CHAPTER-35

PHOTOTHERAPY RESEARCH

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Abstract: Phototherapy is the most common therapeutic intervention used for the treatment of hyperbilirubinemia. Although it has become a mainstay since its introduction in 1958, a better understanding of the photobiology of bilirubin, characteristics of the phototherapy devices, the efficacy and safety considerations of phototherapy applications, and improvements in spectroradiometers and phototherapy devices are necessary for more predictable and improved clinical practices and outcomes. A step forward in instituting consistent, uniform, and effective use of phototherapy is the recent American Academy of Pediatrics clinical guideline on the of hyperbilirubinemia in the newborn infant 35 or more weeks of gestation, which outlines a clinical strategy for the diagnosis of hyperbilirubinemia and contains direct recommendations for the application of phototherapy. This article reviews the parameters that determine the efficacy of phototherapy, briefly discusses current devices and methods used to deliver phototherapy, and speculates on future directions and studies that are still needed to complement our presently incomplete knowledge of the facets of this common mode of therapy.

keywords: Phototherapy ,hyper bilirubinemia, photobiology, spectroradiometers

1. Introduction:

Most pediatricians understand phototherapy as the use of visible light for the treatment of hyperbilirubinemia (jaundice). In a recent article, McDonagh reviewed the history of phototherapy from the use of heliotherapy in ancient Egypt to the use of blue high intensity gallium nitride light- emitting diodes (LEDs) in the new millennium.1 For treatment of hyperbilirubinemia, light, in the range of approximately 400 to 500 nm with a peak at 460 ± 10 nm, is considered the most effective. The efficacy of phototherapy is dependent on the fundamental laws of photobiology and photochemistry. The interaction of blue light with bilirubin causes a photochemical change that is therapeutically useful and this what makes phototherapy of neonatal jaundice possible. Phototherapy causes rapid oxidative reactions and in- termolecular rearrangements of bilirubin to produce mutant bilirubin isomers,2 which are more polar and thus excretable into bile and urine without conjugation. Nonetheless, despite this knowledge, pediatricians sometimes still resort to heliotherapy or apply visible light in homeopathic doses for photo therapy.

In near-term infants, peak total bilirubina levels may be higher and occur later than that in term infants, near the end rather than at the beginning of the first week of life, and may therefore be discharged before they have reached peak total bilirubin levels. In addition, because of a shorter red blood cell (RBC) lifespan coupled.

Despite scientific knowledge about the mechanisms of action and over half a century of clinical experience, de livery of phototherapy by pediatricians has remained highly variable and influenced by beliefs, which would be best characterized as "half truths" or, sometimes, blatant "falsehoods," despite being one of this country's most commonly prescribed medical therapies. Its practice is still too often characterized by homeopathic, ineffective, or unnecessarily intense applications for sometimes ap- propriate, but other times inappropriate, indications. Compliance with the AAP guideline will hopefully lead to a more consistent use of phototherapy.

Collective experience suggests that the efficacy of photo- therapy applied to smaller, less mature newborns can be assumed. But the overall safety of its use in this population remains uncertain and may have unknown potential toxic effects, which are less likely to occur in the larger, more mature and less translucent near-term and term newborns. Although phototherapy is probably safe in short-term appli- cations, especially in near-term and term newborns, the long- term effects of phototherapy and applications in less mature newborns need further consideration and study. Moreover, the methods by which phototherapy is currently being applied are probably far from optimal. This review is intended to comment on current devices and methods used to deliver phototherapy.

2. Photobiology of Bilirubin

The rate of removal of unconjugated bilirubin from the body during phototherapy depends on the following three related processesthe rate of bilirubin the transport of photoproducts from the skin to the circulation; and the excretion of these photoproducts by the liver and kidney .Of these processes, the photo alteration of bilirubin is a complex set of photochemical reactions and believed to be the rate-limiting step in the elimination of bilirubin from the body. Photo-oxidation involves the destruction of bilirubin to colorless polar molecules that are excreted primarily in the urine, and probably accounts for only a small fraction in the elimination of bilirubin in vivo. Because it is difficult to identify and measure all the metabolites before they are excreted, this fraction could be larger than is presently assumed. A second process is configurational isomerization, which is the conversion of the stable, native bilirubin isomer (4Z,15Z) to more water soluble and less toxic isomers (4Z,15E; 4E,15Z; and 4E,15E).7These photochemical reactions are reversible, but contribute to the removal of bilirubin from the body without conjugation. The predominant process of bilirubin elimination, and probably the rate-limiting mechanism, is the irreversible photoalter- ation of bilirubin to a structural isomer called lumirubin, which is the major photoproduct excreted with the bile and urine. Lumirubin is a water soluble compound with an absorption peak of 453 nm and a molar absorption coefficient of 33,000 A453 units/cm, approximately 70% of that of bilirubin (47,000 A460 units/cm). It does not test positive in the diazo reaction.

3. Efficacy

The therapeutic efficacy of phototherapy is dependent pri- marily on the following factors: the spectral qualities of the delivered light (wavelength range and peak) intensity of light (irradiance), exposed body surface area (BSA), skin thickness and pigmentation, the total bilirubin at clinical presentation, and duration of exposure.

3.1 Spectral Qualities

The optimum light quality for the most efficient use of photo therapy is still under active investigation and discussion. The yellow bilirubin absorption spectrum in plasma and in buffer/human serum albumin has been well established. In general, the in vitro bilirubin light absorption spectrum is used as the basis for the design of phototherapy light sources. Thus, the most effective light sources for degrading bilirubin in the skin and the circulation are those that emit light in a relatively narrow wavelength range (400-520 nm) and centered around a peak of 460 ± 10 nm, which most closely matches the bilirubin absorption spectrum. The rationale for this belief is supported by the results of in vitro and in vivo experiments conducted to determine the bilirubin photo- chemical degradation or action spectrum. Most research sup- ports the observation that blue light most closely matches the bilirubin absorbance spectrum and, therefore, is expected to be the most effective light for photodegrading bilirubin in vivo. However, more research is warranted in light of the recent and puzzling observations that the use of green or blue-green (turquoise) light, with peak emission of 490 nm, is nearly as effective as blue light in decreasing total bilirubin levels in vivo. Unfortunately, performance of a complete analysis of the action spectrum of bilirubin in the human

3.2 Irradiance

Irradiance or light intensity refers to the number of photons as directed to or received per square cm of the exposed BSA. Because the irradiance is quantitated as μW/cm2 within the effective wavelength range for efficacy, it is also referred to as "spectral irradiance" and is expressed as μW/cm2/nm. " deliverable spectral irradiance" is different for each type of light source, and is dependent on the its design and the distance between the light source and patient in an inverse square root relationship, where the light intensity of a point source of light will decrease by the square of the distance. The spectral irradiance, like the amount of drug at a given level of purity, determines the efficacy of treatment, with the higher dosage being associated with greater efficacy of treatment. This relationship has been studied with many of the older devices, but still needs to be studied with some of the newer devices. For example, it has been concluded from some clinical studies that a spectral irradiance of approximately 30 μW/cm2/nm represents the beginning of a "plateau region" beyond which further increases in irradiance would not increase bilirubin degrading capability. However, in these same studies, the efficacy of irradiance was also apparently dependent on the initial total bilirubin concentration. In the current AAP guideline, intensive phototherapy is defined as the use of blue light (in the 430-490 nm band) delivered at 30 μW/cm2/nm or higher to the greatest BSA as possible.

In clinical practice, irradiance is traditionally measured With a hand-held spectroradiometer, which is designed to be sensitive only to blue light at a wavelength range centered at 460 ± 10 nm. Thus, these radiometers, most of which appear to have a unique range and peak sensitivity.

4. Skin Thickness and Pigmentation and Initial Total Bilirubin Level

Patient parameters, such as increases skin thickness (ie, in older CriglerNajjar patients) and highly pigmented skin, have been reported to impede effective phototherapy. Fur- thermore, the initial total bilirubin level as well as an imbal- ance between bilirubin production and elimination also negatively affects phototherapy efficacy.

4.1 Duration of Exposure

Although duration of exposure to elevated total bilirubin lev els could be an important factor in understanding risk foracute bilirubin encephalopathy or kernicterus, information about the duration of bilirubin exposure is generally lacking in the literature. Moreover, most of the literature addressing risk has been focused on peak total bilirubin levels. This limited perspective may need to be broadened to include the duration of exposure to total bilirubin or its fractions and is discussed elsewhere in this issue (see article by Drs.Ahlfors and Wennberg). Nonetheless, the rationale for lowering total bilirubin quickly under some conditions seems intuitively obvious. In principle, increased duration of phototherapy does translate into an increased rate of decline in total biliru- bin levels. The AAP guideline now provides an hour-specific total bilirubin nomogram, which serves to inform the clinician at what total bilirubin level phototherapy should be applied in infants with varying risks for acute bilirubin en- cephalopathy or kernicterus.4 Highly effective phototherapy will decrease total bilirubin to safe levels more quickly than less effective phototherapy applied at a lower spectral irradi- ance and over a smaller BSA. In fact, Maisels has coined a term called “spectral power” (mW/nm), which normalizes spectral irradiance across a treated BSA.

4.2 Side Effects

More effective phototherapy probably represents less risk for the newborn, assuming that, in the photochemical reactions, the light does not affect molecules other than bilirubin. This latter possibility is one that should be explored more seri- ously for smaller, less mature and more translucent new- borns, who are often treated with photosensitizing drugs, such as riboflavin (RF), Vitamin K, and others. RF, a powerful endogenous photosensitizer, which has been extensively studied, decreases significantly in the circulation during blue light phototherapy During this process, singlet O2 molecules are produced, which oxidize and destroy intracellular integrity. Currently, a randomized trial of aggressive versus conservative phototherapy for extremely low birth weight (ELBW) infants is underway in 16 centers in the National Institute of Child Health and Human Development (NICHD) Neonatal Research Network.

Although bilirubin may represent a risk for auditory disabilities and poor neurodevelopmental outcome, some degree of hyperbilirubinemia may provide beneficial antioxidant protec- tion in otherwise antioxidant-deficient newborns. For the small immature translucent newborn, phototherapy may repre-

sent an unknown oxidative injury risk. Damage to RBC membranes increases the susceptibility to lipid peroxidation and he molysis has been described. Oxidation and free radicals have been proposed as a contributing factor in the genesis of neonatal diseases such as bronchopulmonary dysplasia (BPD), retinopa thy of prematurity (ROP), necrotizing entercolitis (NEC), and patent ductus arteriosus (PDA), all of these occurring more fre- quently in ELBW infants who are almost all exposed to photo- therapy. Although phototherapy may be useful for avoiding high levels of bilirubin that could contribute to auditory disability or other neurodevelopmental problems, the over-application of phototherapy might eliminate from circulation and tissues naturally occurring antioxidants that may be important in the transitional newborn period, thus predisposing ELBW infants to more conditions caused or exacerbated by free radical reactions. Importantly, the new LED light technology can potentially allow for the design of more finely-tuned devices that could minimize the photo-oxidizing effects, while still achieving the desired photochemical reactions with bilirubin.

4.3 Current Light Sources

There is a considerable selection of various custom-made and commercial phototherapy devices, which have been pro- duced for investigative and clinical applications. However, a complete discussion of these is beyond the scope of this re- view. In summary, phototherapy devices can be categorized by their light source as follows: (1) fluorescent tube (TL12, 60 cm, 20W) devices with different colors of light [cool white (CW), blue, special blue (BB, 52, and 03), turquoise, or green] of straight or U-shaped (18 cm, 18W tubes); (2) metal halide bulbs used in spotlights and incubator lights; (3) metal halide bulb and fiberoptic light guide combinations as used in pads, bla

nkets or spotlights; and (4) high intensity LEDs used presently as canopies and in the future as pads, blan- kets, or even clothing.

4.4 Fluorescent Tubes

The most commonly used light source in the U.S. is the special blue tube, such as F20 T12/BB or TL52/20W (Philips, The Netherlands). CW light has also been used together with special blue tubes to ameliorate caretakers' complaints re- garding the blue hue of the light, but this combination of tubes dramatically decreases efficacy by as much as 50%— depending on the proportion of CW to special blue tubes. At a standard distance of 40 cm, the devices with a 1:1 ratio of tubes can deliver up to 11 μW/cm2/nm, while a unit contain- ing only special blue tubes can deliver up to 24 μW/cm2/nm. However, the use of CW light typically provides only homeo- pathic doses of phototherapy and may be inadequate in suf- ficiently decreasing total bilirubin levels in a jaundiced infant unless the lights are positioned in close proximity, such as directly below the infant.

4.5 Halogen Spotlights

Halogen spotlight systems utilize a single or multiple metal halide lamps as the light source and can provide fairly high irradiance often exceeding 20 μW/cm2/nm. However, these units can generate considerable heat, which can, in turn, cause thermal injury to the infant and to unwary staff if applied too closely, and can emit ultraviolet (UV) radiation if not appropriately shielded. The use of spotlights is some- times preferred in the intensive care nursery because with premature or critically ill neonates on

radiant warmers, its design allows for ad hoc positioning of these devices for the convenience of caregivers. However, their variable position- ing with respect to the distance from the infant and angle of application as well as their irradiance heterogeneity can lead to unreliable dosing and unpredictable clinical responses.

4.6 Fiberoptic Systems

Fiberoptic phototherapy has been available since the late 1980s. Since that time, there have been improvements in the way the plastic fibers are woven into the light pad, but the metal halide bulb remains the source of infrared (IR) and UV-filtered light that enters the fiberoptic cable. Because the pads or blankets emit insignificant levels of heat, they can be placed in direct contact with the infant and, thereby, can deliver up to 35 μW/cm2/nm of spectral irradiance. The ori- entation of the fiberopticfibers determines the uniformity of emission and is unique to each of the commercially available devices. Ultimately, the main advantages of this system are that, while receiving phototherapy, the infant can be held or even nursed and the covering of the infant's eyes is not nec- essary. Although a boon to the home phototherapy market, these systems often provide only homeopathic doses of light for treatment of hyperbilirubinemia because they have a low average spectral power and treat only a small portion of BSA. These devices can be used as an adjunct to conventional overhead application of phototherapy providing "double" phototherapy, thereby more closely approximating circum- ferential phototherapy, which has greater efficacy because of greater BSA exposed to the light.

5. Conclusion

In conclusion, phototherapy is one of the most common medical interventions with well-established efficacy and probably safety for most short-term applications in near-term and term infants with neonatal hyperbilirubinemia. There has been recent clarification of management of hyperbiliru- binemia in the newborn infant 35 or more weeks of gestation with the publication of the AAP guideline with direct recom- mendations for the application of phototherapy. Nonethe less, a better understanding of the photobiology, character- istics of the devices employed for phototherapy, the efficacy and safety of phototherapy applications, and improvements in spectroradiometers and phototherapy devices are all nec- essary for more predictable and improved clinical practices and outcomes.

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ANTIUROLITHIATIC ACTIVITY ON AERVA LANATA

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ABSTRACT

Aerva lanata plant belongs to the family Amaranthaceae. Aerva lanata is also referred as the Mountain knotgrass. The leaves of Aerva lanata is one of the indigenous medicinal plants used in the treatment of diabetes mellitus, kidney stones and its associated problems in Africa. The present study was undertaken to evaluate the in vitro antiurolithiatic activity of the medicinal plant Aerva lanata (mountain knotgrass). The present study indicates the physicochemical & phytochemical studies of Aerva lanata. Ethyl acetate extract showed its maximum efficiency in the dissolution of calcium oxalate crystals. Our results have clearly indicated that the Ethyl acetate extract of Aerva lanata shows better results than Methanolic extract and it was quite promising for further studies in this regard.

INTRODUCTION

Urolithiasis is a process of forming stones in the kidney, bladder, and/or urethra (urinary tract). Reduced urine production or increased excretion of substances that might cause stones, such as calcium, oxalate, urate, cystine, xanthine, and phosphate, are linked to the formation of stones. The kidney's pelvis, where urine collects, is where the stones develop, and they may between microscopic and staghorn stones the size of the renal pelvis. The pain associated with kidney stones typically comes on suddenly, is excruciatingly painful, colicky (intermittent), does not ease with movement, and radiates from the back, down the flank, and into the groyne. Vomiting and nausea are frequent.[5]

The Amaranthaceae family includes the medicinal plant Aerva lanata, which is found all throughout India's plains. Aerva lanata, a perennial herbaceous plant that can reach heights of up to two meters (30 cm to two meters), is found throughout the warmer Indian plains, including the states of Telangana, Andhra Pradesh, and Karnataka and Tamil Nadu, Sri Lanka, the Arabian regions, Egypt, Africa, Java, and the Philippines are additional nations where this plant may be found (Baladrin and Kloeke, 1988; Kareru). Tropical Africa, South Africa, Madagascar, Saudi Arabia, and tropical Asia are the natural habitats of the Aerva lanata. The species, which favours dryer locations than Aerva javanica, may be found in open woods on mountain slopes, on disturbed and waste land, abandoned cultivations, and coastal scrub at elevations ranging from level to 900 m (3,000 ft) [1]. In bare stretches of earth and arable fields, it is a typical weed. Aerva lanata contains chemical constituents such as Carbohydrates, Tannins, Saponins, Alkaloids, Flavonoids and other compounds such as methyl grevillate, lupeol, lupeol acetate benzoic acid, β-sitosteryl acetate and tannic acid. The various parts of the plant such as leaves, stem, flowers are widely used as aerial parts. It has anti-oxidant strength. It also decreases blood sugar levels. It is useful in treating asthma. It treats diarrhoea. It helps in kidney stone treatment It helps to get rid of intestinal worms. [2][9][12]

METHODOLOGY

Plant material:

The whole plant *Aerva lanata* was collected in the month of January 2013 from the local area of Tirupati, Andhra Pradesh, India. The plant material was identified and authenticated by Dr.K. Madhava cheety, Asst. Professor, Department of Botany, SV University, and Tirupati. The voucher specimen (0919) of the plant was deposited at the college for further reference.

