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Introduction of Phytomedicine and Isolation Technique of Curcumin from Curcuma Longa Linn

Prashant Tripathi, Vikas awasthi, Prachi verma, Vidhi Nigam, Sneha verma, Shraddha verma
Chaudhary institute of pharmaceutical science ,sherpur lakhimpur kheri

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I. INTRODUCTION OF PHYTOMEDICINE

The word **Phytomedicine** has been derived from **Greek** word **Phyto** which means **Plants .**

Phytomedicines are also called as **BOTANICAL MEDICINE/PLANT MEDICINE** which is differ from Chinese herbalism , phytotherapists use these plants which have medicinal value and grow mainly in the western hemisphere .

Phytomedicines is rooted in scientific research and therefore not to be confused with homeopathy .

It takes its name from the word used in other parts of Europe . where plants base medicine continue to be provided by doctors and pharmacists as **Phytomedicine** .

The method which is used for evaluation of plants based medicine are similar to those which is used by orthodox medicines . every herb contains many active chemicals ingredient unlike conventional drug which focus on specific chemical,botanical or herbal medicine may combine several actions to support body's health .

Phytomedicine is defined as a **crude drug** (dried herb) , an essential oil, an extract or fraction of it for medicinal properties and quite often complex mixture of compound that generally occur in low(variable)concentration . the most commonly used phytomedicine are plant extract obtain through the use solvent by maceration or percolation of dried plant . the extract can be used as liquid preparation or in powdered form . water and alcohol are most commonly used as solvent for extraction. Some times fraction are used,which contain more concentrated level of the active principles that genrally obtained by the partition with solvent of increasing polarity .

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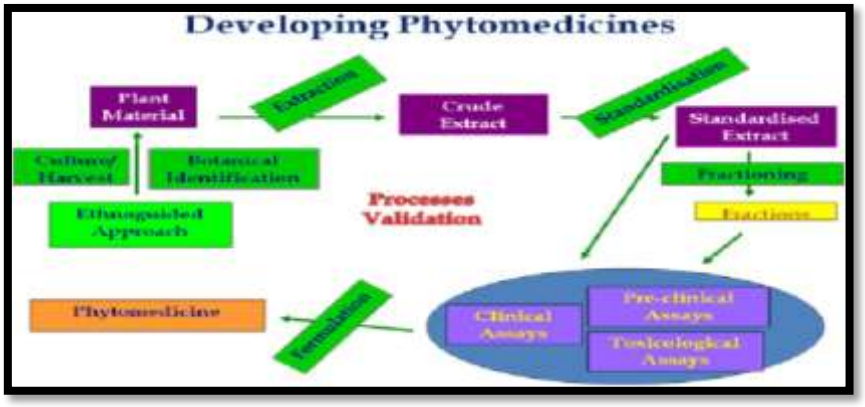
Sometimes availability and quality of the raw materials are frequently problematic because the active principle are often known , and standardization and stability through feasible are not easy. Compared with modern medicine herbal medicine costless are more often used to treat chronic disease and appear to have less frequent undesirable side effect . so modern techniques received more attention in recent years and the number of publication produced annually in this field is the hypenened analytical technique. Which has enablled a reliable fingerprint to be obtained. This has lead to a growing class and a promising market as it generates revenue of **21.7 billion per year .**



HOW DOES PHYTOMEDICINE WORKS

In phytomedicine or plant medicine are selected to modulate or strengthen the body's own functions and immune system , hence it support the body to restore itself to health. the phytotherapist approaches each patient as a unique individual in making a diagnosis and assessing their needs .

The herbal medicine wich are prescribed may be a combination of plants choosen for the therapeutic actions required to treat individual .

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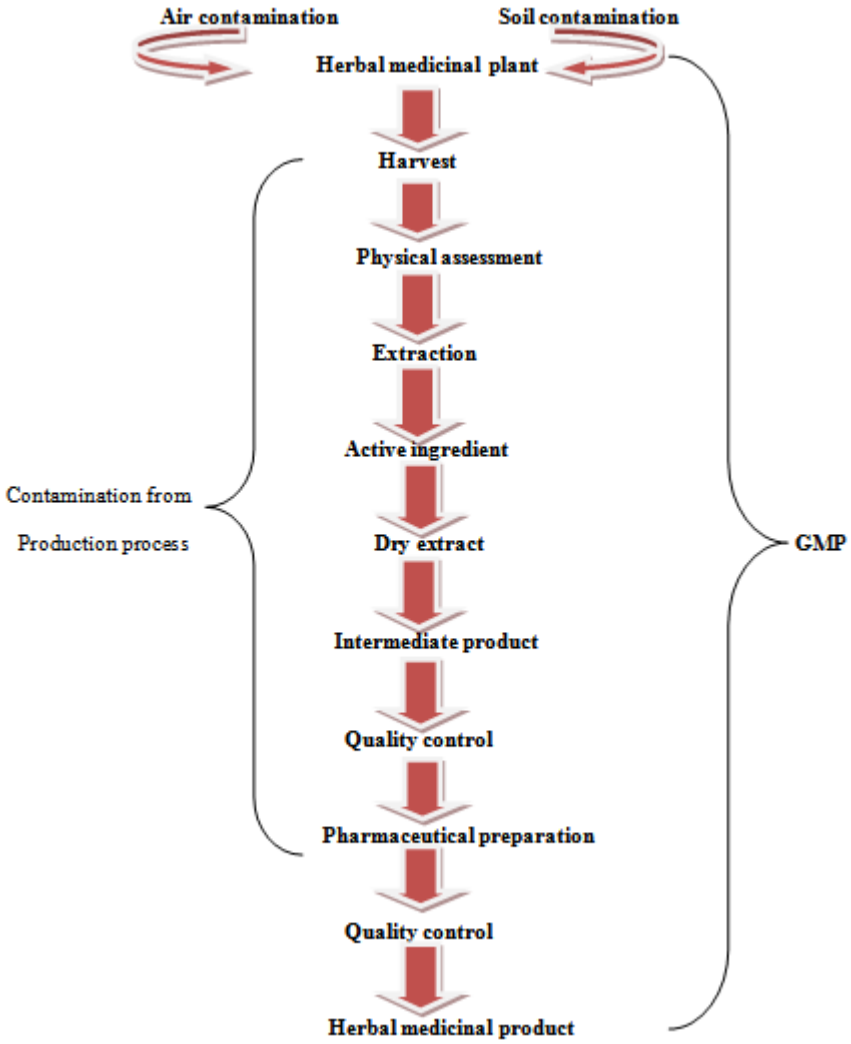
They provide strengthen to the immune system instead of destroying the pathogens .



