, turmeric is usually planted in the spring after the last frost. This allows the plant to grow during the warmer months and be harvested before the first frost in the fall.

Land Preparation:

Before planting turmeric, it's crucial to prepare the land adequately.
Clear the Land: Remove any weeds, rocks, or debris from the area to ensure a clean planting space.
Soil Loosening: Turmeric prefers loose, well-draining soil. Use a plow or a tractor to loosen the soil to a depth of about 8 to 10 inches (20 to 25 cm).
Soil Amendments: Conduct a soil test to determine the soil's nutrient levels and pH. Turmeric prefers a slightly acidic to neutral soil (pH 6.0 to 7.5). If necessary, amend the soil with organic matter like compost or well-rotted manure to improve its fertility and structure.
Ridges and Furrows: Create ridges and furrows in the prepared soil. This helps with water drainage and prevents waterlogging around the turmeric plants.

Transplanting:

Transplanting involves moving the young turmeric shoots from the nursery to the main field.
Timing: Transplant the turmeric when the shoots are around 6 inches (15 cm) tall, and the threat of frost has passed (for temperate regions).
Spacing: Plant the turmeric rhizomes in the furrows, maintaining a spacing of about 8 to 12 inches (20 to 30 cm) between plants.
Planting Depth: Place the rhizomes horizontally in the furrows, about 2 inches (5 cm) below the soil surface.
Covering: Gently cover the rhizomes with soil, making sure not to damage the young shoots.

Crop Nutrition:

Turmeric plants require essential nutrients for healthy growth and good rhizome development.
Fertilization: Before planting, incorporate well-rotted compost or organic matter into the soil to enrich its nutrient content.
Top-Dressing: As the turmeric plants grow, apply balanced fertilizers or organic fertilizers to ensure they receive a steady supply of nutrients.
Micronutrients: Monitor the plants for any signs of nutrient deficiencies, and if required, apply appropriate micronutrient fertilizers

Irrigation:

Turmeric plants require consistent moisture throughout their growing season.
Regular Watering: In the absence of sufficient rainfall, provide regular watering to keep the soil consistently moist. Turmeric requires about 1 to 2 inches (2.5 to 5 cm) of water per week.
Avoid Waterlogging: While turmeric likes moisture, it is essential to prevent waterlogging, as excess water can lead to root rot and other diseases.
Mulching: Applying a layer of organic mulch around the plants can help retain soil moisture, suppress weed

growth, and maintain a stable soil temperature.

Pests and Management:

Common pests that can affect turmeric include rhizome fly, shoot borer, aphids, mites, and nematodes.
Natural Predators: Encourage the presence of natural predators like ladybugs and spiders, which can help control aphids and mites.
Biological Control: Introduce beneficial nematodes to control harmful nematode populations in the soil.
Neem Oil: Neem oil can be used as an organic pesticide to deter and control various pests.
Pheromone Traps: Use pheromone traps to monitor and control the population of pests like shoot borers.
Crop Rotation: Practice crop rotation to reduce pest build-up in the soil.

Harvesting:

Turmeric is usually ready for harvest after 8 to 10 months of planting when the leaves and stems start to turn yellow.
Digging: Carefully dig up the entire plant using a spade or fork to avoid damaging the rhizomes.
Rhizome Removal: Remove the soil from the harvested plants to access the rhizomes.
Separation: Separate the rhizomes from the mother plant and cut off the foliage.

Processing:

After harvesting, turmeric undergoes a series of processing steps to prepare it for consumption or other uses. The processing steps include:
Boiling: Boil the fresh turmeric rhizomes in water to soften them and facilitate easier peeling.
Peeling: Once the rhizomes are boiled, peel off the outer skin to reveal the bright orange-yellow flesh.
Drying: Dry the peeled rhizomes either under the sun or in a mechanical dryer until they become hard and brittle.
Polishing: After drying, the rhizomes may be polished to improve their appearance and remove any residual outer skin.
Grinding: Finally, grind the dried and polished turmeric rhizomes into a fine powder, which is the familiar turmeric spice used in cooking.

Expected yeild:

The expected yield of turmeric can vary significantly based on various factors such as climate, soil conditions, agronomic practices, and the turmeric variety being cultivated. On average, under optimal growing conditions, turmeric yield can range from 20 to 30 tons per hectare (approximately 8 to 12 tons per acre) of fresh rhizomes.