Physicochemical Standards:

Materials methods:

Such as total ash, acid insoluble ash, water soluble ash, extractive values were determined separately for air dried powdered leaves of this plant as per the official method.

1) Determination of total ash:

About 2 to 3 grams (accurately weighed) ground leaf powder was taken in a silica crucible previously ignited and weighed. It was incinerated by gradually increasing the heat not exceeding dull red heat (450 degrees centigrade) until free from carbon, cooled and weighed. The percentage of ash was calculated with reference to the air-dried powder. The procedure was repeated five times to get constant weight.

2) Determination of water-soluble ash:

The total ash was boiled with 25 ml of water for 5 minutes and was filtered through an ash less filter paper (Whatman No 41). It was followed by washing with hot water. The filter paper was ignited in the silica crucible, cooled and the water insoluble matter was weighed. The water-soluble ash was calculated by subtracting the water insoluble matter from the total ash.

3) Determination of acid insoluble ash:

The total ash obtained was boiled for 5 minutes with 10% w/v dilute hydrochloric acid and filtered through an ash less filter paper (Whatman No. 41). The filter paper was ignited in the silica crucible, cooled and acid insoluble ash was weighed.[34][35]

Extractive Values:

a) Determination of alcohol soluble extractive:

5 grams of the powder was macerated with 100 ml of alcohol of the specified strength in a closed flask for 24 hours, shaking frequently during 6 hours and allowing it to stand for 18 hrs. It was filtered rapidly taking precautions against loss of alcohol, and 25ml of the filtrate was evaporated to dryness in a tarred bottomed shallow dish at 105 degrees centigrade and weighed. The percentage of alcohol soluble extractive was calculated with reference to the air-dried powder [3][8].

b) Determination of water-soluble extractive:

About 5 grams of the powder was added to 50 ml of water at 80 degrees centigrade and to it 2 grams of kieselguhr was added and filtered. 5 ml of the filtrate was transferred to a tarred evaporating dish, the solvent was evaporated on a water bath, drying was continued for half an hour, finally it was dried in a hot air oven for two hours and weighed. The percentage of water-soluble extractive was calculated with reference to air dried drug.

c) Determination of loss on drying:

For the determination of loss on drying the following method was followed. About 1-2 gm of the powdered leaf was accurately weighed in a glass stoppered weighing bottle which is previously dried for 30 min in the drier. Then, the sample was gently shaken side wise for even distribution and dried in an oven at 100 degrees centigrade to 105 degrees centigrade by removing the stopper. It was cooled in a desiccator and again weighed. The loss on drying was calculated with the reference to the amount of air-dried powder.

Phytochemical Investigation of the Aerva lanata:

The phytochemical investigation of the plant involves the following

- Extraction of the plant material
- Fluorescence analysis
- Identification of the phytoconstituents
- The collected leaves of the plant were dried in the shade. Then the shade dried leaves were powdered to get a coarse powder. The coarse powder was subjected to a continuous percolation by using Soxhlet apparatus. Different solvents were used according to the polarity.

Materials Required:

Shade dried leaf powder of *Aerva lanata* was extracted by using different solvents.

- Ethyl acetate
- Methanol

Ethyl acetate extract of *Aerva lanata* :(EEAL)

About 650 grams of the dry powder extracted first with 2 litres of ethyl acetate at. Suitable temperature (depends on B.P) by continuous hot percolation method using Soxhlet apparatus. After completion extraction, the ethyl acetate extract was filtered and concentrated to dry mass by vacuum distillation. A green colour residue was obtained.[7]

Methanol extract of *Aerva lanata* :(MEAL)

About 650 grams of the dry powder extracted first with 2 litres of methanol. at suitable temperature (depends on B.P) by continuous hot percolation method using Soxhlet apparatus. After completion extraction, the methanolic extract was filtered and concentrated to dry mass by vacuum distillation. A dark green colour residue was obtained.[11]

Fluorescence analysis:

Fluorescence analysis of the drug was observed in day and UV light (365& 254 nm) by using powder and various extracts of the drug.

Analysis of drug powder:

The drug powder was treated separately with different solvents. The solvents used were 1N sodium hydroxide (aqueous), 1N sodium hydroxide (alcoholic), 1N hydrochloric acid, 50% nitric acid and methanol. Then they were subjected to fluorescence analysis in day and UV light.

Analysis of extracts:

The ethyl acetate, methanol, aqueous extracts were subjected to fluorescence analysis in visible and UV light.

IDENTICATION TESTS:

Test for alkaloids:

To the extract dilute hydrochloric acid will be added and filtered. The filtrate will be treated with various alkaloidal reagents.

a) Mayer's test:

The filtrate will be treated with Mayer's reagent: appearance of cream colour indicates the presence of alkaloids.

b) Dragendroff's test:

The filtrate will be treated with Dragendroff's reagent which leads to the appearance of reddish-brown precipitate indicates the presence of alkaloids.[13][14][19]

Test for carbohydrates and reducing sugar:

The small quantities of the filtrate will be dissolved in 4ml of distilled water and filtered.

a) Molisch's test:

A small portion of the filtrate will be treated with Molisch's reagent and sulphuric acid. Formation of a violet ring indicates the presence of carbohydrates.

b) Fehling's test:

The extract will be treated with Fehling's reagent A and B. The appearance of reddish-brown colour precipitate indicates the presence of reducing sugar

Test for steroids:

a) Liebermann Burchard's test:

The extract will be treated with 3ml of acetic anhydride, few drops of glacial acetic acid followed by a drop of concentrated sulphuric acid. Appearance of bluish green colour indicates the presence of steroids.

Test for proteins:

a) Biuret test:

The extract will be treated with copper sulphate solution, followed by addition of sodium hydroxide solution; appearance of violet colour indicates the presence of proteins.

b) Million's test:

The extract will be treated with Millon's reagent; appearance of pink colour indicates the presence of proteins.

Test for tannins:

The extract will be treated with 10% lead acetate solution; appearance of white precipitate indicates the presence of tannins.

Test for phenolic compounds:

The extract will be treated with neutral ferric chloride solution; appearance of violet colour indicates the presence of phenolic compounds.

The extract will be treated with 10% sodium chloride solution; appearance of cream colour indicates the presence of phenolic compounds.

Test for flavonoids:

5ml of extract will be hydrolyzed with 10%sulphuric acid and cooled. Then, it will be extracting with diethyl ether and divided in to three portions in three separate test tubes. 1ml of diluted sodium carbonate, 1ml of 0.1N sodium hydroxide, and 1ml of strong ammonia solution will be added to the first, second and third test tubes respectively. In each test tube. Development of yellow colour demonstrated the presence of flavonoids

Shinoda's test the extract will be dissolved in alcohol, to which few magnesium turnings will beaded followed by concentrated HCL drop wise and heated, and appearance of magenta colour shows the presence of flavonoids.

Test for gums and mucilage:

The extract was treated with 25 ml of absolute alcohol, and filtered. The filtrate will examine for it swelling properties.

Test for glycosides:

When a pinch the extract was treated with glacial acetic acid and few drops of ferric chloride solution, followed by the addition of conc. Sulphuric acid, formation of ring at the junction of two liquids indicates the presence of glycosides.

Test for saponins:

a) Foam test:

About 1 ml of the extract was diluted to 20 ml of with distilled water and shaken well in a test tube. The formation of foam in the upper part of test tube indicates the presence of saponins.

Test for Triterpenoids:

The substance was warmed with tin and thionyl chloride. Pink colour indicates the presence of triterpenoids.[28][29][33]

IN-VITRO PHARMACOLOGICAL ACTIVITY:

Drugs and Chemicals:

Cystone (Himalaya), Tri's buffer, Di-Sodium oxalate, Calcium chloride, Sodium chloride, Methanol (Merck Pvt. Ltd. Mumbai) and Ethyl acetate other chemicals were procured from suppliers.

Groups:

Group I –control

Group II-Test Samples

Ethyl Acetate Extract of¬ *Aerva Lanata*

Methanol Extract of¬ *Aerva Lanata*

Group III- Standard Drug (Cystone) [9]

Procedure for Anti- Urolithic Activity of Aerva lanata:

Calcium chloride was added to distilled water to create the calcium oxalate crystals in a lab setting. It was given time to react with the sodium oxalate and 2N sulphuric acid combination. In the presence of distilled water, the two solutions were given enough time to react. At the end of the process, precipitate calcium oxalate was produced. The resulting precipitate was collected, cleaned of contaminants with distilled water, and dried at 60°C. By combining 10 mg of the plant extract with 1 mg of calcium oxalate and packing it in an egg's semi- permeable membrane, the percentage of dissolution was calculated. The egg membrane was put into a sterile beaker containing 100 ml of 0.1M Tri's buffer [4]. Four separate classes made up the experiment. The first class was empty and contained just one milligram of calcium oxalate. The second class is the positive control, which consists of 10 mg of Cystone (standard drug) and 1 mg of calcium oxalate. The final class had 1 mg of calcium oxalate together with 10 mg of *Aerva lanata* extract, whereas the third class contained 1 mg of calcium oxalate. All classes' beakers underwent two-hour incubation at 37° C. Following the incubation time, the contents of the semipermeable membrane were taken out and put into a clean tube. It was diluted further with 2 ml of 1 N sulphuric acid before being titrated against KMnO4.

Titration was carried out until the hue became pink. Finally, the starting concentration measured at the start of the operation was subtracted from the undissolved calcium oxalate. The difference gives an idea about the amount of dissolution of calcium oxalate crystals by the ethyl acetate and Methanol extracts of *Aerva lanata.* [10][11]

RESULTS:

Table 9.1 Fluorescence analysis for different extracts of *Aerva lanata*

TYPES OF SAMPLES	UV LIGHT 365nm	SHORT UV LIGHT 254nm	VISIBLE LIGHT
Powder sample	Dark green	Dark green	Light green
Alcoholic sample	Purple with black	Purple with black	Greenish black
Ethyl acetate sample	Purple	Purple	Greenish black

Table 9.2 Aerva lanata powder on treatment with different chemical Reagents

S.NO	POWDER+REAGENT	OBSERVATION
1	Powder+conc HNO3	Reddish Brown
2	Powder+conc.H2SO4	Black Colour
3	Powder+1N HCL	Light Brown
4	Powder+dil HNO3	Brown colour
5	Powder + 5% Ferric chloride	Greenish Brown
6	Powder+10% NaoH	Light Green
7	Powder +Iodine Solution	Brown colour
8	Powder+ conc. Hcl	Light Green
9	Powder+dil.H2So4	Pale brown

Table 9.3 Physicochemical properties of *Aerva lanata*

S.NO	PARAMETERS	Values (%)
1	TOTAL ASH (%)	8.32%
2	WATER SOLUBLE ASH (%)	6.10%
3	ACID INSOLUBLE ASH	3.12%
4	WATER SOLUBLE EXTRACT (%w/w)	0.80%
5	ALCOHOL SOLUBLE EXTRACT (%w/w)	1.140%
6	LOSS ON DRYING	3.91%

Table 9.4 Preliminary phytochemical screening for different extracts of *Aerva lanata*

S.NO	TYPE OF CONTITIUENTS	METHANOLIC EXTRACTS	ETHYL ACETATE EXTRACT
1	Carbohydrates	+	-
2	Proteins	+	-
3	Amino acids	-	+
4	Fats & oils	+	-
5	Saponins	+	+
6	Glycosides	-	+
7	Flavonoids	+	-
8	Alkaloids	+	+
9	Tannins	+	-
10	Phenolic compounds	-	+

Table 9.5 Percentage of dissolution of Calcium oxalate crystals by *Aerva lanata* extracts for Anti urolithic activity

S.NO	Category	Percentage of dissolution of calcium oxalate crystals
1	BLANK (Control)	-
2	EEAL	87
3	MEAL	78
4	CYSTONE (Standard drug)	98

Ethyl acetate extracts of *Aerva lanata* (**EEAL**) Methanolic extract of *Aerva lanata* (**MEAL**)

Fig.9.1 Water and Methanolic Extract of *Aerva Lanata*

Fig. 9.2 Egg for Decalcification With 10% Acetic Acid

Fig. 9.3 Decalcified Eggs

Fig. 9.4 Titration with Potassium Permanganate Fordissolution Of Calciumoxalate Crystal

DISCUSSION:

The plant selected for the present study is *Aerva lanata* belongs to the family *Amaranthaceae.* Fluorescence analysis was performed with powder & plant extract by using visible light, long & short U.V light. The powder of *Aerva lanata* on treatment with various chemical reagents which gives a different colour. The results on various tests for physicochemical parameters such as ash values, extractive values, and loss on drying will help in the correct identification of this plant for future work. Preliminary phytochemical screening for different extracts (methanol and Ethyl acetate) of *Aerva lanata* was performed. The results indicate that it contains alkaloids, flavonoids, glycosides, saponins, amino acids, phenolic compounds, proteins and carbohydrates.

In-vitro Pharmacological Studies:

The data on Invitro urolithiasis has been performed on the selected plant *Aerva lanata* by using the standard drug (Cystone). The work was performed by using Invitro antiurolithiatic model for calculating percentage dissolution of kidney stone.

This study evaluates the antiurolithiatic activity of ethyl acetate& methanolic extracts of *Aerva lanata.* The highest percentage i.e. 95% of calcium oxalate (CaOx) dissolution was observed for standard drug (Cystone) which had percentage dissolution. From this study, it was observed that ethyl acetate extract of *Aerva lanata* showed its highest dissolution of calcium oxalate than methanolic extract. This study has given primary evidence for *Aerva lanata* as the plant which possess lithotriptic property. This Invitro study has given lead data and shown that ethyl acetate extract of *Aerva lanata* is quite promising for further studies in this regard.

Ethylacetate extract of *Aerva lanata* shows better dissolution of calcium oxalate than methanolic extract when compared to standard drug (Cystone).

CONCLUSION

Alkaloids and flavonoids which were isolated from this plant may be responsible for its pharmacological activities. Finally, we conclude that Ethyl acetate extract of Aerva lanata shows better dissolution of calcium oxalate than methanolic extract when compared to standard drug (Cystone). The road ahead is to establish specific bioactive molecules, which might be responsible for these actions. Therefore the cultivation, collection, and further pharmacological exploration of Aerva lanata are essential. The present study was carried out to evaluate Physicochemical, phytochemical and pharmacological activities of different extracts of Aerva lanata. These properties of Aerva lanata justify its use as a better choice of natural drug in the treatment of Kidney stones. However, a detailed phytochemical and pharmacological evaluation should be necessary to deduce a definite conclusion.

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11

ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY OF CANAVALIA GLADIATA

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ABSTRACT

The present study deals with the antioxidant and antimicrobial activities of Canavalia gladiata. Antioxidant activity by nitric oxide and DPPH methods reveals that methanol extract of Canavalia gladiata shows good results when compared to the aqueous extract. It indicates that methanol extract of Canavalia gladiata shows maximum percentage of inhibition when compared to the standard drug (Ascorbic acid). Antioxidants help to neutralize free radicals, which are unstable molecules that are linked to the development of several degenerative diseases such as cancer, cardiovascular disease, cognitive impairment immune dysfunction, cataract and macular degeneration. Antibacterial activity by the Agar well diffusion method reveals that methanol extract of Canavalia gladiata shows better results when compared to the aqueous extract. It indicates that methanol extract of Canavalia gladiata shows maximum zone of inhibition when compared to the standard drug (chloramphenicol).

INTRODUCTION

Canavalia gladiata is a popular plant commonly called as sword bean and belongs to the family Fabaceae and is used for various ailments [1-2]. It is commonly cultivated in almost all Asian countries and European countries such as in India, Myanmar or adjacent China [3-5]. Sword Bean is a twining, nearly erect annual herb, some cultivars may also be semi-erect, and the root system is deep, growing up to 6 ft. Stems are sparsely pubescent or glabrous and Leaf blades are elliptic or ovate-elliptic, base cuneate, apex acute or acuminate; stipules deciduous. Leaves [6-8] are shiny, trifoliate. Flowers are pink and white in color Flowers are bisexual, papilionaceous, all joined; ovary superior, style slender, curved, stigma is small. Pods are 30 cm long and 5cm wide. Seeds are elliptical. Seeds are red or red- brown, rarely black, pink or white. Fruits [9-11] are linear-oblong pods, slightly compressed, and sometimes curved. The main chemical constituents are carbohydrates, alkaloids Phenolic compounds, flavonoids and amino acids such as cysteine, tyrosine, and tryptophan. Seeds contain three crystalline globulins canavalin, concanavalin A and B etc. Six compounds were isolated and their structures were identified Gallic acid, Methyl gallate, 1,6-di-o- galloyl-β-D- glucopyranoside, B-sitosterol, Lupeol and δ- tocopherol[1-15] .All parts of the plant have been used as crude drug for the treatment of vomiting, abdominal dropsy, kidney-related lumbago, asthma, obesity, stomach-ache, dysentery, coughs, headache, intercostal neuralgia, epilepsy, schizophrenia, inflammatory diseases and swellings[12-16].

