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A REVIEW: DIFFERENT EXTRACTION TECHNIQUES ON PLANT ALKALOIDS

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Extraction, Alkaloids, Techniques, Separation, Herbal medicine

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ABSTRACT: Natural products have achieved approval globally for assisting healthcare and also disease obstruction. Alkaloids are an important group of diversely distributed, chemically, biologically and commercially significant natural product which have various organic compounds that give different pharmacological activities. The most important and initial step in medicinal plant is extraction because the bioactive compounds need to be extracted from the plant and various techniques are involved like ultrasound assisted extraction, microwave assisted extraction, supercritical fluid extraction, solid phase extraction, liquid-liquid extraction, enzyme assisted extraction *etc*. alkaloids are obtained from plant, bacteria, fungi and animals. In this paper we gather information about plant alkaloids, classification of plant alkaloids with their different types of extraction techniques, chemical structure and biological sources. Natural products have achieved approval globally for assist healthcare and also disease obstruction. Alkaloids are an important group of diversely distributed, chemically, biologically and commercially significant natural product which have various organic compounds that give different pharmacological activities. Wide range of alkaloids is present in different parts of plants. Different parts have different types of pharmacological properties. Due to various pharmacological values and therapeutic use alkaloids one of the important phytoconstituent. The most important and initial step in medicinal plant is extraction because the bioactive compounds need to be extracted from the plant and various techniques are involved like ultrasound assisted extraction, microwave assisted extraction, supercritical fluid extraction, solid phase extraction, liquid-liquid extraction, enzyme assisted extraction etc. alkaloids are obtained from plant, bacteria, fungi and animals. In this paper we gather information about plant alkaloids, classification of plant alkaloids with their different types of extraction techniques, chemical structure and biological sources. This is helpful for the different extraction techniques for particular part of the plant to extract alkaloids. Alkaloids play an important in the defence systems against pathogens and animals. Therapeutic application of alkaloids includes anti-tumor, anti-viral, anti-inflammatory, anti-malarial activities.

INTRODUCTION: Globe knows that plants are well of origin of a diversity of chemicals with nutritional and healing effects.

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Earliest human beings were completely sensible of the rich potential of herbs for healing various types of diseases. Herbs may be handed-down rightly as teas or extracts (herbals) and they may be used in manufacturing of drugs.

The research or utilize of such medicinal herbs to preclude and cure infections and ill health other wise to encourage well-being and recovering is frequently investigated as herbal medicine. A medicine or compound made from plant on the

other hand plants and used for medicinal known as an herbal drug [1]. In absolute difference to the advanced countries, it is approximate that in excess of one billion individuals live in miserable and that in excess of 80% of the society citizens depend only on local system of medicines, which are mostly based on herbs or plants. The WHO guesses that some 20,000 types of higher plant are used medicinally all over the planet [2]. The significance to medicine of natural effect particles reclines in addition to their pharmaceutical or chemotherapeutic outcome but also in their role as plan molecules for the manufacturing of new drug substances. Morphine from opium poppy for example which continue to be used as a most productive analgesic for the comfort of ultimate pain [3].

Alkaloids are occurring nature ally, and it is very different group of organic compound. Which have at the minimum one nitrogen atom and also have ring structure. Alkaloids are obtained from wide group of organisms that involved plants, bacteria, fungi and animals. They have low molecular weight and presence of heterocyclic ring structure [4]. They are wide sets of secondary metabolites. Alkaloids name derived from "alkaline" because to describe any nitrogen carrying base. They are generally organic bases create salt with acid, although when soluble shows alkaline mixture. Plant alkaloids shows defence system against pathogen and protect the plant. Alkaloids carry 20% of plant kind [5].

The effective alkaloids are present mainly in flowering plants. Alkaloids are present in every part of plant like leaves, stems, roots, flowers, and fruits in different percentage. They have various types of structure. The outline between alkaloids and another nitrogen containing compound is not properly clear. Mainly alkaloids have oxygen in their molecular structure [6]. They are generally colourless crystal sat environmental condition. Some alkaloids are yellow in colour. Alkaloids are willingly soluble in organic solvents like chloroform, diethyl ether. Alkaloids are bitter in taste [6]. Alkaloids have various structural diversity and various properties due to these there is no proper classification of alkaloids. Some classifications are based on similarity of skeleton of carbon, some classification based on their families so that on the basis of different characteristics there is different class of classification. But alkaloids are majorly divided in to three classes [7].