HISTORY OF PHYTOMEDICINE

Phytomedicines came into existence since the advent of human civilization. **SHENG NONGS** Herbal book which are preliminary sources of traditional folk knowledge based on use of herbs in China and dates back to around 3000 BC. It provide the details of almost 365 plants, animals and minerals which find a place in medication. Approximately 420,000 species of plants are found on earth , however, their various uses are not well understood .

There are three major areas, namely, food (foodstuff), medicine (folk and traditional medicine), and research (phytochemical analysis), that predominantly find an immense use of herbal preparations and products and hence can be explored further. Gaining experience from random trails and careful observation fron animal studies, people belonging to ancient periods started employing herbs as a therapeutic method against several illnesses.

Based on this, the ever so popular Chinese herbal medicine as well as Indian herbal medicine, native to and prominently developed in ancient China, Japan, Korea, and India, continue to rule and influence the modern health–care even today. As per the estimate of world health organization (WHO),herbal medicines are one of the most important primary health-care for around 3.5-4 billion people across the world, and a major portion of traditional medicine involves the plant extract-derived medicines and decoction which may also be termed as the ‘‘modern herbal medicine’’.

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PREHISTORIC TIMES

Plants, including many now used as culinary herbs and species, have been used as medicines, not essentialy effectively, from prehistoric times.

Human settlement are often surrounded by weeds used as herbal medicines such as nettle, dandelion and chickweed. For instance, a 60,000-year-old Neanderthal burial site,"Shanidar IV", in northern Iraq has yielded large amounts of pollen from 8 plant species, 7 of which are used now as herbal product.

ANCIENT TIMES

In ancient time Sumeria, hundreds of medicinal plants including myrrh and opium are listed on clay tablets from around 3000 BC.

From ancient times to present time, Ayurvedic medicine as documented in the Atharva veda, the Rig veda and the Sushruta Samthita has used hundreds of herbs and spices, such as turmeric, which contains curcumin.

The chinese pharmacopoeia,the Shennong ben cao jing records plant medicines such as chaulmoogra for leprosy,ephedra and hemp.In arround 60AD,the greek physician Pedanius Dioscorides,working for roman army k.j documented over 1000 recipes for medicine using over 600 medicinal plant in De materia medica. the book remained the authoritative reference on herbalism for over 1500 years, into the 17th century.

CURRENT TRENDS OF PHYTOMEDICINE

Current Trends in Phytomedicine and Clinical Therapeutics is an open access, peer-reviewed journal focussing on current advancements in the field of Phytomedicine and Clinical Therapeutics. Current Trends in Phytomedicine and Clinical Therapeutics journal covers various aspects of related areas like Phytomedicine, Phytology, phytotherapy, and toxicology of plants and their extracts etc.

The journal provides a unique platform for scientists to encourage research publication to research scholars, academicians, professionals and students engaged in their respective field.

More than 70% of India's 1.1 billion population still use these non-allopathic systems of medicine. Currently, there is no separate category of herbal drugs or dietary supplements, as per the Indian Drugs Act. However, there is a vast experiential-base for many of the natural drugs.

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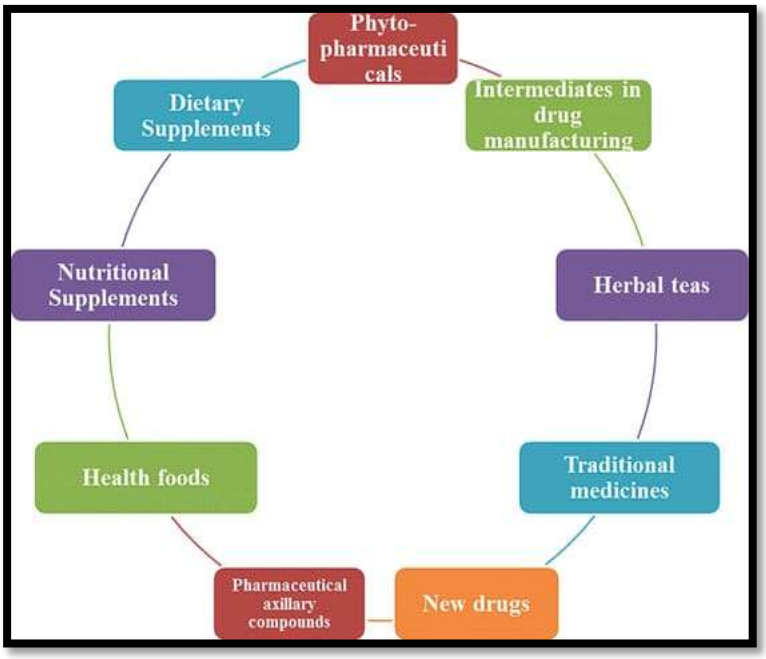