MATERIALS AND METHODS

The leaves of *Canavalia gladiata* were collected from the local area of Nellore, SPSR Nellore district (India). The plant material (PARC/2020/4331 - Voucher Specimen) was identified and authenticated by the botanist Prof.P. Jayaraman M.Sc., Ph.D. (PARC), Director Institute of Herbal Botany, Tambaram Chennai.

A. Methanol extract of *Canavalia gladiata:*

About 650 grams of the dry powder were extracted with 2 litres of 95% ethanol by continuous hot percolation using Soxhlet apparatus. After completion of extraction it was filtered and concentrated to dry mass by vaccum distillation. A pale green color residue was obtained. The extract was then stored in a dessicator.

B. Aqueous extract of *Canavalia gladiata:*

About 650 grams of the dry powder were extracted with 2 litres of distilled water by continuous hot percolation method using Soxhlet apparatus. After completion extraction, the aqueous extract was filtered and concentrated to dry mass by vaccum distillation. A green color residue was obtained.

ANTIOXIDANT ACTIVITY

Nitric oxide method [17-28]

The reaction mixture (3ml) containing sodium nitroprusside (10mM, 2ml), phosphate buffer saline (0.5ml) and extract or standard solution (0.5ml) will be incubated at 25 degrees Centigrade for 150 min. After incubation, 0.5 ml of the reaction mixture containing nitrate will be pipetted and mixed with 1 ml of sulphanilic acid reagent (0.33%i in 20% glacial acetic acid) and will be allowed to stand for 5 min for completing diazotization. Then 1 ml of naphthyl ethylenediamine dihydrochloride (1%) will be added, mixed and will be allowed to stand for 30 min. The absorbance of these solutions will be measured at 540 nm against the blank solution the percentage inhibition will be calculated by comparing the absorbance values of control and test by using the formula.

$$\%\text{scavenging} = \frac{A\ (control - A\ test)}{A\ control} \frac{A\ (control - A\ test)}{A\ control} \times 100$$

A control is the absorbance of the control reaction mixture. A test is the absorbance of samples of the extracts at different concentrations.

DPPH free radical scavenging activity [17-28]

The free radical scavenging activity will be measured in vitro by 1, 1-diphenyl-2-picryl- hydrazyl assay. About 0.3 mM solution of DPPH in 100% ethanol will be prepared and 1ml of this solution will be added to 3 ml of the extract dissolved in ethanol at different concentrations (5-80 mcg/ml). The mixture must be shaken and allowed to stand at room temperature for 30 min. Absorbance will be measured at 517 nm using a spectrophotometer.

Fig. 11.1 ***Canavalia gladiata***

The capability to scavenge the DPPH radicals will be calculated using the formula:

$$\%\text{scavenging} = \frac{A\ (control - A\ test)}{A\ control} \frac{A\ (control - A\ test)}{A\ control} \times 100$$

A control is the absorbance of the control reaction mixture. A test is the absorbance of samples of the extracts at different concentrations.

DETERMINATION OF ANTIMICROBIAL ACTIVITY

Fresh aqueous and methanolic extracts of *Canavalia gladiata* were used for the determination of antimicrobial activity.

Microorganism used: Salmonella typhi

METHOD

Agar well diffusion method [18-28]

From the above-mentioned organisms, inoculums were prepared by inoculating the organisms in 10 ml of nutrient broth and incubated at 37 degrees centigrade for 18 hrs. Nutrient agar medium was poured into each sterilized petri dish and the organism was inoculated. Wells were made in to the medium by using sterile cork borer and each sample of the extracts (100ul) was filled in to the wells of agar plates directly by using a microliter syringe .Then the plates were incubated at 37 degrees centigrade for 24 hr. After incubation, the zone of inhibition was observed and measured in mm.

RESULTS

Table 11.1 DPPH method

S. No	Type of extract	Concentration (ug/ml)	Absorbance	% Inhibition	IC50 (ug/ml)
1	Methanol extract	100	1.0953	34.37	
		200	0.8776	47.42	
		300	0.7788	53.34	291
		400	0.5628	66.28	
		500	0.5151	69.14	
2	Aqueous extract	100	1.3932	16.52	
		200	1.2596	24.53	
		300	1.1291	32.35	487
		400	0.9630	42.30	
		500	0.7634	54.26	
3	Ascorbic acid	100	0.9640	42.24	
		200	0.7624	54.32	
		300	0.6079	63.58	263
		400	0.3609	78.38	
		500	0.2978	82.16	

Table 11.2 Nitric oxide method

S.No	Type of extract	Concentration (ug/ml)	Absorbance	% Inhibition	IC50 (ug/ml)
1	Methanol extract	100	0.7473	32.87	
		200	0.6150	44.76	
		300	0.5420	51.32	290
		400	0.3948	64.54	
		500	0.3635	67.35	
2	Aqueous extract	100	0.8859	20.42	
		200	0.8179	26.53	
		300	0.7152	35.76	510
		400	0.6208	44.24	
		500	0.4881	56.16	
3	Ascorbic acid	100	0.6202	44.29	
		200	0.5171	53.55	
		300	0.4300	61.38	211
		400	0.2645	76.24	
		500	0.2191	80.32	

Table 11.3 Antimicrobial activity of Canavalia gladiata by Agar well diffusion method against S.typhi

S. No	Name of the Extract	Concentration (µg/ml)	Zone of inhibition (mm)
1	Methanol extract	100	16
2	Aqueous extract	100	0
3	Std (Chloramphenicol)	100	26

DISCUSSION

Antioxidant activity by nitric oxide method and DPPH method states that methanol extract of *Canavalia gladiata* shows good antioxidant activity when compared to aqueous extract. In both cases as concentration increases, % of scavenging activity also increases for methanol extracts of *Canavalia gladiata* when compared to aqueous extracts. Antimicrobial activity by agar well diffusion method by using microorganism *salmonella typhi* states that methanol extract of *Canavalia gladiata* shows the better antagonist effect against the microorganism when compared to the standard drug chloramphenicol.

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PRELIMINARY PHYTOCHEMICAL ANALYSIS OF ANTIFERTILITY PLANTS

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ABSTRACT

The objective of this study was to investigate the presence of various phytochemicals obtained from ethanol (E), ethyl acetate (ET), methanol (M), and chloroform (C) extracts of the *Datura Stramonium* and *Musa paradisiaca*.

Methods:

The freshly collected plant materials were subjected to successive extraction separately using E, ET, M and C with Soxhlet apparatus. Using the standard protocols, the leaf extracts obtained were subjected to preliminary phytochemical analysis to detect the presence of carbohydrates, proteins, steroids, flavonoids, tannins, and alkaloids.

Results:

The phytochemical analysis showed the presence of tannins, flavonoids, alkaloids, terpenoids, glycosides, saponins, resins, carbohydrates and proteins. The *Datura Stramonium* and *Musa paradisiaca* plants showed the presence of flavonoids, terpenoids, glycosides, carbohydrates and proteins. Flavonoids, alkaloids, terpenoids, glycosides, resins, carbohydrates and proteins are found in the leaves of *Datura Stramonium*. Flavonoids, glycosides and resins were found in the leaves of *Musa Paradisiaca*. Ethanol and methanol leaf extracts from *Datura Stramonium* and *Musa Paradisiaca* indicated that they contained most of the phytochemical compounds.

Conclusion:

The different extracts of plants have clearly indicated the presence of all the major phytochemicals; hence, these plants can be used for the extraction of bioactive compounds.

INTRODUCTION

The plant realm is considered an asset for various kinds of potential drugs. In ancient days, many of the diseases were cured using plant products, and now again, there is an increasing awareness among people about the importance of plants and their medicinal values1. An indigenous part of ancestral medicine is herbal medicine. In 2008, according to the World Health Organization, more than 80% of the world's population went back to traditional medicines2. The crude forms of plants that are usually used as food supplements are known as herbal therapy in today's world3. In ethnomedicine, many of the plants used contain useful chemotherapeutants, which, in turn, are used in orthodox medical practice4. The whole plants in crude forms (containing both the active and non-active components) show higher efficacy than the plant products in semi-crude or pure form5. The phytochemical constituents in medicinal plants heal and cure human diseases, and these constituents6 are non-phytotoxic and hence readily biodegradable. Both primary and secondary compounds form phytochemicals, wherein the primary constituents include chlorophyll, proteins and common sugars and the secondary compounds are terpenoid, flavonoids, alkaloids, phenolic compounds, glycosides, gums, tannins and essential oils among others7. The most of the active components are found concentrated in the storage organs of the plants8.

These active secondary compounds determine the medicinal properties of plants. Therefore, there is a need for treasuring these medicinal plants not only to determine the scientific basis for their usage but also to discover fresh or lead compounds for treating various diseases in humans9. Added advantage is that these readily available plant medicines are less expensive, safe to use, and biodegradable and rarely have side effects10. In this work, five plants were considered for the qualitative phytochemical analysis, namely, Datura Stramonium and Musa Paradisiaca.

METHODS

Collection of the plant materials

The whole plants of *Datura Stramonium* and *Musa Paradisiaca* was collected from local areas.

Preparation of the extract

The freshly collected plant materials were thoroughly was held thrice in distilled water; shade dried, cut into fine pieces and powdered using a mechanical blender. The shade dried plant materials were pulverized and subjected to successive extraction separately using ethanol (E), ethyl acetate (ET), methanol (M), and chloroform(C) with Soxhlet apparatus.

Phytochemical analysis of leaf extract

The leaf extracts obtained from E, ET, M, and C were subjected to preliminary qualitative tests to detect the presence of carbohydrates, proteins, steroids, flavonoids, tannins and alkaloids.

TEST FOR CARBOHYDRATES

Molisch's test

Few drops of Molisch's reagent and concentrated Sulfuric acid (H_2SO_4) were added to 2ml of methanol extract. Reddish violet ring was observed at the junction of two layers indicating the presence of carbohydrates11.

Reduction of Fehling's solution

About 10 ml of Fehling's solution (copper sulphate in alkaline condition) were added to the concentrated extracts and heated on a steam bath. Brick- red precipitates indicated the presence of carbohydrates11.

TEST FOR PROTEINS

Biuret test

To 3ml of the extract, 4% NaOH and few drops of 1% $CuSO_4$ solution were added. Violet or pink indicates the presence of proteins 12.

Ninhydrin test

To1ml of the extract 1% reagent was added and heated on a steam bath. Violet indicates the presence of proteins12.

TEST FOR GLYCOSIDES

Keller -Kiliani test

About 1 ml of glacial acetic acid containing traces of FeCl3 and 1 ml of concentrated H2SO4 were added carefully to the extracts. A reddish- brown is formed at the junction of the two layers and the upper layer turns bluish-green indicating the presence of glycosides12**.**

TEST FOR TANNINS

To1ml of the extract, 2ml of 5% Ferric chloride was added. A dark blue or green-black indicates the presence of tannins13.

TEST FOR ALKALOIDS

To 2ml of the extract, 2ml concentrated HCl and few drops of Mayer's reagent were added. A green or white indicates the presence of alkaloids 13.

TEST FOR FLAVONOIDS

To 2 ml of the extract, 1 ml of 2N NaOH was added. The appearance of yellow indicates the presence of flavonoids12.

TEST FOR TERPENOIDS

About 2ml of each extract is mixed with 5ml of chloroform and few drops of concentrated H2SO4 is carefully added to form a layer. A reddish-brown coloration formed in the interface shows the presence of terpenoids14, 15.

TEST FOR SAPONINS

Foam test

The crude extract is mixed with 5ml of distilled water and shaken vigorously, resulting in the formation of a stable foam which is a positive indication for saponins14, 15

Froth test

About 2g of the powdered sample is boiled with 10 ml of distilled water and then filtered which is mixed with 5 ml of distilled water and few drops of olive oil, shaken vigorously, and then observed for the formation of emulsion14,15.

ACETONE-WATER TEST

Extracts are to be treated with acetone followed by the addition of 500µl water added and mixed well. Turbid appearance of the extract indicates the presence of resins14, 15.

RESULTS AND DISCUSSION

The phytochemical constituents of the plants tested are summarized in Table1. In the present study, it was observed that the ethanol extract of the whole plant of A. lanata has flavonoids, carbohydrates and proteins but lacks tannins, alkaloids, glycosides, terpenoids, saponins and resins. Similarly, other studies Ragavendran et al. and Koperuncholan et al. 16,17 reported the presence of tannins, flavonoids, saponins, terpenoids, alkaloids, carbohydrates, proteins and the absence of resins and glycosides. In the current study, ethyl acetate extract of whole plant of A. lanata contained tannins, flavonoids, saponins, terpenoids, carbohydrates, and alkaloids but resins, proteins and glycosides were absent.

Similarly, the results of Ragavendran et al. 16 also showed that the ethyl acetate extract of the whole plant extract had tannins, flavonoids, saponins, terpenoid, carbohydrates and alkaloids but resins, proteins and glycosides were absent. In the current study, the methanol extract of the whole plant of A. lanata possessed tannins and alkaloids, terpenoids, carbohydrates, saponins and resins whereas proteins were absent in concurrence with the Yamuna devi et al. 18 that also have shown the absence of tannins, carbohydrates, saponins, proteins and resins.

Although the study Yamuna Devi et al. 18 has reported the presence of flavonoids and glycosides as in the current study, they have also shown the presence of terpenoids and alkaloids. The chloroform extract of the Datura Stramonium and Musa Paradisiaca possessed only carbohydrates and proteins in contrast to another study Battu and Kumar 19 that showed the presence of tannins, alkaloids and flavonoids apart from carbohydrates and has shown the absence of alkaloids, proteins, saponins and resins but tannins, flavonoids, glycosides, saponins, resins, terpenoids, and alkaloids were absent in the present study.

In this study, it was observed that the ethanol extract of the leaves of Datura Stramonium contained only carbohydrates and proteins but other compounds - such as tannins, alkaloids, flavonoids, glycosides, saponins, terpenoids and resins - were absent. In contrast, one study Emimal 20 has reported that the ethanol extract of leaves showed the presence of alkaloids, flavonoids, glycosides, carbohydrates and saponins and absence of tannins, proteins, resins and terpenoids. The ethyl acetate extract of the leaves of Datura Stramonium contained terpenoids and glycosides but other components-such as alkaloids, tannins, saponins,

carbohydrates, flavonoids, proteins and resins - were absent. In contrast, another study Bharathi et al. 21 has reported the presence of alkaloids, tannins, saponins, flavonoids, proteins, and carbohydrates. In the current investigation, the methanol extract of the leaves of Datura Stramonium possessed alkaloids, whereas tannins, flavonoids, terpenoids, carbohydrates, glycosides, saponins, proteins and resins were absent. A study by Subhashini et al. 22 has shown that the methanol extract of leaves showed the presence of alkaloids, carbohydrates, flavonoids, glycosides, proteins and terpenoids and the absence of tannins and saponins. In the current study, the chloroform extract of the leaves of Datura Stramonium and showed only flavonoids, tannins, carbohydrates, resins, terpenoids, glycosides and proteins and alkaloids were absent, but Emimal 20 has reported the presence of alkaloids and flavonoids and absence of resins, carbohydrates, glycosides, tannins, proteins, and saponins.

In the current investigation, the ethanol extract of the leaves of Musa paradisiaca contained flavonoids and absence of tannins, alkaloids, terpenoids, glycosides, saponins, resins, carbohydrates and proteins were noted. Poongothai and Subashini23 have reported the absence of alkaloids and terpenoids. The ethyl acetate extract of the leaves of Musa paradisiaca contained glycosides and resins, whereas tannins, flavonoids, alkaloids, terpenoids, saponins, carbohydrates and proteins were absent. The methanol extract of the leaves of Musa paradisiaca possessed flavonoids and resins but tannins, alkaloids, terpenoids, glycosides, saponins, carbohydrates and proteins were absent. In this study, no phytochemical constituents were extracted in chloroform in contrast to the study of Poongothai and Subashini23 who have reported the presence of flavonoids, tannins, alkaloids, terpenoids, carbohydrates and proteins

Table 12.1 Phytochemical constituents of *D. Sramonium M. Paradisiaca*

Phytochemical tests

Solvents	E	ET	M	C	E	ET	M	C
Tannins	-	-	-	-	-	-	-	-
Flavonoids								
Alkaline reagent test	+	-	+	-	-	-	-	+
Lead acetate test Alkaloids	+	-	+	-	-	-	-	+
Mayer' test Terpenoids Salkowski								
test Glycoside Liebermann's test	-	-	-	-	-	-	+	-
	-	+	-	-	-	+	-	-
	-	+	+	-	-	+	-	-
Salkowski test	-	+	+	-	-	+	-	-
Keller-Kiliani test Saponins	-	+	+	-	-	+	-	-
Foam test								
	-	-	-	-	-	-	-	-
Froth test Resin	-	-	-	-	-	-	-	
Acetone-water test								
Carbohydrates Molisch test	-	-	-	-	-	-	+	+
	+	-	-	+	+	-	-	+
Fehling's test Proteins	+	-	-	+	+	-	-	+
Ninhydrin test								
	+	-	-	+	+	-	-	+
Biuret test	+	-	-	+	+	-	-	+

E: Ethanol, ET: Ethyl acetate, M: Methanol, C: Chloroform

CONCLUSION

The phytochemical analysis of the crude extracts of Datura Stramonium and Musa paradisiaca indicates the presence of major phytochemical compounds such as tannins, flavonoids, alkaloids, terpenoids, glycosides, saponins, resins, carbohydrates and proteins which are secondary metabolites. These compounds are associated with anti-fertility, antioxidant, antimicrobial activities, antidiuretic, anti-inflammatory, anti-analgesic, anti-cancer, antiviral, anti-malarial and anti-fungal activities. Thus, the traditional system of medicine provides biologically active molecules that are promising sources of potential secondary metabolites which can be used as medicinal compounds. Further studies aim at identifying the anti- microbial and anti-oxidant compounds which may be exploited in herbal formulations.