True alkaloids

Proto alkaloids

Pseudo alkaloids

True Alkaloids: True alkaloids are obtained from amino acid and they have heterocyclic ring with nitrogen atom. They are extremely responsive material with biological activity within small doses also. They could come about in plantain the complimentary state as salts and N-oxides. Examples are cocaine, morphine, quinine etc [7].

Proto Alkaloids: Proto alkaloids are combination that the N atom obtained from amino acid which is not heterocyclic. They have closed ring, living model but fundamentally uncomplicated alkaloids. Examples are adrenaline, ephedrine etc [8].

Pseudo Alkaloids: Pseudo alkaloids are combination in which the basic carbon atom is not obtained from amino acids. They are connected with acid pathways. They are obtained from parent (precursor) of amino acids and also from non-parent (non-precursor) of amino acids. The N atom placed into the fragment at almost lost phase. Examples are the bromine, caffeine etc [8].

Extraction Techniques: Extraction is word that used as pharmaceutically. The most important and initial step in medicinal plant is extraction because the liked bioactive compounds need to be extracted from the plant and after the extraction their further analysis like fractionation and separation of extract [8]. Extraction can be defied as separation, split or detachment process of plant to get active constituents or bioactive compounds from passive components using suitable standard extraction technique to extract phytochemicals. Which are present in the different part, region of plant because of plant matrices. The appropriate an extraction procedure which possibly polar, non-polar or both. Extraction method absorbed solvent extraction, pressing, distillation method and sublimation as per the extraction principle [9]. Solvent extraction method is used the most. The determination of all extraction to separate out plant metabolites and

insoluble cellular marc (residue) leaving behind [8]. For the extraction, Plant or raw material can be used in dry or fresh form. Nevertheless, the first choice is dry form over the fresh plant material. Because of fresh material degenerated faster as contrasted to dry material. Drying process is important and majorly used drying techniques are air- drying, oven-drying, and microwave-drying. In air-drying depending upon sample, it takes weeks or months. These types of samples are heat sensitive so that in all over the drying process is in room temperature or in moderated temperature. Oven-drying is safe and easy. It uses thermal energy for remove the moisture present in the sample or raw material [9]. In the extraction there is the reduction of the size of material, so it is useful process for size reduction. Oven-drying is faster process to dry the sample material. Microwave-drying is using electromagnetic radiation to excite rotational motion of molecules, later, in system heat is generated and after that drying process is condense. Due to electromagnetic radiation filed possesses electric and magnetic both. The electric field causes continuously heating due to dipolar rotation. Swinging causes crash between molecules and due to these fast heating of the sample [8].

Due to variation structure of alkaloids, there is no proper single method of their extraction natural raw sample. Many methods explain that the property of most alkaloids to be soluble in organic solvents but not in water and incompatible tendency of their salts. Several alkaloids present in the most of plants. Mixture of alkaloids extracted first and then separate individual alkaloids [8, 9].

Extraction Methods for Medicinal Plants:

- ❖ Maceration
- ❖ Infusion
- ❖ Decocotion
- ❖ Percolation
- ❖ Soxhlet Extrction
- ❖ Ultrasound Assisted Extraction
- ❖ Microwave Assisted Extraction
- ❖ Supercritical Fluid Extraction
- ❖ Solid Phase Extraction
- ❖ Liduid-Liquid Extraction
- ❖ Enzyme Assisted Extraction

Maceration: In maceration extraction plant material or powdered material take in airtight or closed container with suitable or appropriate solvent for extraction of phytochemicals and this process carried out for minimum 3 days or more at room temperature with repeated shaking after that the mixture tried off and pressed solid residue and clarify by settling or cleaning the mixture. Then evaporate the solvent with liquid evaporator and extract is obtained [10].