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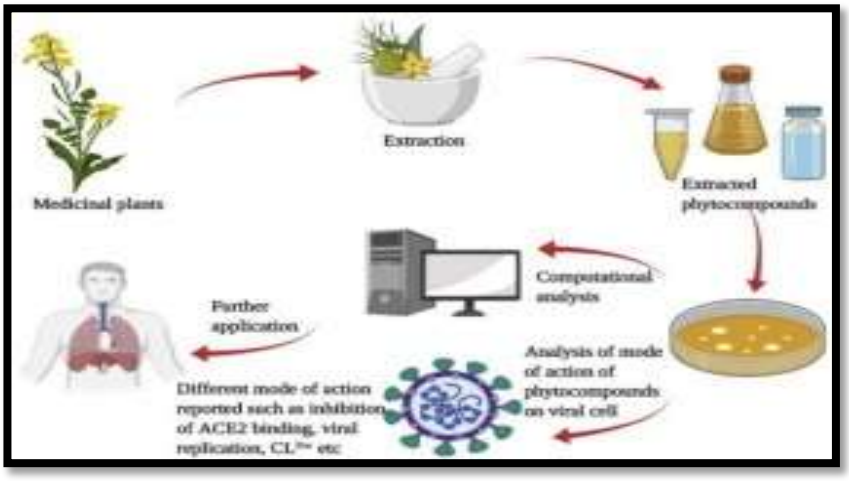
PHYTOMEDICINE FROM HIGHER PLANTS

Plant based drug provide outstanding to modern therapeutics for example,serpentine isolated from the root of indian plant rauwolfia serpentina in 1953. Was a rewolutionary event in the treatment of hypertension and lowering of blood pressure.during 1950 to 1970 approximately 100 plants based new drug were introduced in the USA drug market including deserpedine resinine, resinnamine,reserpine,vinblastin and vincristine which are derived from higher plant . from 1971 to 1990 new drugs such as ectoposide , Eguggulsteron , Teniposide appear all over the world 2% of drugs were introduced from 1991 to 1995 including paciltaxel, toptecan, gomishin, irinotecan etc . vinblastin isolated from the catharanthus rosesus (Farnsworth et al,1967) is used for the treatment hodkings, choriocarcinoma,non hodkings lymphomas,leukemia in children,testicular and neck cancer.



Vincristin is recommended for acute lymphocytic leukemia in childhood ,advanced stages of hodgkins , lymphoma carcoma , small cell lungs , cervical and breast cancer .

ROLE OF PHYTOMEDICINE IN HUMAN SOCIETY

People on all continents have used hundreds to thousands of indigenous plants for treatment of illness since ancient times (levetin and

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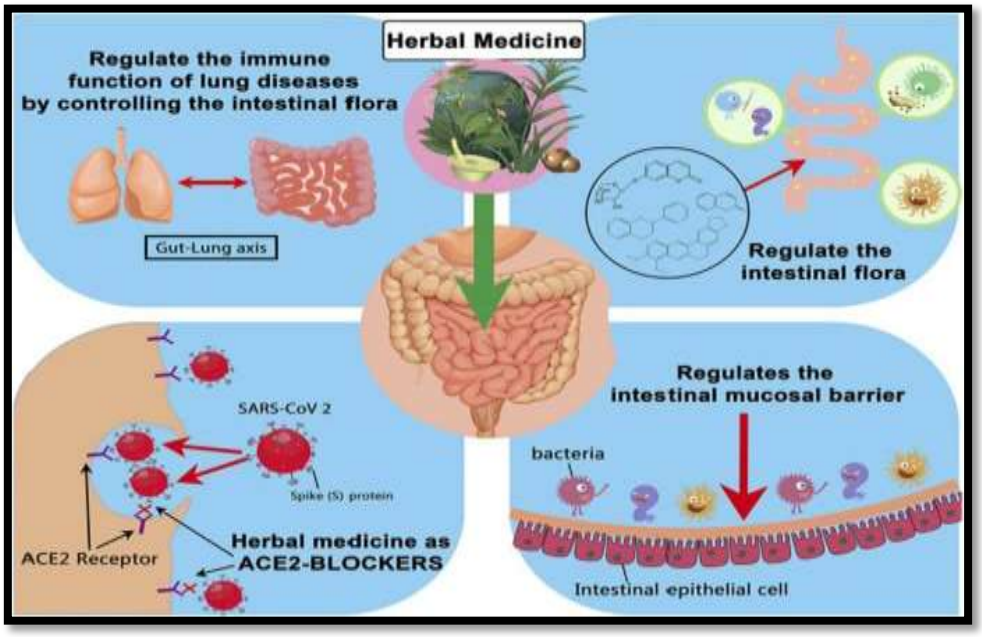
Mc Mohan , 2002) . indegenous healers often claim to have learned by observing that sick animals changed their food preferences to nibbel at bitter herbs they would normally reject (huffman,2003) .