Curcuma longa powder

Description:

Morphological study:

Plant Habit: Turmeric is a herbaceous perennial plant that belongs to the Zingiberaceae family. It typically grows to a height of about 1 to 3 feet (30 to 90 cm) and has a rhizomatous root system.
Leaves: Turmeric has large, long, and lanceolate leaves that arise alternately from the rhizome. The leaves have a distinct midrib and parallel venation. They are green in color and can reach a length of up to 1 meter.
Inflorescence: The flowering structure of turmeric consists of a central spike known as the "spadix." The spadix is surrounded by a modified leaf called the "bract" or "spatha," which is usually green or reddish and acts as protection for the developing flowers.
Flowers: The individual flowers of turmeric are small and tubular with three lobes. They are usually pale yellow or white in color and have a zygomorphic (bilaterally symmetrical) shape. The flowers are arranged in dense clusters on the spadix.
Rhizomes: The rhizomes of turmeric are the underground stem structures from which the plant grows. They are the most economically valuable part of the plant, as they contain the yellow pigments and medicinal compounds. The rhizomes are cylindrical, branched, and have a rough, scaly appearance. When fresh, they are bright orange or yellow inside.
Roots: Turmeric roots, which arise from the rhizomes, are fibrous and serve to anchor the plant in the soil.
Fruits: The fruits of turmeric are three-lobed capsules, each containing numerous small, round, and hard seeds.
Habitat: Turmeric is native to South Asia and is widely cultivated in tropical and subtropical regions. It thrives in well-draining soil with high organic content and requires warm temperatures and abundant rainfall for optimal growth.

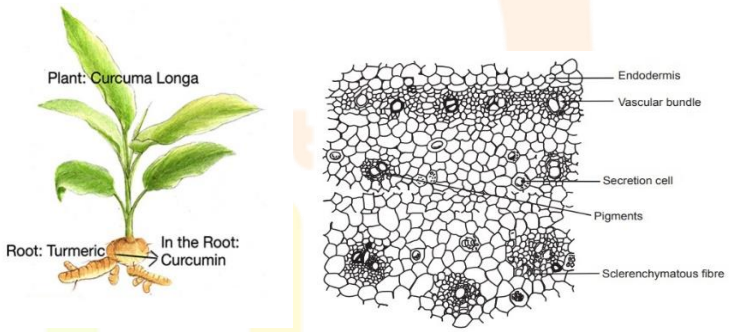


Figure: A)Morphology B)Microscopical charater of curcuma longa

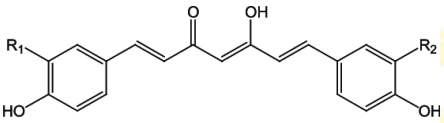
Organoleptic properties:

Color: Turmeric is known for its vibrant yellow-orange color, which is one of its most distinctive features. The color intensity can vary depending on the variety and age of the turmeric rhizomes. Fresh turmeric tends to have a more intense color compared to dried or ground turmeric.
Aroma: Turmeric has a unique and aromatic fragrance. It is often described as earthy, slightly peppery, and with a subtle hint of ginger. The aroma is more pronounced when the rhizomes are freshly harvested or ground.
Taste: Turmeric has a warm, bitter, and slightly pungent taste. The flavor is characteristic of the compound curcumin, which is one of the main active constituents in turmeric responsible for its medicinal properties.
Texture: When handling fresh turmeric rhizomes, they have a firm and somewhat waxy texture on the surface. After being dried and ground into powder, the texture becomes fine and smooth.

Solubility: Turmeric powder is not very soluble in water, but it can dissolve in oil and alcohol. This solubility in fat allows for the extraction of its active compounds when used in cooking or traditional medicine preparation.
Bitterness: Turmeric contains natural bitter compounds, which contribute to its overall taste profile. The bitterness is more apparent in larger quantities or if the turmeric is not properly prepared.
Staining Property: Turmeric has a potent staining property. Its vibrant yellow color can easily dye clothes, skin, and other surfaces. While this may be a nuisance when handling the spice, it is a desirable characteristic for adding color to various dishes.

