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Traditional Uses and Variation in Curcumin Content in Varieties of Curcuma-the Saffron of India

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Key words: Ethnobotanical, Pharmacological, Indian
saffron, Curcumin

Abstract

Curcuma longa going by the name of turmeric, Indian saffron, golden spice, spice of life and yellow root gained out of a Latin term 'terra merita', meaning that admirable earth. The spice is commonly known in the kitchen used in traditional cultures and medicines for 6000 years is now being used worldwide at the clinical and molecular level. There have been many studies published in the last few decades regarding the importance and uses of turmeric in Ayurvedic medicine, in modern medicine, in household uses for the different ailments remedy. Hence, signify its biological, clinical, pharmacological activities. This old age spice has now become an integral part of the vast research areas to develop new ways in the future. Curcumin, the polyphenol derived from turmeric, has been noticed by scientists and researchers worldwide as an antioxidant, anti-inflammatory, antibacterial and antiviral agent. This review emphasis on the importance and use of turmeric since ancient times to explore new areas of research which can be beneficial in today's generation. The objective of this article is to highlight its ethnobotanical significance, its different varieties, curcumin content and its uses in different areas. This provides a brief beneficial overview and shows its powerful medicinal activities in a wide area of research. Hence, concluded as the most beneficial medicinal plant worldwide.

Introduction:

Medicinal plants have hundreds of chemical compounds that are practised in modern and traditional medication to deal with a variety of disorders (Ahn, 2017). Aromatic medicinal plants are plants that produce fragrance and are utilized to treat a range of ailments (Shankar *et al.*, 2015). *Curcuma longa* is a perennial flowering herb plant native to Southern Asia that belongs to the ginger Zingiberaceae family (Priyadarsini *et al.*, 2003). It is derived from the rhizomes of *Curcuma longa* and is recognized as the "Golden Spice of India." It necessitates annual rainfall and a mean temperature of 20 to 30°C (68 to 86°F). It has rhizomes on the stems, elliptical leaves, flowers, and a pedicel with short dense spikes. It can grow to a height of one metre, or 3 feet and three inches. This herb has aromatic rhizomes that are yellowish to orange (Jadhav & Jagadale, 2018). Turmeric is a fragrant medicinal plant that consists of a variety of bioactive compounds. In folk medicine, these compounds were used to treat bile duct diseases, atrophy, cough,

diabetic foot ulcer, hepatic dysfunction, rheumatoid arthritis, and sinus infection (Rathod *et al.*, 2019). Because Indian Haldi is of the richest quality, it has become the world's largest manufacturer and exporter. Erode, in Tamil Nadu, is regarded as the world's largest producer of turmeric. As a result, it's also known as Yellow City, Turmeric City and Textile City (Prasad & Aggarwal, 2011). Other leading states in India that grow turmeric include Telangana, Andhra Pradesh, Karnataka, Maharashtra, Assam, West Bengal, and Odisha (Choudhuri *et al.*, 2018).

Ethnobotany

Ethnobotany is described as the study of the interactions between plants and people, as well as the indigenous plant uses in medicine, nutrition, and natural resource management (Behera *et al.*, 2021). Ethnobotanists research the uses of plants in modern medicine and drug inquiry, such as food, shelter, clothing, and religious ceremonies. Turmeric is an aromatic plant with an orange-yellow rhizome, elliptic leaves measuring 40-60 x 13-15 cm,

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acuminate, glabrous, long petiole, pedunculate spike, bracts, and coma colour, yellow flowers, and hairy ovary at the top. Turmeric has been utilized as a colouring substance for trade purposes in India since ancient times, according to ethnobotanical evidence (Prasad & Aggarwal, 2011). Southeast Asia, China, Japan, Indochina, and the South Pacific Islands are all affected. This genus is used in a variety of dishes as a colour, taste, and flavour enhancer, as well as in the weaving industry as a dye that has been replaced by synthetic dyes (Velayudhan *et al.*, 2012). It's frequently used to flavour or colour curry powders, mustards, butter, and cheeses, as well as a dye, drug, and cosmetic products, and religious ceremonies. It is the prime cash crop in Odisha's tribal districts. Kandhamal, Koraput, Mayurbhanj, Gajapati, and Ganjam are among the districts. The Rhizome is used by traditional healers in the Semiliguda block of Koraput district to treat roundworm, skin infection, and snakebite. Roundworms are treated with turmeric and neem paste, and skin diseases are treated with turmeric and mustard oil paste. Traditional healers in the same district use another variety of turmeric, *Curcuma montana* (Sakuta, Haladikastura) (Revati & Malathy, 2013). *Curcuma montana* rhizome is practised in the treatment of fever. Orally, a crushed rhizome is consumed. Turmeric's ethnobotanical uses include (Kumar *et al.*, 2017).