Low land gorrilas take 90% of their food stuff from the fruits of aframomum melegueta , a relative of the ginger plant which is a powerful antimicrobial and apperently keeps shigellosis and similar infections bay sick animals tend to forage plants rich in secondary metabolites , such as tannins and alkaloids. since these phytochemicals often have antiviral , antibacterial , antifungal and antihelminthics properties , a plausible case can be made for self treatment by animals in the wild .

Cardiotoxicity And Cardioprotective Effect Of Phytomedicinal Plants

Medicinal plants are the future of medicines. Now phytomedicine are coming into equal prominance with orthodox medicine worldwide. however, some medicinal plants are becoming endangered species. it is important to mention that many cardioprotective agent have been found in various plants , but these compounds are not going for clinical trials and then ultimately to pharmacy . the role of phytotherapy research should be drug development from medicinal plants . phytochemicals which modulate enzymes that are used for therapy should be classified, identified cardioactive agent are derived more effective analogues should be synthesized to preserve endangered species. the synergistic property of phytochemical in plants extract often is tangled as an advantage that is difficult to changed by single synthetic drug. It is our advice that “hybrid phytochemicals” that can imitate this synergistic action could be synthesized using templates from plants.

Although advancements in the fight against cardiovascular diseases, it has remained the number one cause of mortality worldwide. Cardioprotective medicinal plants can greatly contribute to germinate the tide of this disease. However, because only a thin line of delimitation exists between a medicinal plant being cardioprotective and its being a poison at times, proper classification and screening is important. This information should be available to all users of medicinal plants.

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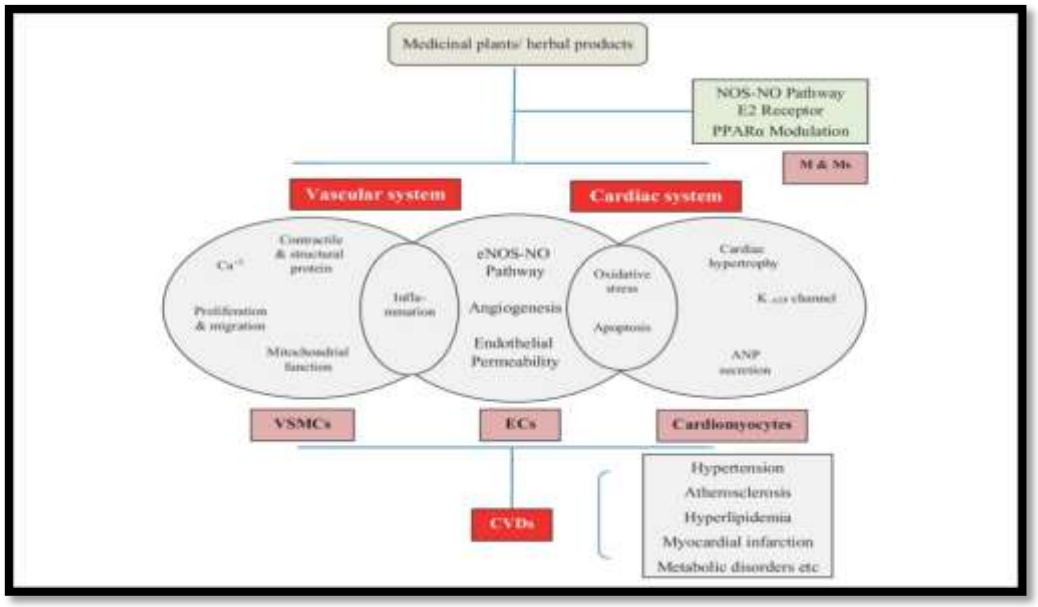

TURMERIC

SYNONYMS- HALDI , SAFFRON INDIAN , CURCUMA BIOLOGICAL SOURCE - It is derived from the rhizome of CURCUMA LONGA FAMILY

- ZINGIBERACEA GEOGRAPHICAL SOURCE - Today, turmeric is widely cultivated in the tropics and goes by different names in different cultures and countries . In North India, turmeric is commonly called "haldi," a word derived from the Sanskrit word haridra, and in the south it is called "manjal," a word that is frequently used in ancient Tamil literature. The name turmeric derives from the Latin word terra merita (meritorious earth), referring to the color of ground turmeric, which resembles a mineral pigment. It is known as terre merite in French and simply as "yellow root" in many languages. In many cultures, its name is based on the Latin word curcuma.

It is generally originated from india , Pakistan, America , Indonesia etc .