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REVIEW ON CLITORIA TERNATA

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ABSTRACT

Clitoria ternatea, a perennial, twining herb that is native to tropical Asia, has a long history of usage as a memory booster and anxiolytic. Various portions of the plant have various components. The plant is said to include tannins, resins, starch, taraxerol, taraxerone, alkaloids, flavonoids, saponins, proteins, anthocyanins, and carbohydrates as well as other active chemical components. The plant is used to treat variety of conditions in traditional medicine, including jaundice, migraine, throat infections, eye infections, skin illnesses, asthma, swollen joints, earaches, eruptions, fever, urinary tract infections, constipation, snakebites, headaches, indigestion, leprosy, and problems of the central nervous system. Clitotia ternatea is a plant that has historically been used for gonorrhoea, stress, infertility, and food colouring. Ayurveda has made extensive use of the plant. Pharmacologically, it has anti-inflammatory, analgesic, antimicrobial, and anxiolytic properties.

Keywords: Clitoria ternatea, Pharmacognostic studies, pharmacological activities, Phyto-Constituents, Traditional Uses.

INTRODUCTION

Clitoria ternatea, often known as butterfly pea, is a perennial twining herb with terete, more or less pubescent stems that is a member of the Leguminoceae family (formerly Papillioneceae). Imperipinnate leaves with petioles 2 to 2.5 cm long and 4 mm long, linear, sharp stipules. Subcoriaceous, elliptic-oblong, 2.5–5 by 2-3.2 cm, obtuse or caute; leaflets: 5- 7; stipules: filiform. Flowers are axillary, solitary, typically bright or blue, occasionally white, with an orange core; seeds are 6–10, smooth, and golden brown. There are two typesa white variation and a blue flower varietythat are frequently cultivated as decorative plants in Bangladesh. A frequent plant in gardens is the butterfly pea, also known as blue pea (Clitoriaternatea), which has 1 to 2 inches long, vibrant blue flowers with wavy rims and a white centre.

Since long time immemorial nature has been a mere source of medicinal plants. These medicinal plants are gift of God, to cure infinite number of diseases in human beings and other living organism. They have been the major source of drugs in all system of medicine and eBooks A Review on Clitoria ternatea (Linn.): Chemistry and Pharmacology Niraj Kumar Singh, Jeetendra Kumar Gupta, Kamal Shah, Pradeep Mishra, Atul Tripathi, Nagendra Singh Chauhan and Neeraj Upmanyu, Institute of Pharmaceutical Research, GLA University, Mathura, Uttar Pradesh-281406, India. Institute of Pharmacy, Pt. Ravi Shankar Shukla University, Raipur, Chhattisgarh, India. Drugs Testing Laboratory Avam. Such exhaustible source of active ingredients invaluable in the management of many intractable diseases which is harbored by plant kingdom. In the various systems of medicine, many plantsandherbs are used to treat various infirmities. In all ancient scriptures of Ayurveda, Aparajita is mentioned as one of the important herb. It is a good looking twing herb. Aparajita‟s botanical name is Clitoria ternatea and belongs to Fabaceae (Pipilionaceae) family It is probably originated in tropical Asia . It is widely distributed throughout the humid, lowland tropics of Africa, Asia and Central America. It is found in low and medium altitudes of the settled areas. C. ternatea is a strongly persistent, sparsely pubescent, legume. It is perennial climber with slender downy stem, found throughout the tropical regions of the and thickets. It is seen that Aparajita is being adapted to clay soils and has been tested as a forage and cover crop, but never developed as a pasture cultivar .In various Ayurvedic preparations different parts of this plant have been used as an active ingredient which is used for treatment of several disorders. There are several reported Ayurvedic „medha‟ drugs which contain C. ternatea along with other plants. This plant has been scientifically studied for various pharmacological activities like antihistaminic, anti-depressant and hypoglycemic.

WHOLE PLANT OF CLITORIA TERNATEA

Taxanomic Heirarchy

Kingdom: Plantae
Phylum: Angiosperms Order:
Fabales Family: Fabaceae,

Genus: Clitoria

Species: C.ternatea

Vernacular Names

The shape of flowers of the Clitoria plant is a reflection of its genus name. The flowers of this plant resemble in shape with human female clitoris, hence the Latin name of the genus "Clitoria" belongs to "clitoris" and "Ternatea", the name of the species, which comes from Ternate, an Eastern Indonesian island. Similarly in different languages various vernacular names of the flowers are based on reference to a woman‟s genital organ.

Sanskrit: Ashphota, Aparajita Saukarnika, Ardrakarni, Girikarnika, Supuspi, Mohanasini Vishadoshaghni, Shwetanama, Vishnu-Kranta, Ashwakhura.

Hindi, Bengali, and Oriya: Aparajita or Aparajit.

Gujarath: Bismar, Garani, Koyala

Kannada: Billisaiuga, Satugadagida.

Telugu: Dintana, Gilarnika, Neela-ghentana, Sankhupuvvu.

Tamil: Kakkanam, Kakatan, Kavachi, Kuruvilai.

Punjab: Dhanattar. Rajasthan: Koyalri, Titlimatar

English: Butterfly pea, Blue pea vine, Mussel-shell climber, Pigeon wings.

Cultivation

Clitoria ternatea is a deep-rooted, tall slender, climbing legume with five leaflets and a deep blue flower. It is well adapted to a variety of soil types (pH 5.5- 8.9) including calcareous soils. It is surviving in both the extended rainfall regions and prolonged periods of drought. Propagation is done through seed. It exhibits excellent regrowth after cutting or grazing within short period and produce high yields also known as Clitoria ternatea L. is well adapted to heavy cracking clay soils in northern Australia. It is also used as a cover crop and green manure. The seeds are normally sown from the beginning until the middle of the wet season. It persists best when grazed lightly during the wet season.

Botanical Description

Habit: Twining climber

Root: Branched tap root system having nodules.

Stem: Aerial, weak stem and a twiner

Leaf: Imparipinnately compound, alternate, stipulate showing reticulate venation. Leaflets are stipellate. Petiolate and stipels are pulvinated.

Inflorescence: Solitary and axillary.

Flower: Bracteate, bracteolate, bracteoles usually large, pedicellate, heterochlamydeous, complete, bisexual, pentamerous, zygomor-phic and hypogynous.

Calyx: Sepals 5, synsepalous, green showing valvate aestivation. Odd sepal is anterior in position.

Corolla: Petals 5, white or blue apopetalous, irregular papilionaceous corolla showing descendingly imbricate aestivation.

Androecium: Stamens 10, diadelphous (9)+1 nine stamens fused to form a bundle and the tenth stamen is free. Anthers are dithecous, basifixed, introse and dechiscing by longitudinal slits.

Geographical Description

Clitoria genus is inconsequential, indigenous climber and a common garden flower found throughout the tropical and subtropical regions of the world. Now the genus becomes rare in humid and sub-humid lands of Asia, America, and Africa and also in semi-arid tropical Australia. It grows from sea level to 1800 and also grown as an ornamental in the warmer parts of the world and outspread from about 20°North latitude to the Salta district in Argentina at about 24°South latitude. In Africa it grows in grasslands, often on seasonally- waterlogged black clays and in old cultivations whereas in Sudan it is grown for fodder or grazing and in Kenya it is grown in a mixture with Chloris gayana. In America, the species of this plant is spread from Florida to Texas and from New Jersey to Kentucky & Arkansas. It is commonly found in Jamaica, Puerto Rico, Turks, and Caicos Islands etc. It is found in all over India, especially in southern India up to an altitude of 1,500 m and in the Andaman Islands.

Phytochemical Constituentsin Clitoria Ternata

Leaf:-

Phytochemical constituents: -

Alkaloids, reducing sugars, flavonoids, steroids, glycosides.

Uses:-

- Prevention of neurodegenerative diseases and diabetes mellitus.
- Effectively controls the excessive sweating.

Flower: -

Phytochemical constituents: -

Saponin, Tanin, Alkaloids, Glycosides, Phytosterols, Carbohydrates.

Uses:-

- Anti inflammatory, analgesic.
- Ethanol extract is used as antidiabetic.

Root: -

Phytochemical constituents: - 1, 1-diphenyl-2-picrylhydrazyl (DPPH) .

Uses:-

- Antioxidant
- The root bark is diuretic and laxative; a decoction is given as a demulcent in the irritation of the bladder and urethra.

Seed: -

Phytochemical constituents: -

The seeds contain nucleoprotein with its amino-acid sequence similar to insulin, delphinidin- 3,3,5-triglucoside, essential amino-acids, pentosan, water soluble mucilage, adenosine, an anthoxanthin glucoside, greenish yellow fixed oil a phenol glycoside, 3,5,7,4-tetrahydroxyflavone-3-rhamoglycoside, an alkaloid , ethyl Dgalactopyranoside, p-hydroxy cinnamic acid polypeptide, a highly basic protein-finotin, a bitter acid resin, tannic acid, 6% ash and a toxic alkaloid.

Uses:-

- Seeds are cathartic and the root diuretic.
- Seeds are purgative and aperients.
- Seeds are used in swollen joints, dropsy and enlargement of abdominal viscera.

Chemical Constituents

- The hydrophilic phase of butterfly pea flower extract contains flavonol glycosides, anthocyanins, flavones, flavonols, phenolic acids, and cyclotides. Meanwhile, the terpenoids, alkaloids, and fatty acids were found in the lipophilic phase of butterfly pea flower extract.
- Ethanol extract of Clitoria ternatea shows presence of terpenoid, flavonoid, tannin and steroid which may act as antioxidant principal.The major phytoconstituents found in Clitoria ternatea are the pentacyclic triterpenoids such as taraxerol and taraxerone. Phytochemical screening of the roots shows the presence of ternatins, alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, resins, starch, taraxerol and taraxerone.
- It also contains anti-fungal proteins and has been shown to be homologous to plant defensins.Aabgeena et al. reported a lectin present in the seeds of Clitoria ternatea agglutinated trypsin-treated human B erythrocytes. Since the purified lectin was found to be potential tool for cancer studies so an attempt was made for the alternate high yielding purification method for Clitoria ternatea lectin designated CTL, present in the seeds of this member of leguminosae family.

Microscopic Characters

Root Shows 10-20 or more layers of rectangular, thin-walled, tangentially elongated exfoliating cork cells; secondary cortex consists of 10-12 rows of large, polygonal, thin walled cells filled with starch grains, a few cells contain prismatic crystals of calcium oxalate in this region; single or groups of 2-10 lignified cortical fibers, distributed in the lower half of the cortex; secondary phloem consists of usual elements; phloem fibers 2-8 in groups, a few solitary fibers also present, very long, thin-walled with narrow lumen and pointed tips; secondary xylem consists of usual elements; vessels pitted with oblong, bordered pits and have short conical tail at one end, mostly occur 2 or 3 in groups; xylem fibers similar to those of phloem fibers, a few showing slit-like pits; medullary 10 rays 1-5 cells wide, oblong and pitted; xylem parenchyma irregular in shape and pitted walls; starch grains simple as well as compound having 2-6 components, single grains measuring 3-13 µ in dia., found in secondary cortex, phloem and xylem parenchyma. Powder - Yellowishbrown; shows simple and compound starch grains, measuring 3-13µ in dia., vessels with oblong bordered pits and fragments of fibers.

Pharmacognostical Description

Different growing conditions can affect its morphology. It is extensively grown in gardens for its flowers as an ornamental plant and it belongs to the sub family papilionaceae and family Fabaceae (Leguminoseae) botanically, butterfly pea (C. ternatea).It has various synonyms like C. purpurea and C. ternatea, some have potential for foraging use and some are partially domesticated. The plant is a long-lived perennial herb 90 to 162 cm tall with an erect habit. It has two types one has white-flower and other blue flower. Clitoria have cleistogamous and chasmogamous flowers i.e., self-pollinating and insect pollinating respectively. Physical properties of flower like color, structure and position vary from species to species they may 60 to 120 mm long like beans and blue scabbard flat and linear. The flowers of this plant are papilionaceous, axillary, solitary, pedicel 0.8 to 1.3 cm long with bright blue or white with yellow or orange center. Calyx 13 to 20 mm long, corolla 38 to 50 mm, oblong, seeds 8 to 11/pod, Pods 50 to 100 mm by 0.8 to 1.3 cm, nearly straight, somewhat flattened, sharply beaked sparsely hairy, 0.3 to 0.4 cm wide, shiny, often mottled, minutely pitted, olive brown to almost black. Pinnate leaves with 5 or 7 leaflets; stipules persistent, narrowly triangular, 1 to 6 mm long, subulate, prominently 3-nerved; rachis 10 to 70 mm long; petioles are 15 to 30 mm long; stipels are filiform, leaflets are elliptic, oblong, ovate or nearly orbicular, 20 to 50 mm long, 3to 30 mm wide, with apex acute or rounded, often notched, and base cuneate or rounded, both surfaces sparsely appressed pubescent. Flattened pods are 40 to 130 mm long, linear to oblong and 8 to 12 mm wide, are style persistent, pale brown, dehiscent when dry, sparsely pubescent when mature and with thickened margins. The bracteoles are persistent and 0.4 to 1.2 cm long, broadly ovate or rounded, calyx is 17 to 22 mm long with a few fine hairs; lobes triangular or oblong; tube campanulate, 8 to 12 mm long 7 to 10 mm long, acute or acuminate. The physiochemical properties of roots are buffy brown in color, with characteristic odor and bitter in taste. Clitoria ternatea have both primary and secondary roots are thick, hard with smooth surface and later are thin, fibrous in nature respectively. Its roots fix nitrogen; therefore this plant has been used to improve soil quality. The thick horizontal roots may grow bearing one to several purplish, glaucous, wiry stems with more than 2 m length.

AYURVEDIC PROPERTIES AND USES

Clitoria is pungent in the post digestive effect, has cold potency, bitter in taste, and possesses light dry and sharp attributes. In Ayurveda „Sankhapushpi‟ is one of the formulations which consists of the seeds and roots of C. ternatea, is used as a „nerve tonic‟, alternative and laxative. It has been used for the treatment of various neurological disorders as an active ingredient in „Medhya

Rasayana". By various group of persons it is considered as medicine which is useful in skin diseases, eye and throat infections also in urinary disorders, ulcers and antidote activity

Root

The roots have a sharp bitter or acrid taste and credited with cooling, laxative, diuretic, anthelmintic, antiinflammatory properties. In the scientific studies it was found that extracts of C. ternatea can raise the acetyl choline content and acetyl choline esterase activity in rat brain in a similar fashion to the standard cerebral drug pyritinol. In other treatments of various ailments like infections, as anthelmintics, antidote to animal stings, urinogenital disorders and body aches C. ternatea is also used. Especially the roots of C. ternatea are useful in severe asthma, remittent fever and bronchitis. These are used to administer with ghee and honey as a tonic to children for boost up in their mental abilities, muscular strength, complexation, whooping cough, goiter and epilepsy. Roots used by tribal to cause abortion and its paste applied on cattle stomach for curing abdominal swelling. Research suggestedthat the methanolic extract of C. ternatea roots shown nootropic, anxiolytic, antidepressant, anticonvulsant and anti-stress activity in animals. The decoction or powder of root is given in rheumatism and ear disease. Root and leaves have emetic and antiperiodic.

Seed

The use of seeds of Clitoria ternatea for medicinal purpose is both for external and internal applications. Fried seeds are recommended in ascites when given orally with hot water in powdered form with ghee and fennel. Seeds are also used in digestive disorders because they have purgative, cathartic and laxative action when used in combination with ginger powder. Seeds are also prescribed in cough, hepatic disorders, spleen and rheumatic infections. The seeds are safe for abdominal viscera, colic, dropsy and also for arthritis.

Leaves

Leaves are used as emetic, diuretic, antiperiodic and laxative. The leaves are also very useful in the inflammation of mastoid lymph nodes when used with salt in paste form. The juice form has the ability to mitigate the toxins. In combination with ginger juice, the fresh leaves are useful in hepatic fever, excessive sweating and also useful in inflammation around the ear and neighboring glands in juice form with common salt.

Flower

Flowers are suggested and used for the treatment of scorpion sting and snake bite. In Cuba decoction of flowers with roots are considered emmenagogue. An infusion of flowers is used to promote menstruation and induce certain contraction. Flowers are also used to treat chlorosis and intestinal problem. In experimentally induced diabetic mice, the ethanolic extract of flowers significantly lowers the serum sugar level.

Stem

Stem is recommended for the treatment of snake bite and scorpion sting. The stem of the plant contains the phytochemicals which are mainly considered as brain tonic and is also useful for eye and throat infections, skin diseases, urinary troubles.