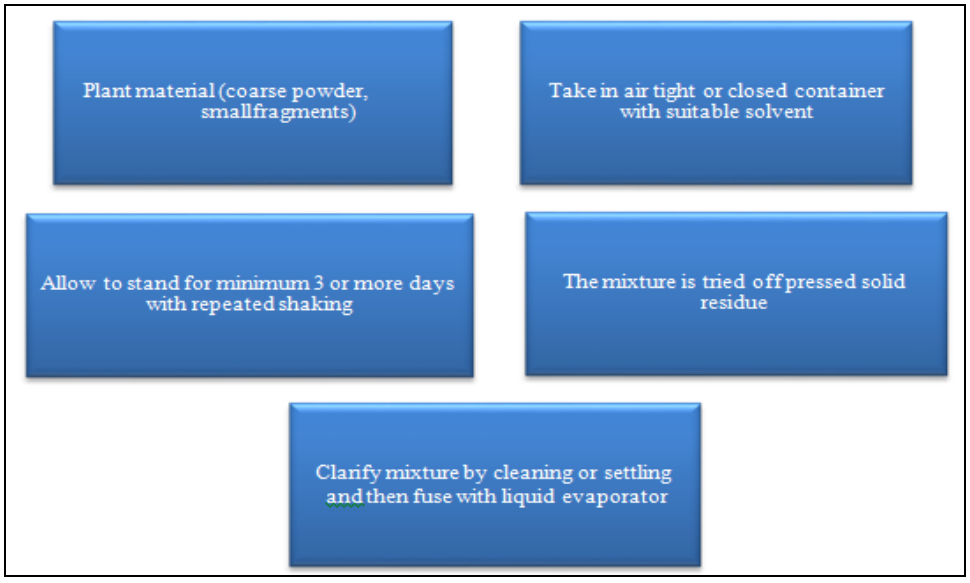
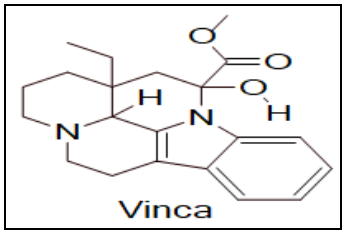
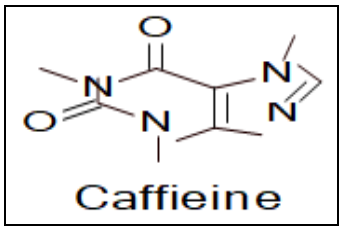


FIG. 1: MACERATION EXTRACTION PROCESS



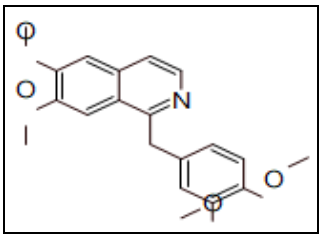
VINCA ALKALOID WAS EXTRACTED WITH MACERATION PROCESS

Infusion and Decoction: Infusion and decoction also named as resultant liquid. Infusion is the process in which raw material are suspended in a solvent like water, oil or alcohol over a time. In infusion they involve the boiling process. Include flowers and leaves. Decoction is the process in which the raw material as mash before extraction for maximum dissolution of the sample and then boil the solvent for the extraction of the chemical compounds. Include stems, roots, bark and rhizomes. They both produce liquids with differing chemical properties but there is different preparation and different temperature gives more oil soluble chemical in decoction in competition with infusion [9, 10, 11].



COFFEE HERB, INDIAN TOBACCO WAS EXTRACTED WITH INFUSION AND DECOCTION PROCEDURE.

Percolation: In the process of percolation extraction solid material which is plant material are soaked with a suitable solvent and allow to stand for approximately 4 hrs in a well closed container, following the mass is fill and the cover of the percolator is lock. Further solvent is added to form a surface layer above the mass. After that the combination is permitted to macerate in the covered percolator for 24 hrs. The exit of the percolator then is unlocked and the solvent carry at hand in is permitted to drop steadily. Further solvent is added on as need, up to the percolate calculate about three-quarters of the needed volume of the final product. After marc is pressed and expressed solvent is filled to the percolate. Add adequate solvent to make the needed volume. And the blend liquid is elucidating by separating or by filtration to draw off. Above procedure is usually used to extract active ingredient (chemical compounds) in the making of tinctures and fluid extract. Shape of percolator is used in the percolation extractions are narrow, cone shaped vessel which is open at both ends. It is more organized than maceration [12, 13].