MARPHOLOGY

Characters	Observation
Organoleptic characters	
Colour	Yellow or yellowish brown
Odour	Aromatic and Characteristics
Taste	Slightly bitter
Quantitative Macromorphology	
Size	2-3 cm in diameter
Length	1-1.5 cm long
Macroscopical features	
Shape	Finger shaped
Surface	Smooth or slightly rough
Texture	Hard and Heavy
Fracture	Short

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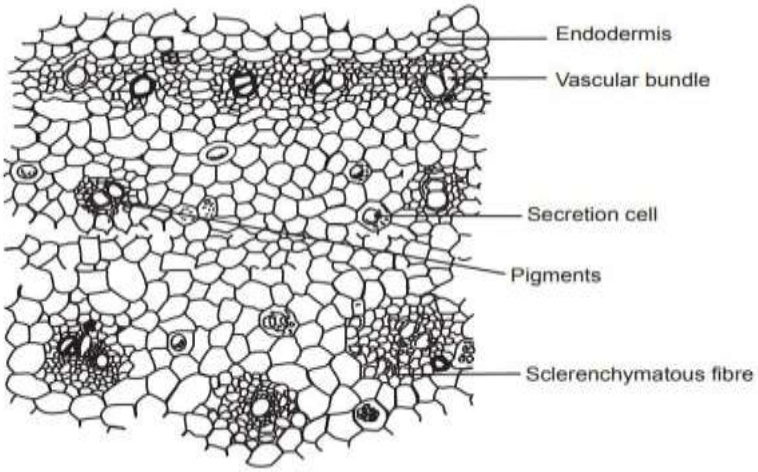
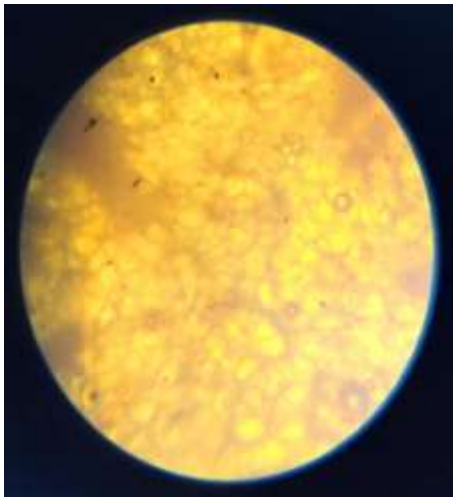
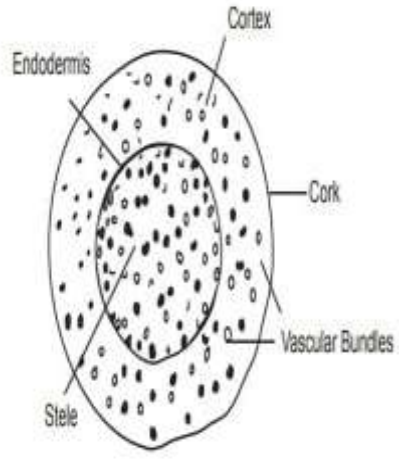
MICROSCOPIC CHARACTERS –



Root: The outline of TS of adventitious root is circular .





Epiblema – Single layered. Consists of thick walled cutinized cells. In old specimen the epiblema is withered and is replaced by ten-layered rectangular cork cells

Cortex – Heterogeneous differentiated into :-
(A) Outer cortex – Composed of parenchymatous tissue of secondary and primary cortex

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(B) Middle cortex – Made up of radially arranged air chambers separated by one cell thick partition wall – the trabaculae (a character of hygrophilous plant)
Endodermis – In the innermost layer of the cortex, the cells are rectangular and barrel shaped.
Pericycle – Three to four layered, consists of rectangular cells
Vascular tissue – Radially arranged. Phloem patches and xylem are arranged alternately.
Pith – Well developed and thick walled parenchymatous.
Rhizome: It consist TS of rhizome triangular and circular.

CHEMICAL CONSTITUENT

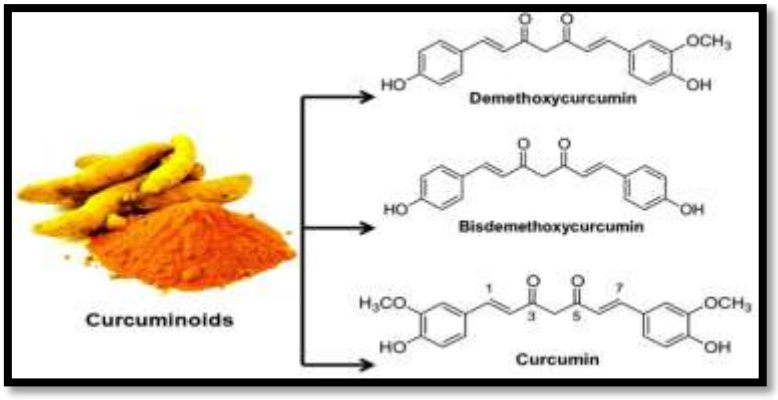
curcumine, and Volatile oils include d-α-phellandrene, d-sabinene, cinol, borneol, zingiberene, and sesquiterpenes. There are a variety of sesquiterpenes, like germacrone,termerone, α-, and β-termerones, β-bisabolen, α-curcumene, zingiberene; β-sesquiphellanderene; bisacurone; curcumenone; etc.

USES

1. It is used in the treatment of depression .
2. It protect our body from free radicals .
3. Turmeric used in servical cancer .
4. It is used as a condiment or spice and colouring agent , especially for ointments and creams . ,
5. It is used for the detection of boric acid .
6. It is used in the treatment of conjunctivitis, small pox and chicken pox .
7. It is a powerful anti-oxidant.

FROM TRADITIONAL MEDICINE TO MODERN MEDICINE

Now modern medicines are mostly used in treatment of various diseases, which is less than 100 years old in comparison of traditional medicine., traditional medicine served mankind for thousands of years, which are safe and effective. The mechanism or the scientific basis of traditional medicine are not well understood .