1. Powdered rhizome paste is applied directly to skin diseases, and a thin uniform of paste is applied to beautify the hands and face.
2. Drinking a blend of powdered Haldi and milk, which acts as an expectorant, is used to treat cough.
3. Powdered rhizome is an anti-inflammatory, carminative, and blood purifier.
4. It is a common spice that is used to flavour and colour a variety of cuisines.
5. Haldi powder is utilized in many religious ceremonies, rituals, and rites.

Varieties of Turmeric

Turmeric grows best in a variety of tropical conditions at an altitude of 1500 meters. To thrive, it needs a mean temperature of 20 to 35 degrees Celsius and annual rainfall of 1500 to 2250 millimetres. It's grown in an irrigated environment. It can grow in a variety of soil types, including light black, sallow loamy, red, and clay loamy. However, it grows best in sandy, clay loamy, well-drained soils. The soil should be humus-rich and have a pH of 4.5-7.5 (Chaudhary *et al.*, 2006).

In India, there are more than 30 varieties of turmeric, but not all of them are used in cooking. They are Erode, Suvarna, Krishna, Suguna, BSR-1, Sudarsana, Roma, IISR Prabha, IISR Prathibha, Suroma, Co-1, Sugandham, Rajendra Sonia, IISR Alleppey, Supreme, Rashmi, IISR Kedaram, Amalapuram, Armour, Ranga, Dindigam, RH-2, Kodur, RH10, Vontimitra, P317, GL Purm I and II (Rai *et al.*, 2016). The 'Erode' variety is the most prominent and finest in India. The 'Krishna' variety of green turmeric yielded the

most. Some of the well-known turmeric varieties include local Haldi, Alleppey Finger, China scented variety, Thodopuza variety, and Red streaked variety. Kerala's 'Alleppey Finger' variety, Maharashtra Sangli, Rajapore variety, 'Nizamabad Bulb' cultivated in Andhra Pradesh and Telangana, and Duggirala cultivated in Andhra Pradesh is among India's principal turmeric varieties. Important varieties grown in Tamil Nadu include Erode local, Salem local, BSR-1, Sudarsana, PTS-10, Roma, and Suguna. Lakadong turmeric is a premium turmeric variety with the highest Curcumin content in the world. Curcumin levels are also high in Alleppey Finger Turmeric. In Meghalaya, North East India, the Lakadong variety is raised in remote areas. Rajendra Sonia, Suroma, Rashmi, Roma, and Ranga are some of the best varieties of turmeric that are high in curcumin and have medicinal value. The most popular varieties used for skin rejuvenation and cosmetics are Kasturi and Keshari. The Lokhandi variety from Maharashtra has bright hard rhizomes, whereas the Patna variety has a deep colour. The Duggirala of Andhra Pradesh has long, stout, smooth, and hard fingers. Other varieties found in Andhra Pradesh include Kasturi, Armour, and Chaya (Varma & Gopi, 2020).

Turmeric varieties such as Alleppey finger, Rajapuri, Madras, and Erode are exported. Madras and Alleppey are the most prevalent variants among them. The Madras type is intense and bright, with 2% volatile oils and 2% Curcumin, while the Alleppey type is an orange-yellow fleshy type with 3-5.5% oils and 4-7% Curcumin. Turmeric powder, dry and fresh rhizome forms and oleoresin are all exported outside of India. Turmeric varieties such as 'Alleppey Finger, Erode, Rajapore, Sangli, and Nizamabad Bulb' are popular in the Middle East, the United Kingdom, the United States, and Japan (Angles *et al.*, 2011).