PAPAVERINE EXTRACTED WITH PERCOLATION PROCESS

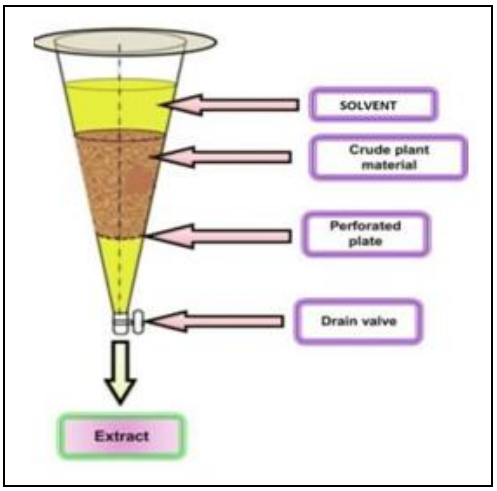


FIG. 2: PERCOLATION PROCESS

Soxhlet Extraction (Continuous Hot Extraction): Soxhlet extractor is consisting of extractor body, solvent reservoir, electrical heating sources and water-cooled reflux condenser. In extractor body thimble is there in which raw material or crude drug place.

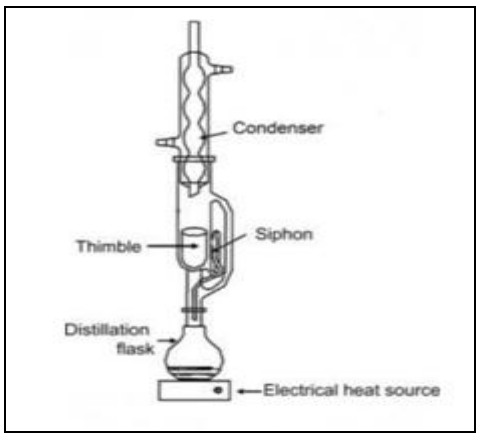


FIG. 3: SOXHLET EXTRACTION ASSEMBELLY

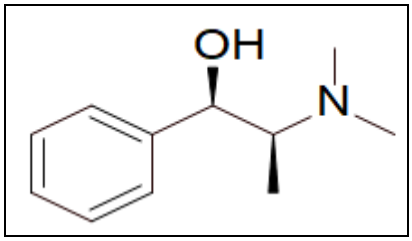
Outer side of extractor have siphon tube. Solvent receiver was distillation flask and in upper side condenser (water cool reflux) was fitted, in condenser two opening was there one is for water inlet and another is for water outlet. Lower side opening is inlet for water which is fitted with water source and upper side of opening is outlet of wastewater. Electric heat source was heating mantle which gives continuous heating to distillation flask and solvent get about to boil.

The raw material or crude drug is put in thimble which is inner portion of extractor body. Raw material is put in solid form in such a way that the solid material is porous. The size of solid material should not be too fine otherwise there is formation of cake inside the thimble. After that solid material was fitted condenser placed on the extractor body and heating mantle fixed with distillation flask is lower side of extractor body.

Then sufficient and suitable solvent pour into the extractor body which goes into distillation flask from the condenser. After that start the heating mantle at appropriate temperature for boiling of solvent. These solvent vapours go into siphon tube and after in water cool reflux due to these vapours converted into solvent and they settle in thimble. When th1imble is fill with solvent drop wise. The movement of warm solvent between the samples holding thimble extract any organic compounds carry it.

The chemical holding solvent gated full in thimble and extractor body. The end is literally a tube by means a tube with the entry of increasing extract carrying solvent detected at the upper end. Previously the extract carrying solvent extends peak of the tube enters the inner tube which is attached with distillation flask.

The solvent is gone in for this inner tube origin a siphoning action which both unloading or clearing solvent from extractor body and joining tubing, all are come back to distillation flask. As the extract carrying solvent will usually have a higher boiling point than the real or pure solvent it is superiorly keep in the distillation flask. Consequently, permit firm (fresh) solvent to reproduce. Permit firm solvent to extract organic compound which is present in the thimble. This solvent cycle is in repetition process for many times (generally at a rate of 4 cycles per hour) for numerous hours (generally between 6 and 24 hours). Wide amount of crude drug can be extracted with less quantity of organic solvent. This process is economy, less time consuming, easy to operate. It is not an eco-friendly extraction method because in this process using of hazardous and flammable organic solvents that condition release toxins during extraction process [14, 15, 16].



EPHEDRA, BETEL NUT, ERGOT, VINCA, NUX-VOMICA WAS EXTRACTED WITH SOXHLET METHOD

Ultrasound Assisted Extraction: It is important process to obtained valuable compounds from crude drug. In these extraction two approaches of ultrasound application involved which is frequency and power of ultrasonic vibration. One is involved high-frequency and low-intensity ultrasound another is low-frequency and high- intensity ultrasound. In low-frequency and high-intensity involves for upgrade the procedure.