EXTRACTION, ISOLATION OF CURCUMIN FROM TURMERIC

There are several methods which are used in the extraction of curcumin

1. **SOXHLET EXTRACTION**
2. **ULTRASONIC-ASSISTED EXTRACTION**
3. **MICROWAVE-ASSISTED EXTRACTION**
4. **ENZYME-ASSISTED EXTRACTION**
5. **SUPERCRITICAL FLUID EXTRACTION**
6. **PRESSURIZED LIQUID EXTRACTION**

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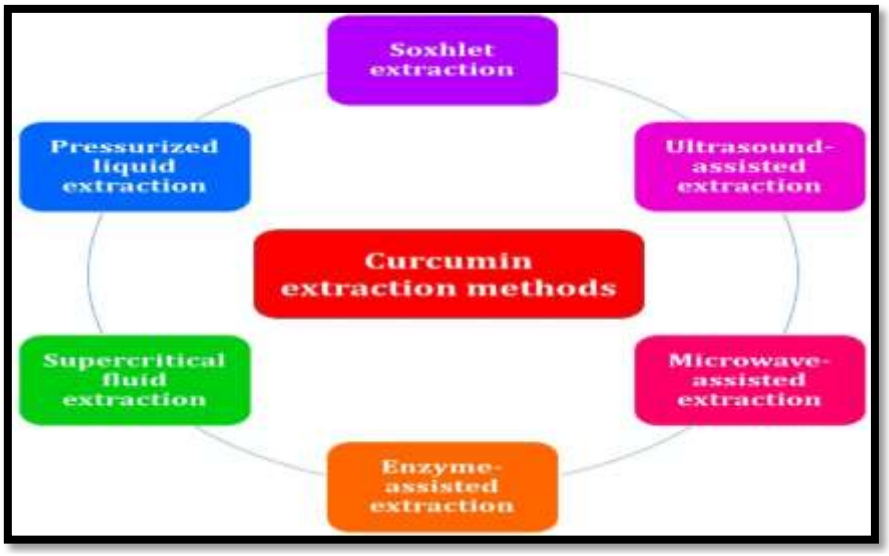
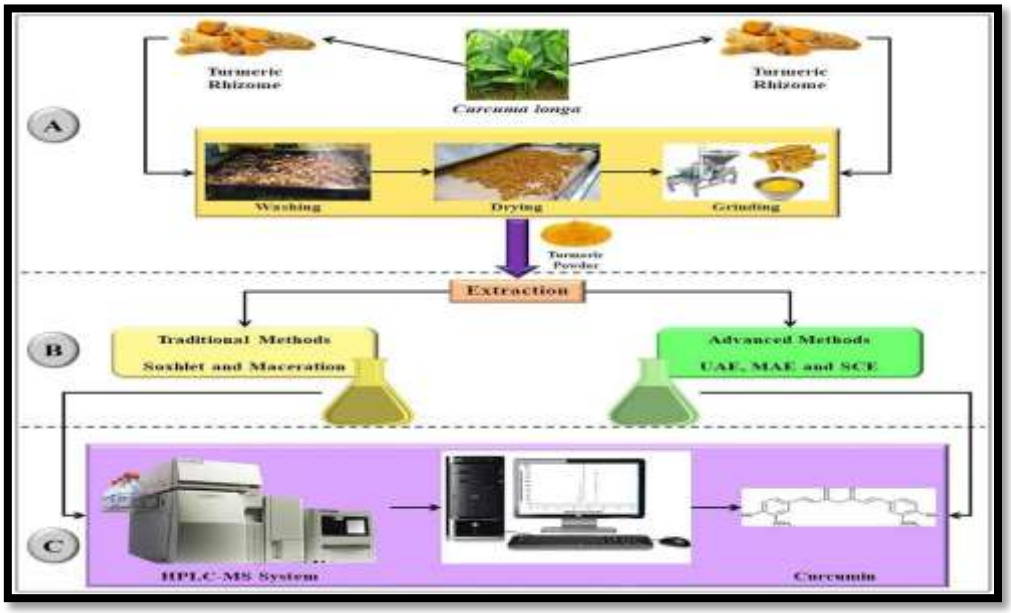


EXTRACTION PROCESS OF CURCUMIN



(A) Sample Preparation : Turmeric rhizomes were appropriately collected and washed. after that drying and grinding were done. Drying and size reduction are essential process which plays an important role in the process of extraction of curcumin from turmeric.

(B) Extraction and Purification: Then the sample are subjected for the extraction process. commonly traditional method are used for the extraction process for curcumin because of low cost of operation and easy handling.