PHARMACOLOGICAL PROPERTIES

Anthelmintic Activity

Anthelmintic activity was found in ethanolic and aqueous extract of C. ternatea leaves at the dose of 100 mg/ml. This was performed at three different concentrations (100, 50, 25 mg/ml) of ethanolic and aqueous extracts respectively by using Eisenia foetida. The study was focused at the in-vitro comparative study of aqueous and ethanolic extracts of leaves of C. ternatea for anthelmintic activity. Thus, the study involved in the determination of time of paralysis (P) and time of death (D) of the worms. While determination for both extracts, the time of paralysis and death time of aqueous extract was observed as 18 ± 1.57 and 53.33 ± 0.33 and in case of ethanolic extracts 12.33 ± 0.80 and 32.33 ± 0.71 respectively. At last, the anthelmintic activity of ethanolic extract of C. ternatea was found more potent than aqueous extract of C. ternatea

Antihistaminic Activity

Antihistaminic activity was found in the ethanolic extract of C. ternatea roots in dose dependent manner. Evaluation for antihistaminic activity was done using clonidine and haloperidol induced catalepsy in mice for Ethanol Extract of C. ternatea Root (ECTR) at doses 100, 125 and 150 mg/kg IP. Dose dependent catalepsy was induced in mice by Clonidine, a $\alpha 2$ adrenoreceptor agonist which was inhibited by histamine H1 receptor antagonists but not by H2 receptor antagonist. Clonidine, which is responsible for the release of histamine from mast cells, is responsible for different asthmatic conditions. A non- selective D2 dopamine antagonist (Haloperidol) induces catalepsy is primarily due to blockade of dopamine receptors in the straiatum. The agents responsible for increase in dopamine transmission inhibit haloperidol-induced catalepsy. Findings showed that ethanol Extract of C. ternatea Root (ECTR) and Chlorpheniramine Maleate (CPM) inhibit clonidine induced catalepsy significantly $P < 0.001$ when compare to control group, while 12 ECTR and CPM fail to inhibit haloperidol induced catalepsy. So it is concluded that the agents increasing dopamine transmission inhibits haloperidol-induced catalepsy and the present study shows ECTR possesses antihistaminic activity.

Antimicrobial Activity

The antimicrobial screening was evaluated against Extended Spectrum Beta Lactamase (ESBL) producing Salmonella enteritidis, Salmonella typhimurium, Klesiella pneumonia, Enteropathogenic E.coli, Uro-pathogenic E.coli, and Pseudomonas aureginosa isolated from patients with urinary tract infection and acute gastroenteritis. Disc diffusion method was used to test the above mentioned extracts for their activity. Water, methanol and chloroform extracts of C. ternatea flowers was exhibited activity against uropathogenic E.coli, Enteropathogenic E.coli, Enterotoxigenic E.coli, Salmonella typhimurium, Klesiella pneumoniae and Pseudomonas aureginosa. Methanol extract of C. ternatea exhibits comparatively high activity as compared with chloroform and aqueous extracts. The inhibitory zone produced by water, methanol and chloroform extracts at a concentration of 4 mg/disc was found 12 mm, 16 to 26 mm and 14 mm to 18 mm respectively while petroleum ether and hexane extracts did not exhibit any activity.

Cytotoxic Activity

The crude methanol extract of stem-bark, leaves and seeds of C. ternatea demonstrated a significant cytotoxic activity in a brine shrimp lethality bioassay test. The LC50 values of the crude methanol extract of stem-bark, leaves and seeds were found to be 179.89,

25.82, 110.92 µgm/ml) respectively. Among them crude methanol extract of leaves (25.82 µgm/ml) and methanol fraction of leaves (22.28 µgm/ml) showed a very promising cytotoxic activity.

Proteolytic Activities

The activities of endopeptidases (pH of hemoglobin is 3.5 and pH of azocasein is 6.0), carboxypeptidase (pH of CBZ-Phe-Ala is 5.2), and arylamidases (pH of LPA is 7.0 and pH of BAPA is 7.6) were assayed in extracts of cotyledons and axis of resting and germinating seeds of C. ternatea L. All the activities were low in resting seeds but the endopeptidases at pH 3.5 and the arylamidase at 7.0 were high in cotyledons. The activities of endopeptidases showed an increase at the day 3 followed by a decrease, while the carboxypeptidase and the arylamidases increased in cotyledons reaching a maximum at the day 9. In the axial tissue the endopeptidases and carboxypeptidase activities showed an increase until the day 9 followed by a decrease and the arylamidases were low. The increase of acidic endopeptidase andcarboxypeptidase activities in germinating cotyledons has been suggested as an indication of their participation in the degradation of the storage proteins.

Antipyretic Activity

Evaluation of anti-pyretic potential Of Methanolic Extract of C. ternatea L. Rootof blue flowered variety (Family: Fabaceae) on normal body temperature and yeast-induced pyrexia in albino rats. Increase in rectal temperature was observed after 19 hours of Yeast suspensionsubcutaneous injection. The extract produced significant reduction in normal body temperature at doses of 200, 300 and 400 mg/kg body wt., p.o., and yeastprovoked elevated temperature in a dosedependent manner. The effect extended up to 5 hours after the drug administration. The anti-pyretic effect of the extract was comparable to that of paracetamol a standard antipyretic agent.

Antioxidant Activity

The chemical composition of the flowers of C. ternatea suggest that they may have antioxidant activity, ethanopharmacological evidences shows that 15 the extracts of C. ternatea (butterfly pea) flowers are used in Thailand as a component of cosmetics. The aqueous and ethanolic extract of C. ternatea was found to have antioxidant potential. Aqueous extracts were shown to have stronger antioxidant activity than ethanol extracts (IC50 values were 2 mg/mL and 5 mg/mL, respectively). This was assessed by performing DPPH scavenging activity test. The total phenolic content was 2.0 mg/g extract as gallic acid equivalents. The data from this study support the use of C. ternatea extracts as antioxidant inclusions in cosmetic products.

In-Vitro Cytotoxic Activity

This study evaluates the in-vitro cytotoxic effect of petroleum ether and ethanolic flower extracts of C. ternatea Linn by using trypan blue dye exclusion method. Both extracts exhibit significant cell cytotoxic activity. For both the extracts decrease in cell count was observed with increase in concentration of the extract. There was a dose dependent increase in cytotoxic activity for all the concentrations tested.

CONCLUSION

Clitoria ternatea is not only a wild herb but also a medicinal plant. It has so many traditional usages as well a number of medicinal usages. Even, it is useful in treatment of some incurable diseases such as cancer, neurological disorder, nephorological disorder, hyperglycemia, urinary disorder, goiter, respiratory disorders etc. The exploring the active component of this plant responsible for the pharmacological activities along with their mode of action will be guided by the accumulative information presented in this article. Major thrust by whole of the pharmaceutical industry is focused towards design and development of new plant based drugs through investigation of leads from traditional system of medicines. In the study of Clitoria ternatea alcoholic extracts of roots, leaves and flowers gives different pharmacological activities like antileprosy, anti-inflammatory, antihelmintic, immunomodulatory, antiasthamatic, antidepressant, anticonvulsant, analgesic, antipyretic, antifungal, proteolytic and antihyperlipidemic. Many important phytoconstituents responsible for the activity were isolated. The scientific research on Clitoria ternatea suggests a huge biological potential of this plant. Though the reported evidences supports the safety and efficacy of CT, but the quality of the evidence is limited in respect to its bioactive secondary metabolites, bioavailability, pharmacokinetics and therapeutic importance including clinical trials, which are not known with sufficient details. It is strongly believed that detailed information as presented in this review might provide detailed evidence for the use of this plant in different medicines. At the same time, the organic and aqueous extracts of Clitoria ternatea could be further exploited in the future as a source of useful phytochemicals compounds for the pharmaceutical industry.

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Chapter No.	Your of student	Name of guide	Institute/college name	City	Names of other students	Title of your article
1	Priyal P Rambhia	Dr. Sreeshyla H S	JSS Dental College and Hospital, A Constituent College of JSS Academy of Higher Education and Research, Mysore	Mysore	Sariya Fathima , Sara Sultana , Sreeshyla H S , Dhakshaini M R	EXPLORING THE POTENTIAL OF OZONE THERAPY IN THE TREATMENT OF MEDICATION RELATED OSTEONECROSIS OF THE JAW - A REVIEW
2	Sarmistha Dutta	Mr. Abhishek Guha Roy	School Of Pharmacy , The Assam Kaziranga University	Jorhat	Deboshmita Purkayastha, Abhishek Guha Roy	HARNESSING THE HEALING POWER OF MIMUSOPS ELENGI IN WOUND HEALING
3	Vanitha Sri. T	Elavarasi. E	Bharath Institute of Higher Education and Research	Chengalpattu , Chen	Shirin Christina. S, Sudharsan. S	A COMPREHENSIVE OVERVIEW OF TOCILIZUMAB
4	R.AMIRTHA VARSHI	Miss.Aparna	Sree sastha pharmacy college	Chennai/chembaram	R.Amirtha Varshini, M. Mahalakshmi	The future of research:Emerging trends and new directions in scientific inquiry
5	R.vidhyalakshmi	Dr.k.Rajaganapathy	Bharath Institute of higher education and research chennai	Chennai	Kowsika.M, Pratheeba.G, T. Blessy flarance	FROM STIGMA TO SOLUTION: THE RISE OF CANNABIS BASED MEDICATIONS IN PHARMACY
6	P.saranya	Dr.Rakshana.V	Bharath insitute of higher education and research	chennai	Jayashree.S, Snehamayee Mahapatra ,Rufina Delphine.A	CREATION AND ASSESSMENT OF HALOPERIDOL SOLID DISPERSION FAST – DISSOLVING TABLETS
7	Pratheeba G	Dr.K. Rajaganapathy	Bharath institute of higher education and research	Chennai	R. Vidhya Lakshmi, M. Kowsika , S. Punithavalli	Automation and efficiency: The future of pharmacy with robotics and AI
8	Jai Sai D	Gomathi J	C L Baid Metha College of Pharmacy	Chennai	Farzana Affrin M F, Srikaviya R, Vidhya Lakshmi T	Formulation and Evaluation of Floating Microspheres of Baclofen for Prolonged Gastric Retention
9	Dr.Sai Koteswar Sarr	Dr.Sai Koteswar Sarma	Sri Padmavathi School of Pharmacy	Tirupati	H.Sumalatha, C.Sai Prasanna, G.Riya Madhuri, V.Anusha	Antiurolithiatic Activity on Aerva lanata
10	Dr. Durga Prasad Th	Dr. Durga Prasad Thammi	Sri Padmavathi School of Pharmacy	Tirupati	Vaddi Snehalatha, Gentam Suneetha, Saikeerthana Pantrangam, Shaik Mujeeb	Green Synthesis of Tupi Nanas Leaves Waste Silver Nanoparticles
11	chandhu priya	Sai Koteswar Sarma	Sri Padmavathi School of Pharmacy	Tirupati	Adusupalli Mounika , Katukutti Chandhu Priya , Eturu Trishala	ANTIOXIDANT AND ANTIMICROBIAL ACTIVITY OF CANAVALIA GLADIATA
12	K.Meghana	Dr .Sai Koteswar Sarma	Sri padmavathi school of pharmacy	Tirupati	E Suhas , K.Vinay Teja , G. Bhagya Sri , G.Naga Nithya sree , M.Ejitha	Preliminary phytochemical analysis of antifertility plants

CHAPTER-12

CULTIVATION OF MEDICINAL PLANTS

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Abstract: Nature has provided us with a better environment for the expansion and development of medicinal plants for thousands of years. The medicinal value of plants dates back to ancient times based on the belief in their safety and economic benefits.Even in today's scenario, about 80% of the global population primarily depends on alternative systems of medicine for their primary healthcare needs.Plants contain different types of secondary metabolites, also called bioactive components, which are responsible for their medicinal properties. Scientific cultivation allows the application of contemporary technological approaches like mutation, polyploidy, and hybridization to enhance the production of secondary metabolites from plants and their byproducts.

Keywords: Medicinal plants, cultivation factors, Advantages, Importance of cultivation

1. Introduction:

A medicinal plant is that species of the plant kingdom, whose parts {flowers, leaves, roots, stems, fruits, or seeds} are directly used or used in some preparation as a medicine to treat a condition or disease. Medicinal plants like aloe, turmeric, Tulasi , pepper, elachi and ginger are commonly used in a number of Ayurvedic home remedies. Medicinal plants are defined as those capable of alleviating or curing diseases and they have atraditional use as a remedy in a population or community. Medicinal plants have been in major demand due to the great efficiency of herbal remedies. The medicinal plants have been prized for their medicinal, flavoring and aromatic values. Today medicinal plants are finding diverse uses in the society from medicine to cosmetics, herbal drinks, herbal foods and other articles in the daily uses.

1.1 Scope of medicinal plants

Medicinal plants may provide three main kinds of benefit:

- Health benefits to the people who consume them as medicines
- Financial benefits to people who harvest, process, and distribute them for sale
- Society-wide benefits, such as job opportunities, taxation income, and a healthier labor force.

Opportunities for medicinal plants cultivation:

l. Widespread use of alternative medicine
2. Preference for natural products and chemicals from botanicals herbs
3. Dwindling forest cover and reduced supplies from natural habitats

4. Availability of markets (global/ national)
5. Availability of high yielding varieties
6. Availability ofagro-technologies
7. Availability of processing technologies
8. Profitable returns on sustainable basis

Identification of medicinal plants

Medicinal plants are identified by human experts using their visual features and aroma.

Visual characteristics

- shape, color, texture of leaves

Plants are identified by leaf factors like vein, color, structure, edges and length structures.

3. Steps in cultivation

Factors influencing the cultivation of medicinal plants:

There are various factors which influence the cultivation of medicinal plants. Some are briefly given below:

Light*:*

Light is needed for: Continuation of life in plants. Regulation of carbon dioxide and oxygen exchange between plants and atmosphere. Plant movements Seed germination Flowering Photosynthesis For eg. Dry sunny weather increases the proportion of: (i) Glycosides in Digitalis (ii) Alkaloids in Belladona.

Temperature*:*

Affects the growth of plant and metabolism.

Affects the rate of transpiration.

Regulates the physiological processes by regulating the activity of enzymes.

For eg.:

Camphor and coffee cannot withstand frost whereas saffron needs only cold climate.

Pyrethrum requires dry weather for cultivation.

***Altitude**:*

It Is important factor influencing the cultivation of medicinal plants. Also affects the chemical composition of medicinal plants. For eg: at high altitudes Pyrethrum provides the better yield of flower heads and pyrethrins. For eg: Plant Altitude (meters)Cinchona 1000-2000 Coffee 1000-2000 Camphor 1500-2000.

***Rainfall**:*

Most plants require: Either proper arrangements for irrigation or sufficient rainfall for their development. Few exceptions are there like xerophytic plants like aloe, acacia etc. No doubt rainfall is essential factor

Influencing the cultivation of medicinal plants but there can be loss of water-soluble substances from leaves and roots due to continuous rainfall. Rainfall also has effect on constituents of plants.

***Soil**:*

a. Supports the growth of all plants

b. Provides- (i) mechanical anchorage (ii) water and essential plant food elements

c. Mainly soil is of 5 types: clay, Sand, Loam, Chalk, Peat. Amongthis soil, Loam is generally considered best type of soil for large number of plants.

Fertilizers and manures:

(i) Promote plant growth

(ii) Helps the plant grow faster and stronger For their growth and metabolism, plants need 16 nutrient elements.

a. Macronutrients-needed in large quantities.

   Eg: carbon, hydrogen, nitrogen, oxygen, calcium, potassium, phosphorous, sulphur and magnesium.

b. Micronutrients-needed in traces.

   Eg: copper, zinc, boron, molybdenum, iron, manganese, chlorine.

3.1 Pest and pest control:

Pest damages the agriculture through-

(i) Feeding on crops

(ii) parasitizing livestock

Types of pests: a. Fungi b. viruses c. Insects d. Weeds Non-insect pest: i. Vertebrates like rabbit, monkey, pigs, hares, squirrel, deer etc. ii.

Invertebrates like crabs, snails, mites etc.

4. Diseases management of medicinal plants

The most common issues with which the producers of medicinal plants encountered are the market, abundance and accessibility of wild populations, agro-environmental conditions, labour availability and costs, investments in machinery, post-harvest processing, and profitability of production.

Destructive harvesting has brought about depletion and scarcity of medicinal plants. The habitat loss by export of medicinal plants collected from wild sources finally lead to severe and irreplaceable loss of genetic stock of many of these species.

Importance of medicinal plants

Medicinal plants will be useful for Maternal and Child health care, as essential drugs, in food and nutrition, for common illnesses and injury, for endemic infectious diseases, mental health and oral health.

5. Advantages of medicinal and aromatic plants:

Major advantages of medicinal and aromatic plants are given below:

1. **Homestead cultivation:** Various medicinal plants such as tulsi, mint stevia, gudamariand Brahmi are suitable for homestead cultivation. Home gardens serve critical functions in fulfilling community and household needs ranging from food security to augmenting thefamily nutritional status, ensuring primary healthcare, income generation and fulfilling otherfamily needs.In Bangladesh, the NGO Development of Biotechnology and EnvironmentalConservation Center (DEBTEC) has encouraged women to cultivate backyard home gardens of medicinal plant, both as a strategy to protect endangered species and to empower womenthrough plant cultivation that will provide a source of earnings. The Government ofBangladesh has advocated farmers to grow more medicinal plants to meet both local demandand enter export markets.