The frequency of ultrasound is in range of 20 kHz to 2000 kHz. With the help of frequency ultrasound make cavitation bubble from ultrasonic wave in whole process. Cavitation bubbles induce mechanical effect include shockwave-induced damage. So, the potential energy of expanded bubble is converted into kinetic energy of liquid which extend inside the bubble and penetrate another bubble wall and cavitation is change the system chemical process.

Increasing of reaction rate or particular process or opening new reaction mechanism. So that penetration was occurred in solvent extract cell wall of plant material and break cell membrane also for enhancing for mass transport. It is energy saving process, work in moderate temperature, also use in heat-sensitive compound. The excessive extraction rate is generally reached in initial some minutes [17, 18].

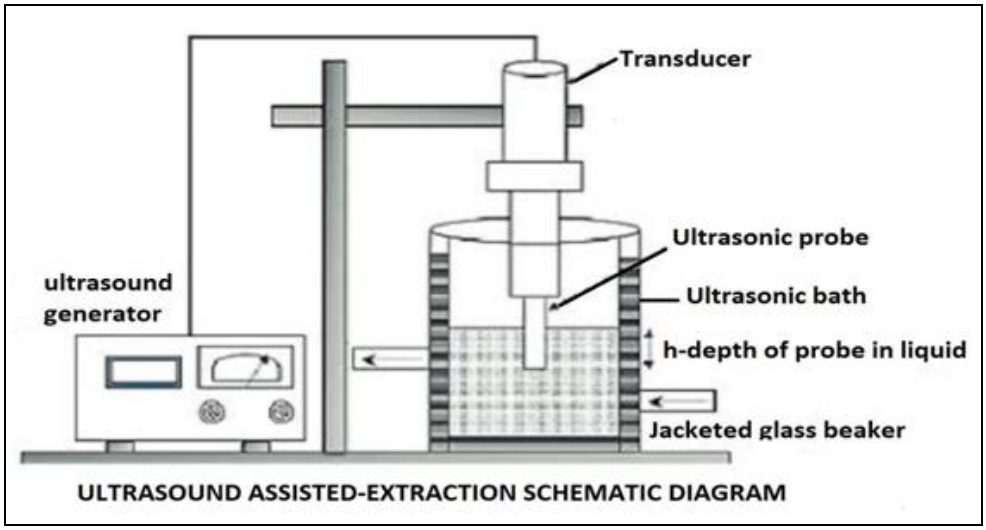
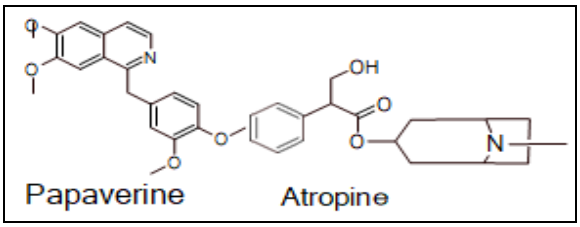


FIG. 4: ULTRASOUND ASSISTED EXTRACTION



OPIUM, BELLADONNA HERB, CINCHONA, CANCER TREE WAS EXTRACTED WITH ULTRASOUND ASSISTED-EXTRACTION

Microwave Assisted Extraction: In microwave assisted extraction in which microwave energy and traditional extraction are merge for extraction. In this extraction microwave energy is applied to warm the solvent in touch with solid sample or liquid sample to help dividing of compound of engrossment from the sample into the solvent. Microwave gives straight heating to solution so that temperature slope is minimum and heating rate is faster due to microwave radiation.

Microwaves are nothing but electromagnetic wave invented of two oscillating fields.

1. Electrical field and
2. Magnetic field

These two fields are perpendicular to each other, and direction of multiplication varies sinusoid ally. Microwaves induce molecular motion with two procedures that is migration of ion and rotation of dipole. The radiation is nonionizing. The magnetic field induced direct movement of waves on the material. As well as free to soak up a bit of the electromagnetic energy and converted into heat. Microwaves produce heat due to ionic conduction and dipole rotation. Both ionic conduction and dipole rotation takes place at the same time in the solvent and in the sample, moreover, successfully turn microwave energy to thermal energy. The result of microwave energy completely is connected with the nature of the two solvent and matrix. Generally, the solvent take to perform this extraction own a high dielectric constant, hence they actively suck up microwave energy. Selection of solvent in this extraction was important due to absorption of radiation is essential part of the extraction. With respect to dielectric constant some common organic solvents are used in microwave assisted extraction.