Chemical Constituents :

Curcuminoids: Curcuminoids are a group of polyphenolic compounds that give turmeric its bright yellow color. The main curcuminoids found in turmeric are:
Curcumin: This is the most abundant and well-studied curcuminoid in turmeric. It is responsible for the majority of turmeric's medicinal properties, including its anti-inflammatory and antioxidant effects.



Curcumin: R_1, R_2=OCH_3
Demethoxycurcumin: R_1=OCH_3, R_2=H
Bis-demethoxycurcumin: R_1, R_2=H

Demethoxycurcumin: A derivative of curcumin with a slightly different chemical structure.
Bisdemethoxycurcumin: Another derivative of curcumin with two methoxy groups replaced by hydrogen atoms.
Turmerones: Turmerones are aromatic compounds found in the essential oil of turmeric. They contribute to its distinct aroma and may also have some health benefits.
Proteins and Amino Acids: Turmeric contains various proteins and amino acids, which are the building blocks of proteins.
Carbohydrates: Turmeric contains carbohydrates, including starch and fiber.
Volatile Oils: Turmeric's essential oil contains a mix of compounds like alpha-phellandrene, sabinene, cineol, borneol, and others, which contribute to its fragrance.
Minerals: Turmeric contains essential minerals such as calcium, potassium, iron, manganese, and zinc.
Vitamins: Turmeric contains vitamins like vitamin C, vitamin E, vitamin K, and several B-complex vitamins.
Phytosterols: These are plant-derived sterols that have structural similarities to cholesterol.
Sugars: Turmeric contains various sugars, including glucose and fructose.
Resins: Turmeric contains resinous compounds, which may have some therapeutic properties.

Medicinal Uses:

1. Culinary Uses: Turmeric is a common spice used in cooking, especially in South Asian and Middle Eastern cuisines. It adds a warm and earthy flavor to dishes and is a key ingredient in curry powders, sauces, stews, and rice dishes.
2. Food Coloring Agent: Turmeric is used as a natural food coloring agent, imparting a bright yellow color to various dishes and food products. It is commonly used in pickles, sauces, and snacks.
3. Traditional Medicine: Turmeric has been used in traditional medicine systems, such as Ayurveda and traditional Chinese medicine, for its potential health benefits. It is believed to have anti-inflammatory, antioxidant, antiviral, and antibacterial properties.

4. Anti-Inflammatory and Pain Relief: Curcumin, a compound found in turmeric, is known for its anti-inflammatory properties. It is used to alleviate inflammation and joint pain in conditions like arthritis.
5. Antioxidant Effects: Curcumin is also a potent antioxidant, helping to neutralize free radicals in the body and protect cells from oxidative stress.
6. Wound Healing: In some cultures, turmeric is applied topically to wounds to aid in the healing process and prevent infections.
7. Digestive Aid: Turmeric is believed to promote digestion and relieve digestive issues like bloating and gas.
8. Skin Care: Turmeric is used in various skincare products due to its potential to improve skin health. It may help reduce acne, lighten dark spots, and provide a healthy glow to the skin.
9. Insect Repellent: The essential oil from turmeric has been used as a natural insect repellent.
10. Cosmetics: Turmeric is sometimes used as a natural dye in cosmetics and beauty products.
11. Health Supplements: Turmeric supplements containing concentrated curcuminoids are available and used to support overall health and wellness.

Conclusion : It could be concluded that studied medicinal plants have antihyperglycemic activity. The study findings favor the use of traditional herbal medicinal practices for the management of diabetes that might due to the presence of bioactive phytoconstituents in plants. However, larger studies are required to identify, isolate, and characterize the bioactive phytoconstituents responsible for antihyperglycemic activity of studied medicinal plants.

References:

1. B.B. Aggarwal, Y. Takada, O.V. Oommen. From Chemoprevention to Chemotherapy: CommonTargets and Common Goals. Expert Opin. Investig. Drugs, 2004, 3, 1327–1338.

2. Alam M.A, Ali N.A, Sultana N. et al. Newborn umbilical cord and skin care in Sylhet District,Bangladesh: Implications for the promotion of umbilical cord cleansing with topicalchlorhexidine. J. Perinatol, 2008, 28, S61–S68.