2. **Easy to establish:** Since mostly medicinal and aromatic plants are hardy in nature. Therefore, they are easy established in different type of climates, soils. Mostly medicinal and aromatic plants are maintained and conserved by ex- situ and in situ methods.

3. **Minimum care:** Since mostly medicinal and aromatic plants are hardy in nature and theyrequire minimum care and inputs for growth and yield.

4. **Short duration:** Mostly medicinal plants are in short duration nature and harvesting isstarted within 3- 4 month after planting Harvesting of Brahmi,tulsi stevia lemon grass isstarted after 3- 5 months of planting in the first year and thereafter at interval of 60 -70 daysin subsequent harvest.

5. **Multipurpose:** The women always choose those medicinal plants that are havingmultipurpose uses. The medicinal plants such as tulsi, aloevera, mint, brahmi etc., arepreferred by women because of day to day uses in their life.

6. **Income generation:** MAPs provide supplementary income to the forest dwellers and poorrural people. The degree of dependence of local people on MAP-based livelihoods issignificant as it provides

jobs to the poor people and much needed cash to the subsistencefarmers, especially to the small scale cultivators, collectors, processors and traders.

7. **Employment opportunities:** The labourers are employed for a number of activities such asharvesting, drying, plucking, packing, carrying, sorting, repacking, loading and unloadingand transporting. Thus MAP-based activities can create employment for the poor andDisadvantaged section of the society

8. **Post harvesting and value addition:** Post harvesting activities of horticultural cropsincluding medicinal plants is done by women. A study has been conducted in Pakistan andfound that tribal women and children collected 90 percent of the medicinal herbs andalldrying is done by women. About 71 percent of medicinal herbs are sold by womenandchildren, and 29 percent by men

6. Medicinal plants and human health

South Asia is home to many rich, traditional systems of medicine (TSM). Ayurvedic system dates back to 5000 B.C. Along with the Unani, Siddha and Tibetan systems, these TSMs remain important source of everyday health and livelihood for tens of millions of people. Himalayan sage scholars of Traditional Medicine have said "NanaushadhiBhootam Jagat Kinchit" i.e. `there is no plant in the world, which does not have medicinal properties.' The ancient scholars are estimated to know the medicinal properties of hundreds of species of plants. It is therefore, no exaggeration to say that the uses of plants for human health are probably as old as human beings themselves. Medicinal plants are accessible, affordable and culturally appropriate sources of primary health care for more than 80% of Asia's population (WHO). Poor and marginalized, who cannot afford or access formal health care systems, are especially dependent on these culturally familiar, technically simple, financially affordable and generally effective traditional medicines. As such, there is widespread interest in promoting traditional health systems to meet primary health care needs. This is especially true in South Asia, as prices of modern medicines spiral and governments find it increasingly difficult to meet the cost of pharmaceutical-based health care.

7. Conclusion:

There is a growing demand for medicinal and aromatic plants at the global level due to health awareness. Therefore, conservation and sustainable use of these species are necessary to meet the needs of present and future generations. Women are well known for conserving genetic biodiversity. Moreover, production of medicinal plants will help for utilization of land for additional income and for conserving the important plant species which are now neglected and under extinction due to deforestation. Skill trainings cum exposure visits on medicinal and aromatic plants production will help and encourage to the farmwomen for cultivation and value addition of these plants like tulsi, stevia, gudmar, brahmi citronella, aloevera, mentha, bhringraj, akarkara, lemongrass etc at their home. Therefore, it is important that medicinal and aromatic plant production technology, enterprise and schemes can be promoted among farmwomen by the NGOs, Government of India, State Agriculture/ forest departments and private industries for employment opportunities and as a source of income throughout the year

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CHAPTER-32

IMPORTANCE OF PHARMACOGNOSY

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Abstract: Pharmacognosy is used in wide range in many aspects like drug discovery,development, quality Control, action of drug, drug Formulations ,prize of pharmaceuticals products, isolation of phytochemical,drugs of therapeutic uses. And their Role in ayurvedic, allopathic, sidda are very well known.Plant based medicaments plays a significant role in the prevention and treatment of diseases (communicable and noncommunicable). Interestingly, more than 80% of the global populations now adopt phytotherapy as a basic source of maintaining good healthy conditions, owing to the pronounced side effects, nonavailability, and expensive nature of conventional treatment options. While this review looked at the prospects and downsides of phytomedicine as it relates to the national health care system, it established the fact that although a number of medicinal plants had been resourceful (effective) against a range of diseases, with few developed into drugs based on the available phytotherapeutics, quite a large number of them are yet to scale through clinical trials to determine their safety and efficacy.

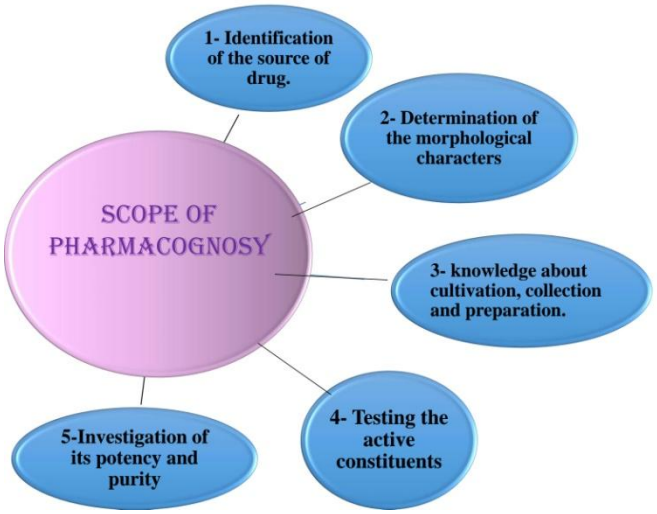
Keywords: Medicinal plants, traditional medicines, Secondary metabolites, drug discovery

1. Introduction:

Pharmacognosy is derived from two Greek words, pharmakon & Gignosco means Pharmakon – drug and Gignosco - to acquire knowledge. Pharmacognosy is a study of crude drugs that originate in the plants,animals,minerals and marines. Pharmacognosy word was coined by a German scientist C.A.Seydler in 1815 during his work entitled Analecta pharmacognistica.In 19th century Materia Medica was used to represent the Pharmacognosy. It involves the identification, characterization,cultivation,extraction,quality Control, preparation and biological assessment of the drugs.

1.1 Scope of Pharmacognosy

1. Plant secondary metabolite and their therapeutic significance
2. Medicinal plants as therapeutic agents
3. Drugs (medicine) discovered from natural sources and development
4. Recent developments of plant-derived active compounds in drug development
5. Importance of phytotherapy (for diseases control) within the global health care system



1.2 Action of drugs

The knowledge of the action of drugs can be utilized successfully when the identity,physical nature and chemical constituents of the drug are known well and Pharmacognosy supplies this information.

- Solubility
- Reactivity & dosage availability
- Stability & isolation
- Toxicity

1.3 Drug Formulation

- Formulation and actual preparation of a pharmaceutical product are dependent on a number of properties such as solubility,Stability of ingredients.
- This type of information on substances of natural origin is available to the pharmacist if he posses a good knowledge of pharmacognosy.

1.4 Prize of pharmaceutical products

The price of the products containing natural substances is influenced by the methods of collection,drying,curing,and assaying of the ingredients, which are dealt within pharmacognosy.

1.5 Isolation of phytochemicals

ALKALOIDS:obtained from the plants of belladonna,hyocyamus,rauwolfia.

GLYCOSIDES:obtained from the digitalis leaves.

MORPHINE:obtained from opium plants.

2. Drugs of therapeutic uses

It has a wide scope for the main element in providing with the information about the drugs of main therapeutic uses like alkaloids,steroids,antibiotics.

2.1 Recent Developments

New Analytical Model

Faster and more effective methods like high-throughput screening, target-based drug discovery, and in silico methods

Molecular Approaches

Molecular pharmacognosy, genomic pharmacognosy, and metabolomic pharmacognosy

Marine Pharmacognosy

The study of marine organisms as a source of bioactive compounds with therapeutic potential

Genetic Engineering

The use of genetic engineering to produce pharmaceuticals, improve the yield of low molecular weight compounds, and regulate the production of secondary metabolites

2.2 Drug Delivery System

The development of new drug delivery systems to improve the bioavailability and therapeutic efficacy of drugs

2.3 Herbal Products

The development of innovative herbal products, including pharmaceuticals, nutraceuticals, and cosmeceuticals

2.4. Role of Pharmacognosy in Allopathy

Role of pharmacognosy in allopathy is that natural products isolated from plants/animals/marine

or minerals acts as the major source for modern medicine. Ex:Taxol from Taxus, Digoxin from Digitalis

2.5 Role of pharmacognosy in ayurveda

Pharmacognosy includes processes such as identification, authentication, production, processing, standardisation, and many more natural medicinal essentials. While the natural drug relevant data volumes are increasing, it also requires an intelligent system to manage it.In ayurvedic pharmacopeia it describes the quality,purity ams strength of selected drugs that are manufactured,distributed and sold by the license holders.At present seven volumes has been printed.

Many ayurvedic Formulations are available in the market contain leaves,roots,fruits,flowers or barks as medicinal source..Pharmacognosy helps in identification of drugs through morphology,phytochemical evaluation, chemical & biological evaluations.More than 5000 plants name has given by ayurveda system of medicines like:Ashwagandha,Triphala ,

Turmeric,Shatavari,Amma,Tulsi,pepper,Clove,Ginger,Cinnamon,Rauwolfia.
Gymnema,Henna,Black,Ashok.

2.6 Significance of pharmacognosy

- Primary source of medicines.
- For identification of crude drugs.
- Isolation,analysis,chromatographic studies and characterization of phytoconstituents.
- Standardization of crude drugs and herbal Formulation.
- Acts as linking between pharmacology. Pharmachemistry and pharmaceutics.
- Base for drug development & research.
- Documentation preservation of crude drugs.
- Production of secondary metabolites by PTC.

The emphasis and focus of research in Pharmacognosy have changed significantly, from focusing on identification of drugs, including the isolation of active principles, and more recently, the investigation of biological activity. Research into ethnobotany, ethnomedicine, and ethnopharmacology has also become an important element in Pharmacognosy.

Current research in drug discovery from medicinal plants involves a multifaceted approach combining botanical, computational, phytochemical, biological, and molecular techniques. It is evident that drug discovery from medicinal plants continues to provide new and important leads against various pharmacological targets including cancer, HIV/AIDS, Alzheimer's, malaria, and pain. Pharmacognosy is important in modern medicine and pharmacy, including the use of plant-based drugs and the role of pharmacognosy in biotechnology and bioinformatics. Modern allopathic medicine has its roots in traditional medicine, and it's possible that many important novel medicines will be created and commercialised in the future from plant biodiversity, as it has done until now.

Pharmacognosy is not a subject of the past, but it has evolved and developed over the years to adapt itself with the changing environment, and is now fit to meet the challenges of the present and the future of drug discovery and development. Thus, the importance of Pharmacognosy in Pharmacy cannot be overemphasized. Pharmacognosy will remain to be a significant and an essential contributor to the knowledge and understanding of drugs and therapies, and thus should be an integral part of any meaningful academic Pharmacy programs world over.

3. Preservation of indigenous knowledge

Pharmacognosy helps preserve indigenous knowledge about the medicinal properties of plants.

Traditional medicine

Pharmacognosy is the basis of traditional medicine, which is still widely used in third world countries.

4. Conclusion

Pharmacognosy has various carrier skills in a research institute in India.The skills of freight forwarders are divided into different fields such as research and development,quality Control,research and quality Control in various research institutions across India.This document provides a professional guide for pharmacognosy and their importance.

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CHAPTER-25

PHARMACOLOGICAL ACTIVITIES OF NATURAL PRODUCTS

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Abstract: Natural products, derived from plants, microorganisms, and marine organisms, have been a rich source of bioactive compounds with diverse pharmacological activities. This review highlights the therapeutic potential of natural products, focusing on their anti- inflammatory, antioxidant, antimicrobial, anticancer, cardiovascular, neuroprotective, and immunomodulatory effects.

Keywords: Natural products, Pharmacological activities, Therapeutic applications, Traditional medicine

1. Introduction

Natural products are organic and inorganic compounds that are found in various natural sources - animal, plant and microbes. Natural products can be entire - organism like as plant, animal or micro-organism. A part of an organism (leaves or flower of plant, isolated animal organ). An extract of an organism or an exudates or pure compounds (Alkaloids, Coumarins, Flavonoids, Steroids and Terpinoids). From traditional herbal medicines to model pharmaceuticals the pharmacological activities of natural compounds have been recognised for their therapeutic benefit and significant impact on health. Their structural diversity and biological properties make them critical components of drug discovery and development.

1.1 Classification

Classifying natural products -their immensive diversity in structure, function and biosynthesis are too great to allow then to fit nearly into a simple category

(a) Primary metabolites

It occurs in all organisms. It includes carbohydrates, amino acids, peptides, proteins, nucleic acids and lipids etc.

(b) Secondary metabolites

It occurs only in certain organisms. It includes alkaloids, Steroids, terpenes etc.

Some of the crude drugs as follows such as,

(c) Abrus precatorius:

(Family: *Fabaceae*), deciduous climbing plant, known as Rosary pea or Ratti, is indigenous to India and commonly found in other tropical and subtropical regions. The plant is used in some traditional medicine to treat scratches, sores, wounds caused by dogs, cats and mice, treat leucoderma, tetanus, abortifacient and also possess antibacterial, antifungal, antitumor, analgesic, antimigraine, antiseptic, antispasmodic, antidiabetic, antiserotonergic and anti-inflammatory activity.

***(d) centella asiatica*:**

(Family: *Apiaceae*) has been widely cultivated as a vegetable or spice in China, Southeast Asia, India, Sri Lanka, Africa known as a “Brain food” in India. It has been described to possess CNS effects such as stimulatory-nervine tonic, rejuvenant, sedative, tranquilizer and intelligence promoting properties.

1.2 Asparagusspecies: Used in the treatment of diarrhoea and dysentery, the plant also has potent antioxidant, antidyspepsia and antitussive, immunomodulatory and apoptosis inducing activity.

(a) Eclipta alba:

(Family: *Asteraceae*) It is used for the treatment of infective hepatitis, liver cirrhosis, liver enlargement and other ailments of liver and gall bladder.

(b) Magnifera indica*:*

(Family: *Anacardiaceae*) its medicinal properties such as antimicrobial, antiviral, antifungal, antiinflammatory, antidiarrhoeal, antioxidant activity, antitumor as well as immunomodulatory.

1.3 Lentinus edodes: It is used medicinally for diseases involving depressed immune function (including AIDS), cancer, environmental allergies, fungal infection, frequent flu and colds, bronchial inflammation, heart disease, hyperlipidemia, hypertension, infectious disease, diabetes, hepatitis.

1.4 Panax ginseng: It has been reported that it exhibits a lot of different biological actions such as antiaging, antifatigue, anti-stress, anti-atherosclerosis, antidiabetic, anti-cancer and antiinflammatory activities.

(a) Platycodongrandiflorum:

(Family: *Campanulaceae*) *P. grandiflorum*exhibits neuroprotective, antimicrobial, antiinflammatory, anticancer, antiallergy, improved insulin resistance and cholesterol-lowering properties.

(b) Tinospora cordifolia:

(Family: *Menispermaceae*): It is known for its immunomodulatory, antioxidant, antiperiodic, antispasmodic, antiinflammatory, antiarthritic, antiallergic, antidiabetic and antibacterial properties.

(c) Tribulus terrestris:

(Family: *Zygophyllaceae*): It contains different substances including sapogenins, flavonoids and alkaloids which have antiinflammatory, antitumor and immunomodulatory, antihypertensive, antifungal and hepatoprotective properties.

(d) Viscum album:

(Family: *Santalaceae*) commonly known as European mistletoe, common mistletoe or simply as mistletoe treatment of a wide range of diseases such as diabetes mellitus, chronic cramps, stroke, stomach problems, difficulties in breathing and hot flushing in menopause.

2. Pharmacological activities

Emetics :- Ipecacuanha
Purgatives : - Senna
Expectorant : - Liquorice
Anti-hypertensive : - Rauwolfia
Cardiotonics : - Digitalis
CNS Depressant : - Belladona
CNS Stimulant : - Coffee (caffeine)
Anti-Cancer Drug : - Vinca
Anti-Malarial : - Cinchona
Local Anaesthetics : - Erythroxylum coca
Anti-Rheumatic : - Aconite
Immunomodulatory Agent: -Ashwagandha

3. Antiinflammatory activity

Natural products such as Curcumin (from Curcuma longa),
Resveratrol (from grapes)
Quercetin (from fruits & vegetables)

Curcumin - Inhibit inflammatory mediators like cytokines and COX-2, reducing inflammation at molecular level.

4. Antimicrobial activity

Examples - Garlic (from compound allicin)
Berberine (from berberis species)

Garlic - Inhibit bacterial growth by blocking enzymatic function.

These products target microbial cell wall, interfere with DNA replication and protein synthesis.