The Kandhamal district in Odisha produces the most turmeric, followed by Koraput, Nayagarh, and Kheonjhar turmeric. It is cultivated by tribal tribes in remote areas of Odisha, accounting for about 21% of India's turmeric production. Odisha grows the turmeric varieties: Dughi, Jobedi, Katigia, Lakadong, Roma, Ranga, Rasmi, and Suroma (Babu *et al.*, 2015).

An experiment was conducted on ten different turmeric varieties based on their vegetative growth. They noticed that the Pratibha, BSR-I, and Punjab Haldi genotypes outperform the control Rajendra Sonia (Sadanand *et al.*, 2019).

Based on its aqueous and ethanolic extracts, the antioxidant properties and constituents of different varieties of turmeric were examined. The ethanolic extract of Chittagong's mura had the highest concentration of polyphenols, flavonoids, and ascorbic acid, whereas Chora had the highest yield, and the ethanolic extract had the highest antioxidant properties than the aqueous extract (Tanvir *et al.*, 2017). Chaitanya, IISR Pratibha, IISR Prabha,

IISR Allepy supreme, Chamarajanagar local turmeric varieties were evaluated in a study. The IISR Pratibha variety had the highest fresh and cured rhizome, followed by IISR Allepy supreme and IISR Prabha. The IISR Allepy supreme variety had the highest curing properties, followed by IISR Prabha and IISR Pratibha. The curcumin content of IISR Allepy supreme was the highest, followed by IISR Pratibha (Kumar *et al.*, 2017).

The insects raised on Tekurpet had a high life span, life's duration rate, fertility rate, fecundity, intrinsic rate of natural increase, low death rate, mean production period, and doubling time (9.84), whereas the insects when reintroduced had a low life span, life's duration, fertility rate, fecundity, intrinsic rate of natural increase, high death rate, mean production period, and doubling time (Nischala & Prasad, 2017).

The Ethiopian Dame variety had the highest total curcuminoids, polyphenol content, radical scavenging capacity, essential oil, and methanol extract content, while the HT3/2002 variety had the lowest curcuminoids, essential oil, and methanol extract content. As a result, Dame is regarded as an effective biological perspective with strong antioxidant and antibacterial properties (Kebede *et al.*, 2021). Maximum plant height, leaf length, leaf width, plant rhizome number, rhizome length, rhizome weight, fresh weight of rhizome per plant, dry weight of rhizome per plant, and curing percentage have all been observed in the Roma variety of Turmeric (Tiwari *et al.*, 2018).

Turmeric comes in four different varieties. Krishna, Sudharsana, Narendra Haldi, and Pratibha have the least amount of leaf spot and produce the most. Krishna was moderately resistant (MR) and Pratibha, Sudharsana, and Narendra Haldi were tolerant (T) (Rathod *et al.*, 2019).

Some of the Varieties (Plotto, 2004)

Roma: It thrives in hilly areas with plenty of rain and hydrated soil, and it blooms late in the season. It contains 6.1% curcumin, 13.2% oleoresin, and 4.2 % essential oil.

Suroma: The rhizome is round and plump. In the field, it can tolerate leaf spots, leaf stains, and rhizome scale. Curcumin is 6.1 %, oleoresin is 13.1 %, and essential oil is 4.2 %.

Ranga: It has a large, spindle-shaped rhizome. It thrives in low-lying areas and is best planted in the fall. It has a moderate level of resistance to leaf blotch and rhizome scales. Curcumin is 6.3%, oleoresin is 13.5%, and essential oil is 4.4%.

Rasmi: The rhizomes are remarkably strong. Its growing season is suitable for rainfed, irrigated conditions, as well as early and late sown seasons. Curcumin is 6.4 %, oleoresin is 13.4%, and essential oil is 4.4 % in this blend.

Alleppey Finger: It has rhizomes that range in colour from deep yellow to orange. It contains 6.5 % curcumin. It's used as food colouring.

Madras/Salem: It has a mustard yellow rhizome. It necessitates good soil conditions and the absence of cross-contamination. It contains 3.5 % curcumin.

Rajapuri: The rhizome has a saffron yellow hue to it and contains 3.5 to 4% curcumin.

Duggirala: It has larger, high-quality rhizomes. Its growth necessitates the presence of heavy black soils. Curcumin concentration is 3%.