TABLE 1: SOLVENT USED IN MICROWAVE ASSISTED EXTRACTION

Solvent	Dielectric Constant	Boiling Point (°C)
Acetonitrile	37.5	81.6
Water	76.7	100
Ethanol	24.3	78.3
Methanol	23.9	64.7
Acetone	20.7	56.2
Ethyl acetate	6.02	77
Hexane	1.89	68.7

The extractors are of two types.

1. Open (atmospheric) extractor
2. Closed (pressurized) extractor

Above classification is based on application of microwave energy to the sample. Open system is for one sample and is also known as single-mode and focused system. Closed system is for multiple samples so that is called as multi-mode system or pressurized system.

Multi-mode system permits continuous extraction of up to 12, 24 and 40 samples. With the help of microwave assisted extraction, extract complex sample from crude drug. Also used in environmental analysis and food analysis. It is rapid, more effective and gives more efficacy than Soxhlet extraction and supercritical fluid extraction [19, 20].

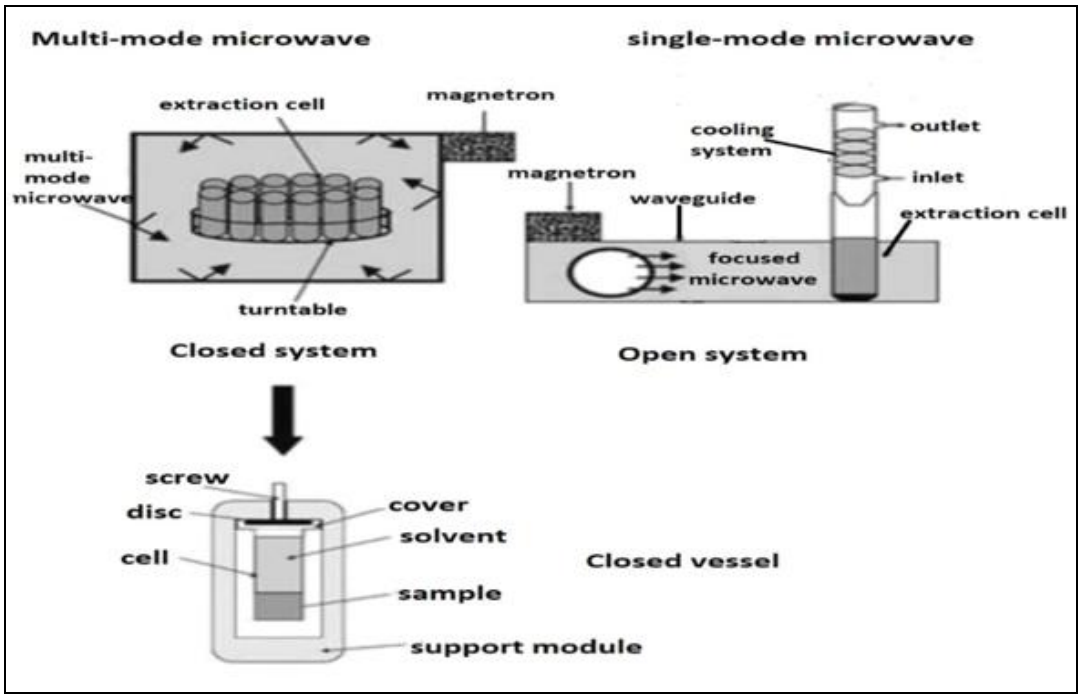
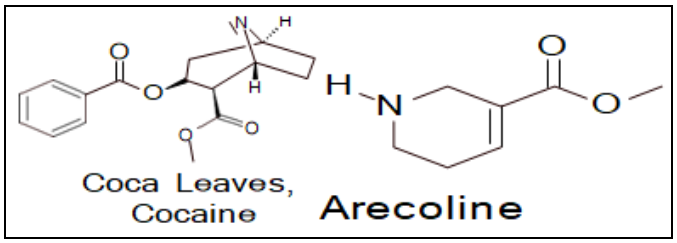