5. Anticancer activity

Examples - Vincristine (from Catharanthus roseus)
Paclitaxel (from Taxus brevifolia)

They prevent cancer cell from dividing and growing by distrupting the formation of microtubules essential for cell division and arrest cell cycle.

6. Antioxidant activity

Examples - GreenTea (Camiella sinesis)
Vitamin E (From nuts and seeds)
Polyphenols (from grapes and berries)

They show activity by scavenging (inhibit) free radical, inhibit angiogenesis. Anti-oxidant enzymes like superoxide dismutase, catalase, Glutathione peroxidase scavenge free radicals.

7. Cardiovascular benefits

Examples - Omega -3 fatty acids (from fish oil)
Flavonoids (from Cocoa and berries)

Omega-3 fatty acids - Reduce triglycerides level, decreases blood pressure and have anti-inflammatory properties which collectively lowers risk of heart disease.

8. Neuroprotective activity

Examples - Gingko biloba
Ashwagandha (Withaniasomnifera)

It reduces oxidative stress by decreasing ROS and improves Cognitive function.

9. Respiratory system benefits

Examples - Liquorice (Glycyrrhizaglabra).
Vasaka
Ephedra

Liquorice - It helps to loosen phlegm by accelerating the secretion of tracheal mucus and expel congestion in the upper respiratory tract.

Ephedra - It shows bronchodilator activity by dilating the bronchial tubes in the lungs

10. Gastrointestinal system benefits

Examples - Agar
Senna
Ipecacuanha

Senna - It shows stimulant laxative activity by increasing fluid secretion within and contraction of the large intestine to cause bowel movement.

Ipecac - It shows emetic effect by irritating the stomach lining and chemically stimulating the chemoreceptor trigger zone.

11. Skeletal muscle activity

Examples - Curare
Zingiber officinale
Chamaemelum nobile

Curare-it blocks neuromuscular agent (Ach) to relax skeletal muscle. This causes rapid paralysis of skeletal muscles.

Zingiber officinale- it reduces muscle related pain mainly in elders.

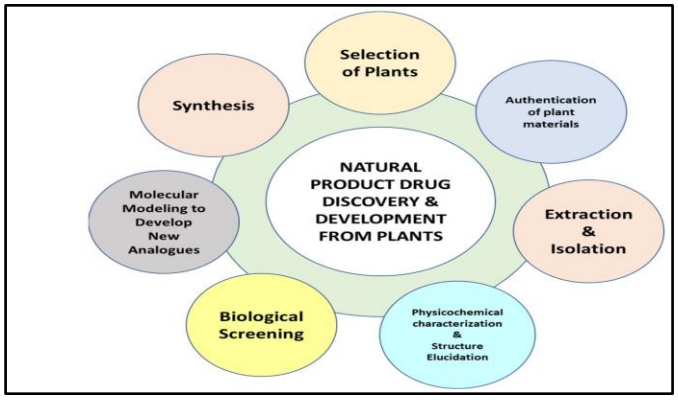

Image of Natural Product Drug Discovery & Development from plants

12. Impact

The exploration of natural products, pharmacological activities contribute significantly to the the development of novel therapeutic agent, offering new avenues for disease management and health care.

13. Conclusion

Pharmacological activities of natural products highlight their importance in preventing and treating wide range of diseases.Because of increased commercial exploitation of medicinal foods, all varieties of fruits and vegetables even plants were re-evaluated for their phytochemical compositions and health benefits. Recently, there has been increased in immune stimulating function of herbs not only in aquaculture but also in other field of research.While modern synthetic chemistry have revolutionized drug discovery , natural products remaining crucial source of new therapeutic agents due to their unique chemical diversity and biological activities . Further research of natural products Pharmacological potential is essential for continue development of safe and effective treatment.

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CHAPTER-38

NATUROPATHY SYSTEM OF MEDICINE

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Abstract: Naturopathy is a distinct type of primary care medicine that blends age-old healing traditions with scientific advances and current research. It is guided by a unique set of principles that recognize the body's innate healing capacity, emphasize disease prevention, and encourage individual responsibility to obtain optimal health. The naturopathic physician strives to thoroughly understand each patient's condition, and views symptoms as the body's means of communicating an underlying imbalance. Treatments address the patient's underlying condition, rather than individual presenting symptoms. Modalities utilized by NDs include diet and clinical nutrition, behavioral change, hydrotherapy, homeopathy, botanical medicine, physical medicine, pharmaceuticals, and minor surgery. Naturopathy can be traced back to the European "nature cure," practiced in the nineteenth-century, which was a system for treating disease with natural modalities such as water, fresh air, diet, and herbs. In the early twentieth-century, naturopathy developed in the U.S. and Canada, combining nature cure, homeopathy, spinal manipulation and other therapies.

Keywords: Naturopathy System, Holistic Approach, Naturopathic medicine, Natural treatment.

1. Introduction

Naturopathy or "Nature Cure" is more than a system of health care: it is both a way of life and a concept of healing, employing various natural means of treating symptoms and the root causes of symptoms. Naturopathy is a system of man building in harmony with the constructive principles of Nature on physical, mental, moral and spiritual planes of living. It has great health promotive, disease preventive and curative as well as restorative potential.

According to the manifesto of British Naturopathic Association, "Naturopathy is a system of treatment which recognises the existence of the vital curative force within the body." It therefore, advocates aiding human system to remove the cause of disease i.e. toxins by expelling unwanted and unused matters from human body for curing diseases.

Naturopathy believes that if one restores or maintains the equilibrium of the body, our immune System is better placed to defend itself against infection and disease. There is therefore no use of or reliance on medication, which would only serve to suppress the symptoms of an illness.

Naturopathic medicine aims to heal the whole body and not just one area of it. It is best to allow nature to do the treatment and to enhance the capability of the body to heal itself. Doing this will not only get relief from a certain disease but boost the immune system of the body.

2. History of naturopathic medicine:

Naturopathy is a hybrid word, and was first coined in 1895 by Dr. John Scheel of New York City, to describe his method of health care.

The term began with the teachings and the concepts of Sir Benedict Lust (mostly hydrotherapy and nature cure traditions).

1900 – 1917 – convergence of American dietetic, hygienic, physical culture, spinal manipulation, mental and emotional healing and homeopathic systems.

1918 – 1937 – Great public interest and support, philosophical basis and scope of therapies encompass botanical, homeopathic and environmental medicine.

1938 – 1970 – Suppression and decline due to the growth of political and social dominance of allopathic medicine, combined with the infatuation with technology and miracle drugs, and surgical procedures.

→1971 – present – Naturopathic medicine reemerges due to growing awareness of health promotion, prevention of disease and concern for the environment.

3. Principles of naturopathic medicine:

Do not harm – The first principle of Naturopathy is that Naturopathy doctors must not harm their patients. They must follow a non-invasive and gentle procedure to honour the holistic abilities of each patient hence not interfering with the natural healing process.

Healing power of nature – Naturopathy identifies and brings out an individual's hidden healing abilities by understanding the effects that nature has on our bodies. As the process is completely natural, the chances for any side effects are close to zero..

Treat and cause – While modern medicine mostly focuses on treating symptoms for a better chance of recovery, it does not guarantee that the problem will not occur again. Naturopathy believes in identifying the underlying cause of your problem and diving deep into it to understand what caused it. It could have been the environment, lifestyle, or your inner dispositions.

Doctor as teacher – Learning about your own body from your naturopathy doctor is essential for maximum effect of naturopathy. Your naturopathic doctor will teach you how to take care of your own body in their absence.

Treat the whole person – While Western medicine focuses on treating a specific illness in your body, naturopathy aims to treat the person completely to eradicate any disease that might have affected you through your environment, habits, or physical state.

Disease prevention – It's like building a dam for diseases in your body. Naturopathy specialises in the prevention of disease and stops it from spreading any further. You would be given a set of rules to live your life by prioritising personal and environmental hygiene.

4. Naturopathic Approaches:

Naturopathic treatment can take the form of a variety of therapies and approaches, including

Dietary advice – a balanced diet is an essential component for a healthy body.

Herbal remedies – traditional remedies utilized for hundreds of years for healing.

Hydrotherapy – the healing power of water.

Iridology – analysis of the iris for diagnosis of health issues.

Massage – the manipulation of the tissues of the body for healing and relaxation.

Nutritional supplements – especially useful when immunity is compromised by illness.

Osteopathy – manipulation therapy concerned with the musculo-skeletal system.

4.1 Types of Naturopathy Treatment : Hydrotherapy, Ayurveda, Mud therapy, Sun therapy, and Color therapy, Massage therapy, Homeopathy, Magnet therapy, Unani , Natural diet and fasting therapy, Yoga therapy, Acupressure.

4.2 Hydrotherapy:

A branch of naturopathic medicine that deals with the use of water in various forms (ice, water, steam) at various temperatures, for various time periods, to treat diseases is known as Hydrotherapy. It uses the curative properties of water in the treatment of various ailments in the form of packs, compresses, baths and steam baths (back, spine, arm, leg), (chest, heart, throat) packs, local steam etc.

Throughout the beginning of time, hydrotherapy has been used to treat pain. The physiologic and bio-dynamic qualities of water are used to decrease pain and promote body function. A fundamental grasp of the various hydrotherapy procedures used for the treatment purpose. Some physical characteristics of water such as buoyancy, hydrostatic pressure, viscosity, refraction, and specific heats are responsible for the therapeutic effect of water.

Water has a wide range of physiological effects.. The main therapeutic benefit of hydrotherapy are the encouragement of muscle relaxation, reduction of muscle spasm, and improvement of ease of movement.

4.3 Ayurveda:

Ayurveda is considered to be the soul of naturopathic treatment and this particular type of treatment is known to have potential for almost all kinds of diseases, especially life style diseases are more likely to find better cure through Ayurveda than other traditions of treatment.

In Ayurveda our body is said to be organized in accordance with three major characteristics, namely, Vata, Pitta and Kapha. All the diseases are characterized with their relation with any of these characteristics or 'doshas'. According to the determination of the association of the disease with any of these 'doshas' medicine is prescribed along with a prescription for necessary nutrition and life style changes.

Ayurvedic medicines are prepared from natural herbs and other natural produces and have no side effect on the body.

4.4. Mud therapy:

Mud is a symbol for prithvi (earth), one of the panchamahabhutas' elements. It is regarded as some of the first universal knowledge for healing illness and restoring health.

According to history, people have used mud for medicinal purposes since the early Middle Ages. It served as a valuable therapeutic tool at the time. One of the early proponents of natural medicine was Just a thought that lying down and sleeping would heal all illnesses.

Mud therapy includes treatments such as mud packs (local mud baths), hot mud applications and full body mud baths. To provide a cooling effect by absorbing body heat, reducing inflammation, improving circulation, absorption and elimination.

Mud therapy, which uses mineral waters and mud packs to treat chronic illnesses, rose in popularity in Europe between the 17^{th} and 19^{th} centuries.

4.5 Sun therapy and color therapy:

Surya Chikitsa is the therapy in which sunlight is used to cure various diseases. Surya Chikitsa focuses on the application of sunlight in the treatment of various diseases especially skin diseases.

Colour therapy involves the application of different colours for the treatment and management of diseases. Colour therapy is a type of holistic therapy that uses the visible spectrum of light and colour to affect a person's physical or mental health.

Each colour holds a specific frequency and vibration, which affects the energy and frequencies within our body. Colour charged oils and water are also used for the therapeutic purpose in this therapy.

4.6 Massage therapy:

The practise of massage therapy involves the scientific manipulation of the body's soft tissues. It primarily uses manual (hands-on) techniques to apply fixed or variable pressure, hold and move muscles, and manipulate body tissues.

Massage therapy is done to relax and detox the body, increase blood circulation, enhance nutrition to the muscles, improve blood circulation, improve skin activity, activate sweat glands, and normalise the functioning of the nerves.

5. Homeopathy:

Homeopathy as a type of naturopathic treatment is characterized with the philosophy of treating the gross disharmony of the body rather than finding treatment for any particular disease. The philosophy is explained in the famous saying of the founder of homeopathy, Hahnemann that, 'treat the patient, not the disease' and this famous quotation well explains the way homeopathy works towards the treatment of any disease.

Most importantly, homeopathic medicines are absolutely side effect less and application of the homeopathic medicine is more dependent on the diagnosis of the treatment and in homeopathic treatment one medicine can be prescribed for great many types of diseases and symptoms.

6. Magnet therapy:

Magnets are used to relieve pain in various areas of the body. It is a system that treats the sick with the application of magnets to afflicted parts of the body. Magneto-therapy is based on the fact that magnetic fields have the ability to heal the body and relieve pain.

While the therapeutic benefits of static magnetic fields have been studied, magneto-therapy has a long history in Europe as a safe physiotherapist approach for the treatment of several disorders (articular, intra-abdominal, and intra-cranial). A patient stand within the coil as the electric current runs through it. In an effort to purportedly promote recovery, the patient's entire body can be submerged in a magnetic field. Such therapies' allure may be due to the placebo effect or maybe to some degree of healing impact.

With its capacity to penetrate deeply into the tissue throughout the mending process, magneto-therapy is an alternative physical therapy treatment that has positive results.

7. Unani:

According to Unani medicine, management of any disease depends upon the diagnosis of disease. In the diagnosis, clinical features, i.e., signs, symptoms, laboratory features and mizaj (temperament) are important. Any cause and or factor is countered by Quwwat-e-Mudabbira-e-Badan (the power of body responsible to maintain health), the failing of which may lead to quantitatively or qualitatively derangement of the normal equilibrium of akhlat (humors) of body which constitute the tissues and organs.

This abnormal humor leads to pathological changes in the tissues anatomically and physiologically at the affected site and exhibits the clinical manifestations. After diagnosing the disease, UsooleIlaj (principle of management) of disease is determined on the basis of etiology in the following pattern: elimination of cause, normalization of humors, normalization of tissues/organs

For fulfilment of requirements of principle of management, treatment is decided as per the Unani medicine which may be one or more of the following:

Regimenal Therapy, Cupping Therapy, Aromatherapy, Pharmacotherapy or surgery.

8. Natural diet and fasting therapy:

Naturopathy believes that food is an important factor in maintaining health and that a faulty lifestyle of food causes weakness of the digestive system and this leads to accumulation of toxins in the body which ultimately leads to diseases.

Diet and fasting play an important role in treating our faulty system as they facilitate faster removal of toxins and the healing process. Various types of cleansing and rejuvenation diet plans are offered according to the conditions and needs of the patient. Various types of fasting are done under the strict supervision of well trained naturopathic doctors. It is important that after fasting, the patient should break the fast gradually with fruit juices, fruits, salads and then a normal cooked diet.

9. Yoga therapy:

Yoga therapy is the application of yogic concepts to a specific person in order to meet that person's spiritual, psychological, or physical objectives. The techniques used are composed of well-thought-out procedures that may include, but are not limited to, Ashtanga Yoga's yama, niyama, asana, pranayama, pratyahara, dharana, dhyana, and samadhi teachings.

In order to meet the needs of the individual, other methods such as ritual, chanting, imagery, textual study, spiritual or psychological counselling, and meditation are also included. Individual diversity in age, culture, religion, philosophy, career, and mental and physical health are respected in yoga therapy.

10. Acupressure:

Acupressure has shown exceptional therapeutic promise for treating a variety of illness states. A kind of acupuncture is acupressure. The core idea behind acupuncture and acupressure is the activation of acupoints along meridians. In acupressure, muscle tension is relieved by pressing certain acupoints with the hands, pressing the thumbs on particular points, or using pressure to balance the flow of physiological energy.

Applying physical pressure on trigger points, acupoints, or certain pressure points located along meridians is required for acupressure. The human body's numerous organs and tissues are related to each meridian. Pressure applied to a specific location on a meridian causes it to become activated, which promotes pain relief both locally and across the body.

It is a pressure point-based, hand-mediated energy healing treatment that is regarded as an effective method for the management of a variety of ailments as well as for the improvement of physical comfort,

fulfilment, and economy. Acupressure is a manually administered, needle-free, non-invasive, economical, and non-pharmacological healing method that is used to improve patients' well-being.

11. Conclusion

Naturopathy is a holistic approach to healthcare that integrates traditional healing practices with modern medical principles. It emphasizes the body's innate ability to heal, focusing on prevention and education. Naturopathic treatments include dietary changes, herbal medicine, hydrotherapy, and lifestyle counseling, aiming to address underlying health issues rather than just symptoms. Practitioners are typically categorized as licensed naturopathic doctors or traditional naturopaths, with varying levels of training and recognition. While some therapies are evidence-based, others remain controversial and should complement, not replace conventional medical treatments.

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CHAPTER-34

INDUSTRIAL CROPS AND PRODUCTS

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Abstract: Industrial Crops and Products is an International Journal publishing research on cultivated plants (crops) of industrial interest (non-food, non-feed). Papers concern both crop-oriented and bio-based materials research. It should be of interest to an international audience, hypothesis driven, and repeatable. Crops and products of interest include: fiber, forest, and energy crops, industrial oilseeds, rubber and resins, and cultivated medicinal and aromatic plants. The plant(s) in the manuscript must fit our definition of industrial crops.