Various Species of Curcuma

Genus *Curcuma* belongs to the Zingiberaceae family. It contains about 100 accepted species. It grows best in shaded areas having loose and sandy soil. The *Curcuma* genus is widespread among Southeast Asia, the Indian Subcontinent, Southern China, Northern Australia, and New Guinea. There are around 133 species of *Curcuma* identified worldwide out of that few varieties were found in different states of India (Table 1) (Sirirugsat *et al.*, 2007). *Curcuma amada*, *C. aromatic*, *C. angustifolia*, and *C. zedoaria* are some of the most significant species in the genus *Curcuma* (Kaufman, 2016).

Table 1. Different Varieties of Turmeric

#	Varieties of Turmeric	State
1.	Allepey Finger	Kerala
2.	Rajapore, Sangli	Maharashtra
3.	Nizamabad Bulb	Andhra Pradesh, Telangana
4.	Duggirala	Andhra Pradesh
5.	Erode local., Roma, PTS-10, Suguna, Sudarsana, BSR-1, Salem	Tamil Nadu
6.	Lakadong	Meghalaya
7.	Lokhandi	Maharashtra
8.	Kasturi, Armoor, Chaya	Andhra Pradesh
9.	Dughi, Jobedi, Katigia, Roma, Ranga, Rasmi, Suroma	Odisha

***Curcuma amada* (Mango ginger):** it is a Zingiberaceae ginger family aromatic herb with rhizomatous characteristics. Turmeric and mango ginger have a close relationship. This herb can be found in many South-East Asian countries, including India, Bangladesh, and Sri Lanka. Mango ginger rhizome is used as an appetizer, alkaliser, stimulant, and balsamic in pickles, culinary preparations, and treatment. It possesses antioxidant activity, antimicrobial activity, anti-inflammatory activity, cytotoxicity, antiallergic activity, enterokinase inhibitory activity, analgesic activity, and more. It is utilized to treat sickness, dermatosis, chronic bronchitis, asthma, synchronous diaphragmatic flutter (SDF), and inflammation. The major compounds found in *C. amada* include starch, volatile oils, curcuminoids, phenolic acids, and terpenoids such as difurocumenonol, amadaldehyde, and amadannulen (Policegoudra *et al.*, 2011).

***Curcuma angustifolia* (Wild arrowroot, narrow-leaved turmeric):** East Indian arrowroot, wild arrowroot, and narrow-leaved turmeric are some of the English names, while tikhur is the Hindi name. It is a member of the Zingiberaceae family. Northwestern, Central, and South India are its native habitats. It thrives in moist, cool

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environments (Sharma, 2012). This is used as a dietary aid in the treatment of gastrointestinal diseases, pain or inflamed mucus, and bronchitis. It has antimicrobial and antifungal properties (Doble *et al.*, 2011). The study found that leaf oil compounds such as -eudesmol acetate (7.3%), 14-hydroxycadinene (18.6%), and curzerenone (33.2%), as well as rhizome oil compounds such as camphor and germacrene (3.3%) and curzerenone (72.6%), are present. Camphor (4.2%), palmitic acid (5.2%), methyl eugenol (10.5%), and xanthorrhizol isomer are among the major constituents of Central India rhizome oil (12.7%). Southern Indian rhizome oil contains major constituents such as 1, 8 cineole (4.8%), curdione (8.4%), isoborneol (8.7%), camphor (12.3%), and germacrene (12.8%) (Srivastava *et al.*, 2006).

***Curcuma aromatic* (Cochin turmeric, wild turmeric):** it is a member of the Zingiberaceae family and is native to South Asia, the eastern Himalayas, and Tamil Nadu. It is used as a drug medicine for skin diseases, sprains, bruises, snake poison, epilepsy, autoimmune diseases, to improve complexion, cardiovascular and respiratory systems, cosmetic formulations, blood circulation promotion, blood stasis removal, wound healing, mosquito repellent, and anticancer herb in cancer treatment. It has anti-inflammatory, anti-platelet, anti-tumor, antioxidant, antibacterial, anti-fungal, anti-diabetic, and anti-allergic properties (Sikha & Harini, 2015). CA Snake poison uses rhizomes in particular. When combined with aromatics, astringents can help with injury, headaches, sprains, hiccoughs, respiratory problems, pertussis, achromoderma, and skin rashes (Rathaur *et al.*, 2012). The anti-inflammatory properties of ethanol extracts are well known. CA contains Germacrone, a bioactive constituent with anti-tumour activity, according to many studies (Liu *et al.*, 2014; Hu *et al.*, 2011). CA extracts provide effective personal protection against mosquito bites (Pitasawat *et al.*, 2003). An investigation of *Curcuma aromatica* rhizome essential oils in Japan and India discovered they were distinct from one another. Curdione, germacrene, 1, 8-cineole, (4S, 5S)-germacrene-4, 5-epoxide, -elemene, and linalool are some of the key ingredients in Japanese tea. Curcumene, ar-curcumene, xanthorrhizol, germacrene, camphor, and curzerenone are components of Indian sample essential oil. *C. aromatica* can heal wounds in 9 to 11 days (Santhanam & Nagarajan, 1990).