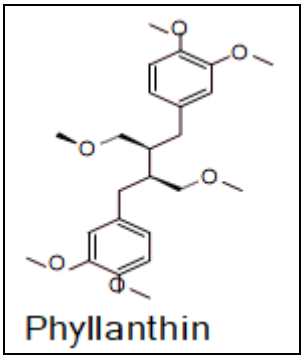
FIG. 5: MICROWAVE ASSISTED EXTRACTION



COCA LEAVES, BETEL NUT, GLORIOSA WAS EXTRACTED WITH MICROWAVE ASSISTED EXTRACTION PROCESS

Accelerated Solvent Extraction: Accelerated solvent extraction is method which included extraction utilizing liquid solvents at raised temperature and force, which increase the extraction production as contrast to those methods put through at near room temperature and atmospheric pressure. The standard of allowing the use of solvents at degree above their aerial boiling point is the increase solubility and mass transfer effects. The success of the extraction calculated on the nature of the sample of arrangement, the chemical to be extracted and the position of the chemical within the arrangement. The extraction and improvement of the chemical from the sample arrangements can be indicated in one or two pace. At first, to be able to separate the chemical from the extraction container, the combination is first taken away remove from its area in the sample arrangement; then it is spread between the organic parts of the arrangement to be able to extend the arrangement-fluid connection.

At this phase the chemical is diffused into the extraction period, and then it spread between the extractions stages that are there with in the opening, then it extends the bit of the extraction stage that is pretentious by evaporation. The last phase of the extraction procedure is assembly of the extracted chemicals [21, 22].



BHUIMLA WAS EXTRACTED WITH ACCELERATED SOLVENT EXTRACTION PROCESS

Supercritical Fluid Extration: Supercritical fluid extraction is introduced "green chemistry". Because of in this extraction organic solvents are not involved. Due to use of solvent in extraction waste of solvents are takes place and also at more quantity solvents are used in some extraction like maceration, percolation, Soxhlet extraction. Supercritical CO_2 involved in this extraction which is environment friendly. A supercritical fluid is a material which is more than its critical temperature and critical pressure. Solid sample is filling with dried sample or powder along with supercritical solvents move between the column and breakdown of derivable compounds from the solids. The melted compounds are covey by spreading away to the separator place the combination of extract and solvent are divided between pressure depletion and temperature rise or the two [23].

This extraction apply two types of method

- Dynamic method
- Static method

In dynamic method, the flow of supercritical fluid is regular between extractive column holding sample along with dynamic method the sample is soak up supercritical fluid and here is no rush-away fluid to the extraction column throughout the procedure. In supercritical extraction solubility of solute is depends on temperature and pressure, which possess outcome on thickness of fluid. It is suitable method as it allowed an adaption of the solvent ability and specificity of supercritical fluid. And it is also use for analytical determination with straight connection with gas chromatography and supercritical fluid chromatography.

Supercritical extraction consists of High purity of CO_2 supply

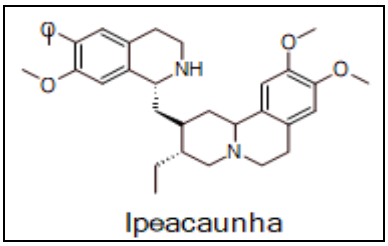
High purity of organic modifier supply Pump

Oven

Extraction vessel

Restrictor and collecting vessel

The selection of CO_2 is a major consideration in supercritical fluid extraction. CO_2 is provided in cylinder shaped with a dip duct which permitted condensed CO_2 to be pushed by needle pump. Organic modifier is to improve the resolution oh hydrophobic compound. Needle pump is in 400atm pressure at the minimum. In heated extraction cell the flow rate of critical fluid is controlled by valve. To extract chemical compound or phyto-constituents cell in which the sample are placed for the extraction. Extraction cell is temperature and pressure controller to continue the wanted state. Restrictor to maintain the pressure and can be selected flow rate. And at the end collecting vessel was their which collect extractive solution. Supercritical fluid extraction is used in pharmaceutical sector, food industries and also in cosmetics. Extraction of complex compounds is carried out. In food industry due to this extraction ingredients are free from chemical addition. In pharmaceutical industry they extract the complex compound with the help of this extraction. In cosmetic industry isolation of antioxidant for cosmetic product which are naturally occurring [24, 25].