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FRESH TURMERIC RHIZOMES

SHORTING
(to remove foreign material)

WASHING
(For the proper cleaning of rhizomes)

DRAINING
(Remove water used in washing)

SPREDING
(Used to remove moisture content)

SLICING
(Increase surface area for rapid drying)

OVEN DRYING (AT 60℃)

MILLING/GRINDING

STORAGE/SAMPLE COLLECTION

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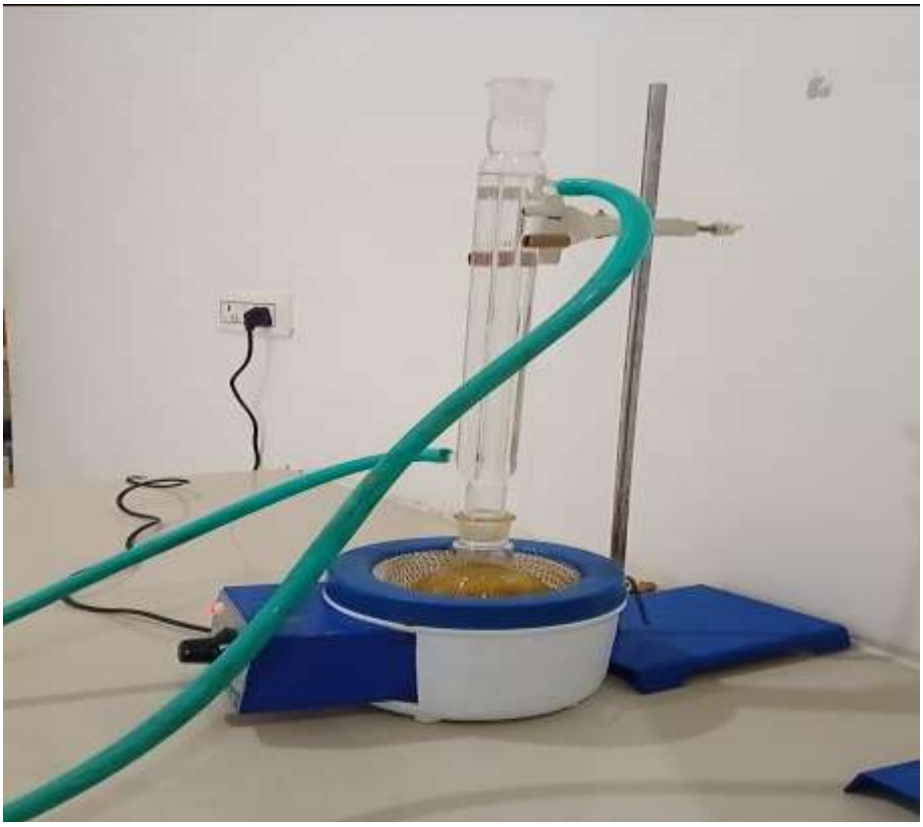

EXTRACTION OF CURCUMIN BY REFLUX CONDENSATION PROCESS :

Take dried crued rhizome of turmeric

Then the dried rhizome of the turmeric is triturated in mortal pistle since it converted in to fine powder

After that take 15 gm of turmeric powder in round bottom flask

Add 150 ml of organic solvent

Dissolve the powder drug with organic solvent in round bottom flask

Extraction for 2hr by reflex condentation process

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Then filter the solution with filter paper Now,residue and filterate is obtained and weight the residue

Then take the marc in another beaker

Dissolve the marc with 150ml of acetone in round bottom flask

Extraction for 2hrs by reflux condensation process

Then the marc is centrifuged at 3500rpm for 10mins

Then filter the solution with filter paper

Residue and filterate get seperated

Then place the marc for specific period of time

After few days we get the form of pure curcumin

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Then calculate the % yield of curcumin by following formula

$$\text{Percent (\%) Yield} = \frac{\text{Practical Yield}}{\text{Theoratical Yield}}$$

Practical Yield = 0.71gm
Theoretical Yield = 1-6 gm per 100 gm / (0.9gm in 15gm)

So , acoording to the formula: -

$$\text{\% Yield} = \frac{(0.71)X(100)}{0.90}$$

% Yield = 78.88%

ISOLATION OF CURCUMIN BY SOXHLET APPARATUS :
PROCEDURE

Turmeric powder extrcted with 95% alcohol in soxhlet apparatus

Filter the solution and concentrate to semisolid residue by evaporation

Add 0.1% NaoH solutionand shake slowely,alkali layer is separated

Acidify with Hcl

Yellow colour precipitate is formed

Concentrate the solution by stirring

Lumpy mass of resins separate out

Filter and evaporate the filtrate

Pure Crystal of curcumin is obtained

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- **And the percent yield is calculated by the following formula**

Percent(%) Yield = Practical Yield / Theoratical Yield

STANDARDS OF QUALITY

Foreign organic matter : Not more than 2.0 per cent

Ash Not more than 8.0 per cent

Water soluble extractives : Not less than 9.0 per cent

Alcohol – soluble extractives : Not less than 10.0 per cent

Moisture : Not more than 10.0 per cent

PROPERTIES

- **Appearance:** Orange yellow crystaline powder
- **Odour :** Characterstic
- **Taste :** Slightly pungent and bitter
- **Solubility :** Insoluble in water and ether , but soluble in alcohol

IDENTIFICATION BY CHEMICAL TEST

- Powdered drug + sulphuric acid (H2SO4) gives **crimson colour**
- The aquous solution of turmeric + boric acid gives **reddish brown colour** which on addition of alkali changes to **greenish blue** .
- Sample id treated with acetic anhydride and concentrated H2SO4 it gives violet colour . when this test is observed under UV light , red fluorescence is seen .