***Curcuma zedoaria* (Zedoary):** it belongs to the Zingiberaceae family and is recognized as zedoary or white turmeric. These are prevalent in South Asia, Southeast Asia, and the state of Florida in the United States. The essential oil of dried rhizome contains 36 compounds, according to a study. Terpenes 17, alcohols 13, and ketones 6 were among the 36 compounds identified. Epicurzerenone (24.1%) and Curzerene (10.4%) have the highest and second-highest quantities (Mau *et al.*, 2003). It has antimicrobial, antiamoebic, larvicidal, pain reliever, antinociception, hepatoprotal, antiallergenic antiulcer, platelet-activating,

antivenom, antifungal, anti-leukotriene, hemagglutinating, mutagen inhibiting, cytotoxic, anticancer, and antioxidant properties (Lobo *et al.*, 2009).

Uses of Turmeric

Anti-leukotriene, antioxidant, anti-cancerous, anti-carcinogenic, anticoagulation, antifertility, anti-diabetic, anti-microbial, anti-protozoal, anti-viral, anti-fibrotic, anti-venom, antiulcer, hypotensive, and hypocholesterolaemia are just a few of its properties. *Curcuma longa* is thought to be valuable to one's health. *Enterococcus durans* TP2 MH916769 was found to play a role in the immunity booster as a good probiotic candidate in the study (Sharma *et al.*, 2021).

A studies revealed turmeric's healing benefits, which include promoting a balanced mood, wound healing, joint pain relief, blood sugar balancing, soothing irritated tissue, controlling cholesterol, treating tonic and acute allergies, treating asthma, eczema, acne, and psoriasis, curing digestive and eye disorders, liver disease, cancer, atherosclerosis, and osteoarthritis, and bacteria that causes osteoarthritis. It's known for being the most potent immunomodulatory (Yadav *et al.*, 2017).

Curcumin is a potent antioxidant that helps to boost the body's antioxidant activity by blocking oxidative radicals. It also involved Curcumin in the induction of apoptosis and thus has anticarcinogenic properties. It also aids in the prevention of atherosclerosis, heart attacks, and strokes, as well as plaque build-up that causes artery blockage. It inhibits the growth of *Helicobacter pylori* CagA+ strains in vitro, as well as a variety of bacteria like *Streptococcus*, *Lactobacillus*, and others. It helps with indigestion by reducing bloating and gas symptoms. By calming the pores, it aids in the healing of wounds and the reduction of acne on the face. Obesity management, diabetes control, arthritis relief, and antifungal activity are among the other functions (Verma *et al.*, 2018).

Turmeric has been used in food since ancient times and is thus considered an old spice. It was used as a dye and had many pharmaceutical uses in the nineteenth century, and it was regarded as a new spice (Cooksey, 2017). Turmeric rhizome is used to purify the blood, as a brain and heart tonic, and in the treatment of leucoderma, diabetes, hemorrhoids, and respiratory diseases such as chronic bronchitis and bronchial asthma, tumours, tuberculosis glands in the neck, spleen enlargement, leucorrhea, and gonorrhoeal discharge checking. It contains volatile oils and curcumin, both of which have anti-inflammatory properties. Its extract and essential oil inhibited many bacteria, parasites, and pathogenic fungi. Because of its antioxidant activity, it has hepatoprotective and renoprotective properties, as well as the ability to reduce the formation of pro-inflammatory cytokines. Because it contains curcumin and soluble water and fat extracts, it is used as a carcinogen and has strong antioxidant activity. It aids in the maintenance of low cholesterol and triglyceride

levels, as well as lowering the susceptibility of low-density lipoprotein (LDL) to lipid peroxidation and platelet agglomeration. The constituent sodium curcumin and p-tolymethylcarbinol have several protective effects on the gastrointestinal tract (Chanda & Ramachandra, 2019).