3. Amara A.A, El-Masry M.H, Bogdady H.H. Plant crude extracts could be the solution: Extractsshowing invivo antitumorigenic activity. Pak. J. Pharm. Sci, 2008, 21, 159–171.

4. Ammon H.P, Wahl M.A. Pharmacology of Curcuma longa. Planta Med., 1991, 57, 1–7.

5. V. Lampe, J. Milobedeska. Studien über curcumin. Ber Dtsch Chem Ges, 1913, 46, 2235-2240.

6. A.M. Anderson, M.S. Mitchell, R.S. Mohan. Isolation of curcumin from turmeric. J. Chem.Educ., 2000, 77, 359-360.

7. Ah. L. Haque, K.A. Saleem. Separation and identification of curcuminoids in turmeric powder by HPIC using phenyl column. Anal. Methods, 2014, 6, 2526-2536.

8. Chandra D, Gupta SS 1972. Anti-inflammatory and anti-arthritic activity of volatile oil of *Curcuma longa* (Haldi). *Indian J Med Res 60*: 138-142.

9. Arora RB, Basu N, Kapoor V, Jain AP 1971. Anti-inflammatory studies on *Curcuma longa* (Turmeric). *Indian J Med Res 59*: 1289-1295.

10. Sreejayan, N., & Rao, M.N. 1996, Free radical scavenging activity of curcuminoids.Arzneimittelforschung, 46 (2): 169-171.

11. Srivastava R., Puri V., Srimal R.C., Dhawan B.N. 1986, Effect of curcumin on plateletaggregation and vascular prostacyclin synthesis. Arzneimittelforschung, 36: 715-717.
12. Thaloor D., Singh A.K., Sidhu G.S., et al., 1998, Inhibition of angiogenic differentiation ofhuman umbilical vein endothelial cells by curcumin. Cell Growth Differ, 9: 305-312.
13. Venkatesan N., 2000, Pulmonary protective effects of curcumin against paraquat toxicity. LifeSci 66(2):PL21-28.
14. Verma S.P., et al., 1997, Curcumin and genistein, plant natural products, show synergisticinhibitory effects on the growth of human breast cancer MCF-7 cells induced by estrogenic pesticides. Biochem Biophy Res Comm, 233: 692-96.
15. Verma S.P., et al., 1998, The inhibition of the estrogenic effects of pesticides and environmental chemicals by curcumin and isoflavonoids. Environ Health Perpect, 106: 807-812.
16. Ozaki K, Kawata Y, Amano S, Hanazawa S 2000. Stimulatory effect of curcumin on osteoclast apoptosis. *Biochem Pharmacol 59*: 1577-1581.
17. Park EJ, Jeon CH, Ko G, Kim J, Sohn DH 2000. Protective effect of curcumin in rat liver injury induced by carbon tetrachloride. *J Pharm Pharmacol 52*: 437-440.
18. Phillipson JD 1994. Natural products as drugs. *Trans R Soc Trop Med Hyg 88*: 17-19.
19. Pulla Reddy Ach, Lokesh BR 1992. Studies on spice principles as antioxidants in the inhibition of lipid peroxidation of rat liver microsomes. *Mol Cell Biochem 111*: 117-124.
20. Pulla Reddy Ach, Lokesh BR 1994. Effect of dietary turmeric (*Curcuma longa*) on iron-induced lipid peroxidation in the rat liver. *Fd Chem Toxic 32*: 279-283.
21. Rasmussen HB, Christensen SB, Kvist LP, Karazmi A 2000. A simple and efficient separation of the curcumins, the antiprotozoal constituents of *Curcuma longa Planta Med 66*: 396-398.
22. Roughley PJ, Whiting DA 1973. Experiments in the biosynthesis of curcumin. *J Chem Soc 20*: 2379-2388.
23. Scartezzini P, Speroni E 2000. Review on some plants of Indian traditional medicine with antioxidant activity. *J Ethnoparmacol 71*: 23-43.
24. Sreejayan Rao MN 1994. Curcuminoids as potent inhibitors of lipid peroxidation. *J Pharm Pharmacol 46*: 1013-1016.
25. Srimal RC, Dhawan BN 1973. Pharmacology of diferuloyl methane (curcumin), a non-steroidal anti-inflammatory agent. *J Pharm Pharmacol 25*: 447-452.