TLC METHOD

Sample preparation : Dissolve 1mg of curcumin in 1ml of methanol

Stationary phase : Silica gel G

Mobile phase: Chloroform : ethanol:glacial acetic acid (94:5:1)

Detecting agent : Anisaldehyde sulphuric acid reagent

Rf value : 0.79, 0.60,and 0.43

Colour test: Bright yellow fluorescent

Sample Preparation for TLC Analysis

A 100 mg amount of C. xanthorrhiza rhizomes from each region was accurately weighed and placed into a 2 mL microtube, and then 1.5 mL methanol was added. The mixtures were vortexed for 5 min and then followed by centrifugation at 4000 rpm for 5 min. To prepare sample stock solution, 1 mL supernatant from the previous extraction was transferred to a 10.0 mL volumetric flask and diluted to volume with methanol. Test solutions were prepared by transferring 2.0 mL of each sample stock solution of C. xanthorrhiza extract from Bantul, Kulon Progo, and Karanganyar, and transferring 4.0 mL of each sample stock solution of C. xanthorrhiza extract from Sleman and Pati, into respective 5.0 mL volumetric flasks and diluting to volume with methanol. Binary mixtures of C. xanthorrhiza from Sleman with various concentrations (10%, 25%, 40%, 50%, and 75%) of C. aeruginosa as adulterant were also prepared. Extraction of each binary mixture was done according to the previous step. Sample stock solution for binary mixture was prepared by transferring each 1.0 mL supernatant from the previous extraction to 10.0 mL volumetric flask for mixtures of 10% and 25% C. aeruginosa, and transferring each 1.0 mL supernatant from the previous extraction to respective 5.0 mL volumetric flasks for mixtures of 40%, 50%, and 75% C. aeruginosa, and then diluting to volume with methanol.

IDENTIFY TEST OF CURCUMIN IN PURIFIED TURMERIC EXTRACT USING TLC

Preparation of test solution

preparation of reference solution and solvent system

chloroform :ethanol : glacial acetic acid (94:5:1)

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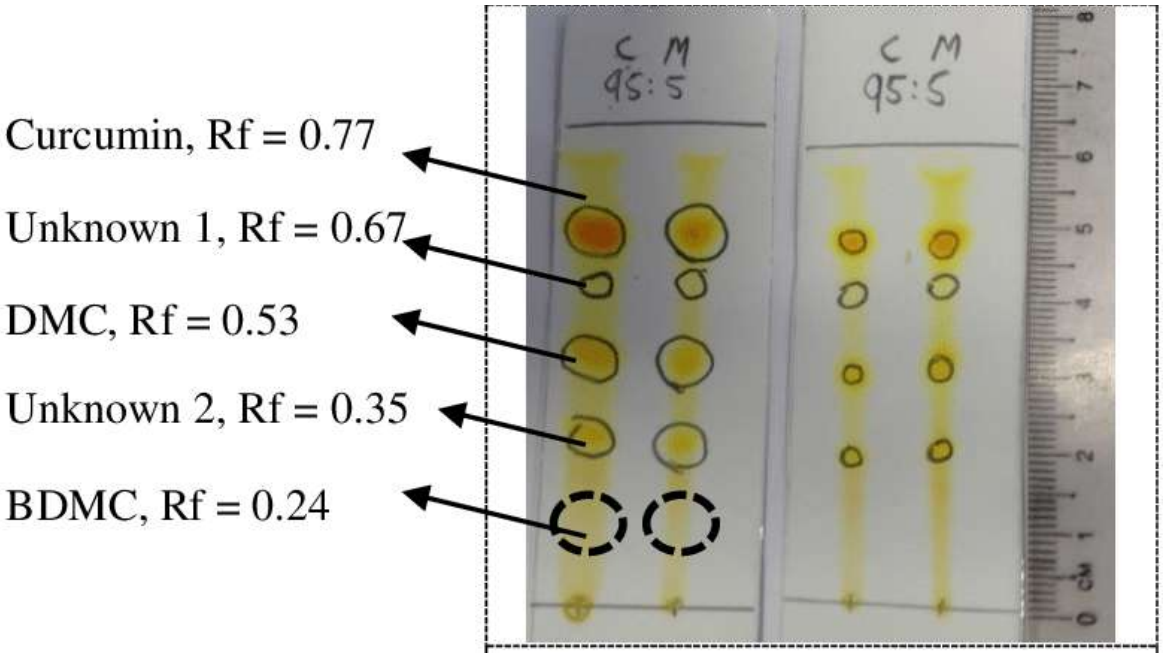
preparation of stationary phase using silica gel as an adsorbent

densitometric scan at 366 nanometer



$$\text{RF(RETENTION FACTOR)} = \frac{\text{DISTANCE TRAVEELD BYSOLUTE}}{\text{DISTANCE TRAVELLED BY SOLVENT}}$$

RF = 0.77

RESULT: The Rf values were found to be **0.77 , 0.53 , 0.24** for curcumin, de methoxy curcumin and bis demethoxy curcumin respectively **.**

II. CONCLUSION

The beneficial effects of turmeric are traditionally achieved through dietary consumption, even at low levels, over long periods of time. A precise understanding of effective dose, safety, and mechanism of action is required for the rational use of turmeric in the treatment of human diseases. Further clinical studies are warranted if turmeric is to be employed in meeting human needs and improving human welfare. The activities of turmeric include antibacterial, antiviral, anti-inflammatory, antitumor, antioxidant, antiseptic, cardioprotective, hepatoprotective, nephroprotective, radioprotective, and digestive activities. Phytochemical analysis of turmeric has revealed a large number of compounds, including curcumin, volatile oil, and curcuminoids, which have been found to have potent pharmacological properties .

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