Turmeric is a nutrient-dense natural food because it consists of an enormous amount of carbohydrates and fibre. It contains proteins, fats, vitamin C, pyridoxine, calcium, potassium, magnesium, and phosphorous. Turmeric inhibits the down-regulation of NF- κ B and its gene products, which is related to cancer cell persistence, proliferation, and metastasis, and thus has antitumor and anticancer properties. It fights colorectal, renal, hepatic, bone, lung, blood, and other cancers with anticancer properties. It inhibits the production of prostaglandin E₂ in HepG2 cells and has antioxidant properties. Turmeric essential oil inhibits fungal growth, as well as the production of aflatoxins B₁ and G₁. Curcumin, in combination with epigallocatechin gallate (EGCG), has been shown to have increased antibacterial activity against *Acinetobacter baumannii*, multidrug-resistant bacteria. Acute myocardial infarction, cardiac arrest, cardiac hyperplasia, arteriosclerotic vascular disease (ASVD), cerebrovascular accident, diabetes mellitus, and other cardiovascular problems are all treated (Ahmad *et al.*, 2020).

Curcumin, a polyphenol found in the *Curcuma longa* plant, is figured out to be the most effective biological component. Curcumin has anti-inflammatory properties, making it beneficial for rheumatologic conditions such as arthritis, dermatology, psoriasis, acne, itching, and skin wounds. Curcumin performs best in the processes of metastasis, angiogenesis, and cell death. It has an antioxidant effect because it lowers LDL blood levels and lowers the risk of atherosclerosis (Ahmad *et al.*, 2020). Turmeric is extensively utilized in Asian cuisine and culture. It has been used for centuries to control disease prevention and cure by using it in traditional medicine, pre-clinical and clinical trials, and dermatology (Zdrojewicz *et al.*, 2017). Turmeric has been used to treat and prevent a wide range of human-related disorders as a spice, food colorant, flavouring substance, cosmetics, and medicine or drug. It's a natural food colour that's too popular as a skincare product and a healthy food ingredient (Gopinath & Karthikeyan, 2018; Ahmed *et al.*, 2020).

Turmeric is a boon because it is used in a variety of therapeutic properties in our daily activities. It possesses antiseptic properties and is used as a disinfectant in burns and cuts. It promotes wound healing. It has antidiabetic, antiapoptotic, antiangiogenic, anti-inflammatory, and immunomodulatory properties because it regulates insulin levels, lowers blood cholesterol, strengthens the immune system, aids in the liver's detoxification and fat metabolism, and acts as a natural pain reliever in the treatment of arthritis. It's too used to prevent platelet aggregation, cancer cell metastasis, melanoma, and the risk of childhood leukaemia. It's also used as a colourant in pit-and-fissure

sealants and dental plaque detection systems because it has anti-inflammatory properties that help with pain relief, gingivitis, and periodontitis. Its chemopreventive activity is demonstrated in premalignant lesions and conditions treated in the oral cavity. It has antioxidant and free radical properties that inhibit carcinogenesis, mutagenesis, oncogene expression, cell cycle regulation, apoptosis, tumorigenesis, metastasis, and precancerous lesions and conditions in the early stages. It is used as an antibacterial agent in the treatment of infected root canals. It is available, cost-effective, and can be used for a variety of biological activities (Kuwatada *et al.*, 2017).

Conclusion :

Turmeric is a marvel to humanity because it contains a plethora of biological activities that benefit the modern world. Curcumin, the main active compound, and its constituents have a wide range of biological effects. Many experimental data showed significant evidence in favour of turmeric as a natural product in the treatment of various diseases causing no human toxicity. There is enough information about turmeric uses other than as a spice and medicinal uses, but more research is needed in the future to develop new products.

Acknowledgements:

I acknowledge the contributions of eminent authors whose works, ideas enriched this work. I gratefully like to thank my guide Dr. Gyanranjan Mahalik for his valuable suggestions in completing this review.

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