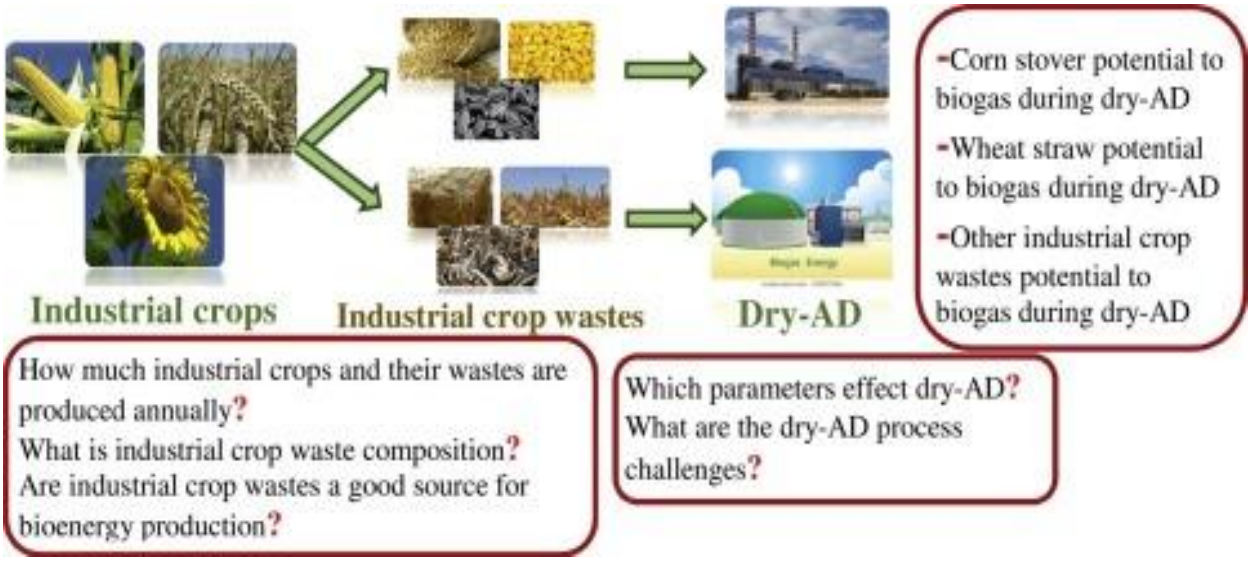
Keywords: Industrial crops, types, Factors, Applications

1. Introduction:

Industrial crops are plants that produce oils, fiber, or chemicals from their leaves, seeds, bark, or roots. They can be used for income or on-farm use.Some examples of industrial crops include sesame and sweet sorghum. Sesame is grown for its seeds and the oil extracted from them, while sweet sorghum is grown for its syrup and sugar.

Plant fibers are a valuable commodity in world trade and are essential for manufacturing clothing, cordage, and coarse fabrics. Oil crops are the second most important crop in the world by sown areas, after cereals.

Industrial crops are suitable resources for oils, waxes, resins, rubbers, gums, fibers, dye, latexes, sugars, starches, proteins, and energy production (Hoffmann and Lipinsky, 1983). By introducing energy crops, biofuel production in measurable scale was developed. Sustainability and flexibility of feedstock, high biodegradability, minimal toxicity, and socioeconomic issues associated with rural areas are biofuel advantages, compared to fossil fuels. On the other hand, applying bioenergy for different purposes decreases greenhouse gas emissions because the emitted carbon from biofuel combustion has been extracted by growing plants .Biodiesel from oilseed and bioethanol from sugarcane, corn, and wheat are the most popular industrial biofuels. In the near term, according to the feedstock used in the process, biofuels are roughly grouped into first- and second-generation biofuels. Energy crops with human food potential and lignocellulosic biomass without food usage are the first- and second-generation biofuels feedstocks, respectivel



Crops

Crops are plants grown by the farmers. Agriculture plays a very important role in the Indian economy. It is the backbone of our country. 70% of the Indian population depends on agriculture for food and money. It is the major occupation in the rural areas. The cultivation of crops depends primarily on the weather and soil conditions.

Crops

Industrial agriculture

1.1 Types of industrial crops and products:

Here are some types of industrial crops and their products:

(a) Fiber crops

These plants are grown to produce fiber for textiles, rope, paper, and filling. Some examples of fiber crops include cotton, hemp, jute, kenaf, and flax.

(b) Oilseed crops

These crops are grown for the oil in their seeds. The oil content of different oilseed crops varies, with soybeans having around 20% oil content and sunflowers having around 40%. Seed oils can be used for both industrial and edible purposes.

(c) Sugar cane

Sugar cane is used to make a variety of industrial products. The sugar from sugar cane is used to make different products in industries. A small amount of sugar cane is also used to make things like khandsari and gur.

2. Energy crops

These crops are a type of industrial crop that can help farmers increase their revenue.

(a) Chemical plants

These plants are primarily concerned with manufacturing chemicals that are used in a variety of materials.

Kharif Crops

- The crops which are grown in the monsoon season are known as Kharif crops. For eg., maize, millet, and cotton.
- The seeds are sown at the beginning of monsoon season and harvested at the end of the monsoon

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- Such crops require a lot of water and hot weather for proper growth.

Rabi Crops

- The name “Rabi” means “spring” – a word derived from Arabic.
- The crops that are grown in the winter season and harvested in the spring are called Rabi crops.
- Wheat, gram, and mustard are some of the Rabi crops.

- Various agricultural practices are carried out to produce new crop varieties.
- Such crops require a warm climate for the germination and maturation of seeds. They, however, require a cold climate for their growth.

Zaid Crops

- Such crops are grown between the Kharif and Rabi seasons, i.e., between March and June.
- These crops mature early.
- Cucumber, pumpkin, bitter gourd, and watermelon are zaid crops.

Other types of industrial crops include:

- Tobacco
- Hops
- Aromatic, culinary, and medicinal plants

2.1 Factors Affecting Crop Production:

The factors affecting the production of crops include:

Internal or Genetic Factors:

The genetic makeup decides crop growth and production. Breeders incorporate maximum desirable characters in the crops to obtain a new hybrid variety. The desirable characters include:

- Early maturity
- High yielding ability
- Resistance to drought, flood, and salinity
- Tolerance to insect and diseases
- Resistance to lodging
- The chemical composition of grains
- Quality of grains and straw

These characters are transmitted from one generation to another.

2.2 External or Environmental Factors:

The external factors include:

- Climatic
- Edaphic
- Biotic
- Socio-economic

Climatic Factors:

The climatic factors that affect crop production include:

- Precipitation
- Temperature
- Atmospheric Humidity
- Solar radiation
- Wind Velocity
- Atmospheric Gases

Edaphic Factors:

The growth of the plants depends upon the type of soil on which they are grown. These are known as edaphic factors and include the following:

- Soil Moisture
- Soil Air
- Soil Temperature
- Soil Mineral Matter
- Soil Organic Matter
- Soil Organisms
- Soil Reactions

Biotic Factors

Plants and animals are biotic factors that affect crop production. Even pests impact crop production, often with negative implications.

Socio-economic Factors:

- The number of human resources available for cultivation.
- The inclination of society towards cultivation.
- Appropriate choice of crops.
- Breeding varieties for increased yield or pest resistance by human inventions.

2.3 Applications:

- **Bioenergy:** Industrial crops can be used to produce biofuel, a clean alternative to fossil fuels. Biogas can be produced from industrial crop wastes like wheat straw, corn stover, and sugar beet residue**.**
- **Chemicals**: Industrial crops can be used to produce insecticides, herbicides, fungicides, and pharmaceuticals.

- **Essential oils:** Essential oils can be used to make inks, dyes, lubricants, perfumes, cosmetics, and plastics.
- **Fibers:** Industrial crops can be used to produce fibers. For example, cotton is a mono-functional industrial crop that is used only for fiber.
- **Food industry**: Some industrial crops, like oil palm and sugarcane, are used in the food industry, even though they are not staple crops.
- **Rubber:** Industrial crops can be used to produce rubber and related compounds.
- **Timber**: Industrial crops can be used to produce timber.

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CHAPTER-37

HOMEOPATHY SYSTEM OF MEDICINE

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Abstract: Homeopathic is the part of alternative system of medicine. Simply means treating disease with remedies prescribed in minute doses. This is capable of producing symptoms similar to the disease, when taken by healthy people. It is based on the natural law of healing 'Similia Similibus curenthur.'Homeopathic word derived from Greek word homeos means similar and pathos means suffering . Homeopathic medicines are prepared by plant source , mineral source ,animal source, diseased tissues , imponderables hormones and healthy tissues.

Keywords: Principles of homeopathy, Source of homeopathy, Benefits of homeopathy, Precautions & Side effects of homeopathic medicines

1. Introduction

Homeopathy is a highly systematic method of clinical evaluation .The term homeopathy is derived from the Greek word homeos and pathos which means similar suffering. Homeos - Similar Pathos - Suffering .In these system medicine is chose according to the law of Similars (the concept of like curing like), these principle based on the observed relationship between a medicine produces the ability a special batch of signs and symptoms in a healthy person and the same medicines ability to cure a sick patient with similar signs and symptoms. These principles recognized by firstly Hippocrates. Homeopathic medicines appropriate 70% derived from the herbs. They are prepared by the any part of plants like fruits, seeds, stems, bark, flowers, leaf, stigma or root and non woody plant.

Homoeopathy was discovered by a German Physician, Dr. Christian Friedrich Samuel Hahnemann (1755-1843), in the late eighteenth century. It is a therapeutic system of medicine premised on the principle, "Similia Similibus Curentur" or 'let likes be treated by likes'. It is a method of treatment for curing the patient by medicines that possess the power of producing similar symptoms in a healthy human being simulating the natural disease, which it can cure in the diseased person. It treats the patients not only through holistic approach but also considers individualistic characteristics of the person. This concept of 'law of similars' was also enunciated by Hippocrates and Paracelsus, but Dr. Hahnemann established it on a scientific footing despite the fact that he lived in an age when modern laboratory methods were almost unknown.

PCIM&H coordinates with Homoeopathic Pharmacopoeia Committee (HPC) to publish/validate/arrange for various activities regarding official Pharmacopoeia for quality standards of single drugs of plant/chemical/mineral/animal origin listed in the Homoeopathic Pharmacopoeia of India at suitable intervals and of such addenda or supplementary compendia during the intervening periods as may be deemed necessary.These pharmacopoeias serve as official compendia of standards under the Drugs and Cosmetics Act, 1940.

Homeopathic is the alternative system of medicine. The German physician Samuel Hahnemann is proposed the homeopathic in 1796. Homeopathic simply means treating disease with remedies prescribed in minute doses. Which are capable of producing symptoms similar to the disease, when taken by healthy people. It is based on the natural law of healing " Similia Similibus curentur".

2. Fundamental Principles of Homoeopathy

Every science has certain basic principles that guide the whole system. Homoeopathy as a science of medical treatment has a philosophy of its own, and its therapeutics is based on certain fundamental principles that are quite distinct and different from those of other school of medical science. These fundamental principles were discussed by Hahnemann in different sections of his medicine and philosophy.

They are as follows:

1. Law of Similia.

2. Law of Simplex.

3. Law of minimum.

4. Drug proving.

5. Drug dynamization or potentization.

6. Vital force.

7. Acute and Chronic Diseases.

8. Individualization.

9. Direction of cure.

3. Law of similia

The therapeutic law on which homoeopathy is based is Simillia Similibus Curentur, which means 'Let likes be cured by likes'. In this art of healing, the medicine administered to a diseased individual is such that if given to a healthy person it produces same sufferings (diseases) as found in the diseases individual. Thus, the symptoms of the diseased individual are to be matched with the pathogenesis of the medicine, and the medicines which are most similar, viz. Simillimum is selected and administered with certainty to cure.

4. Law of simplex

Simple and single drugs should be prescribed at a time. Thus, medicines are proved on healthy human beings singly and in simple form without admixture of any other substance.

4.1 Law of minimum

Drugs are administered in a minimum quantity because of hypersensitivity in disease and the action of drug is always directed towards normal by virtue of altered receptivity of tissue to stimuli in disease. The medicines are just required arouse a reaction in the body. If they are given in large doses, they cause

Physiological action producing unwanted side effects and organic damage. The minutest quantity of medicine helps it to reach the disease, which is of very subtle in nature. The curative action of drug can only be expected without any unwanted aggravation by using minimum quantity of medicine.

4.2 Drug proving

To apply drugs for therapeutic purposes, their curative power should be known. The curative power of a drug is its ability to produce disease symptoms when employed on a healthy person. The curative power of a drug is known by its pathogenesis and is ascertained by proving the drug singly on healthy human being. This serves the only true record of the curative properties of drug.

4.3 Drug dynamization or potentization

Disease is a disturbance or deviation in the normal harmonious flow of life force which is dynamic in nature. Now medicine used to encounter disease should also have dynamic action to act on the dynamic disturbance of life force. Therefore, the drugs are dynamized or potentized liberating their dynamic curative power which lies dormant in them. This dynamization is done by the process of Trituration (in case of insoluble substances) or Succession (in case of soluble substances).

4.4 Preparation of potencies

The potency can be prepared by three different scales, like decimal scale, centesimal scale and millesimal scale.

4.5 Decimal scale

This scale was introduced by Dr Constantive Bering. In this scale, the first potency should contain 1/10 part of original drug. The second potency will contain 1/10 part of the first potency, and so on. The potency in this scale is denoted by suffixing the letter ‘X’ to the number indicating the potency, i.e. the first potency is 1X, the second potency is 2X, and so on.

4.6 Centesimal scale

In this scale the first potency should contain 1/100 of original drug and the second potency will contain 1/100 of the first potency, and so on. The potency in this scale is denoted by suffixing the letter ‘C’ to the number indicating the potency. In practice, it is generally denoted by a simple numerical 1C potency equivalent to 2X potency and 2C potency is equivalent to 4X, and so on.

4.7 Millesimal scale

In this scale, the first potency should contain 1/50,000 part of the original drug and second potency will contain 1/50,000 of the first potency, and so on. Potency in this scale is denoted by I, II, V, X, etc., or 0/1, 0/2, 0/5, 0/10, etc. In this scale potency 0/2 is equivalent to 4C = 8X, 0/4 8C = 16X and so on. Preparation of potency through trituration is made by either decimal or centesimal, and the preparation of potency though succession is made by decimal, centesimal and millesimal.

4.8 Vital force

Disease is nothing but the disharmonious flow of the vital force giving rise to abnormal sensation and functions (symp-toms and signs). In order to restore the health, the disor-dered vital force is to be brought back to normal. Disease and health are two different quantitative states of this vital force of living being, and cure is to be affected here. Vital force has the following characteristics: spiritual, autocratic, automatic, dynamic, unintelligent and instinctive.

5. Acute and chronic diseases

The diseases are classified into these types depending upon their onset, nature of progress and termination of diseases

5.1 Individualization.

No two individuals are alike in the world, so the diseases affecting individuals can never be the same assuming the unique individual picture in each diseased individual. Thus, medicines can never be prescribed on the basis of the name of the disease without individualizing each case of disease.

5.2 Direction of cure

Dr. Hering states that 'cure takes place within outward from above to downward and the symptoms disappears in the reverse of their appearance'. If the direction is reverse of that stated then it is not cure but suppression which has occurred.

5.3 Sources of homeopathic medicine

1. Plant Kingdom

2. Mineral Kingdom

3. Animal Kingdom

4. Disease tissues

5. Hormones and healthy tissues

6. Imponderables

Plant Kingdom

About 60% of homeopathic medicines is prepared by the one or more parts of the plants.Such as leaves, root, flowers, seeds, and berries.Various types of plants, benign, poisonous and carnivores used in the homeopathic medicines.

Mineral Kingdom

20% of the homeopathic medicines are prepared from minerals.Pharmaceutical uses of almost all known metals and non-metals and various important compound have been exploited in homeopathy. Eg. Gold, Potassium, Common salt, and Silica.

Animal Kingdom

Homeopathic medicines is prepared from the certain animal products. Animal products, like snake poison, spider poison etc are used in extremely minute doses to prepare homeopathic medicines.

Diseased tissues

Some homeopathic medicines is formulated by the using of tissues or secretions contains viruses, bacteria, and other microorganisms.

Hormones and healthy tissues

Homeopathic medicines is prepared from the using of healthy humans/ animals tissues and it's secretions.Eg. Thyroidinum and Adrenaline.

Imponderables

Magnetism, x-ray radiation etc are energy sources is also used in homeopathic medicines preparation.

5.3.1Benefits of homeopathic medicine

Pregnant and nursing women can be used these medicine.

- Children and infants can be used these medicine.
- Dose not interfere with the remedy taken by a person
- If the incorrect doses is completely safe and it will not harm the person at all.
- It is used in chronic and acute conditions.
- Homeopathic remedies is produces very rare side effects.

5.3.2 Precautions of homeopathic medicine

- We take the medicine homeopathic practitioners.
- It can also avoid taking antidotes and other substances.
- During treatment time avoided the coffee, peppermint, camphor and very spicy foods.
- It also handled with care , and can not be touched with the hands or fingers.[8]

5.3.3 Side effects

It produce some time aggravation during initial treatment with homeopathic remedies.These aggravation is a positive sign that the remedy is good match for the patient symptoms. It produce the emotional disturbances, we known by patient can experience.

6. Conclusion

In this review literature we are discussed about the homeopathic system of medicine. It is broadly used in the medical field. It is based on the natural law of healing 'Similia Similibus curenthur.' Dr. Samuel Hahnemann gave it a scientific basis in the earth in 19th century. It is based on demanstrable laws and principles such as Law of Similia, law of single remedy, law of Minimum dose, potenzed remedy.

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