IPEACAUNHA, EPHEDRA WAS EXTRACTED WITH SUPERCRITICAL FLUID EXTRACTION PROCESS

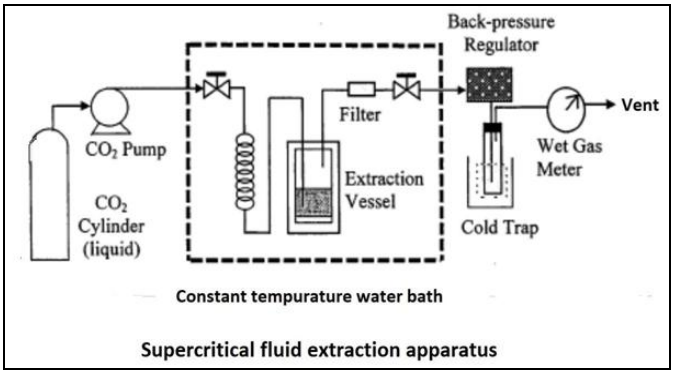
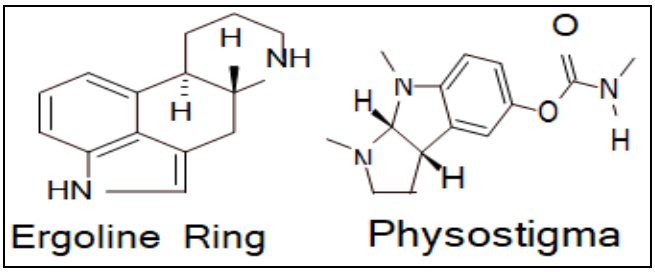


FIG. 6: SUPERCRITICAL FLUID EXTRACTION PROCESS APPARATUS

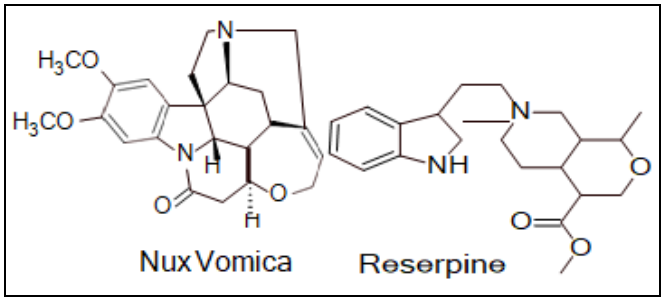
Solid Phase Extraction: Solid is well organized instrument for the test composition in chemistry. Solid phase extraction is at present profitably working in contrasting area of branch of knowledge. In solid phase extraction various resins are use like silica-based, carbon-based, and clay-based. The principle is same as liquid- liquid extraction. The pair of procedures requires the

circulation of disappeared types in the middle of two phases. Still solid phase extraction requires the distribution of the analyte amongst a liquid that is sample medium and a solid that is adsorbent phase alternatively the two liquid phases and may not be blend collectively as in liquid-liquid extraction. This method permits the advance and absolution of the analytes on a solid uptake from the solution [26].



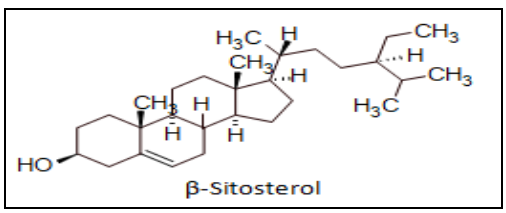
ERGOT, PHYSOSTIGMA WAS EXTRACTED WITH SOLID PHASE EXTRACTION PROCESS

Liquid-Liquid Extraction: Liquid-liquid extraction is called as solvent extraction and dividing method. It is a method to divide mixture or metal compounds. This is constructed on their respective dispersibility in two different un-mixable liquids. Generally, water that means it is a polar and organic solvent that means it is non-polar. There is net move of one or more types from one liquid into other liquid phase, usually from soaking to organic. The transfer is driven by chemical potential, that is once the transfer is complete, the overall system of chemical components that make up the solutes are in a more stable configuration that is lower energy. The solvent that is enriched in solutes is called extract. The feed solution that is depleted in solutes is called the raffinate. Liquid-liquid extraction is a general method in chemical laboratories, where it is carry out to utilize a multiplicity of apparatus [27].



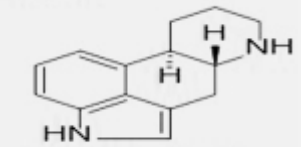
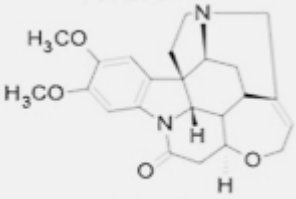
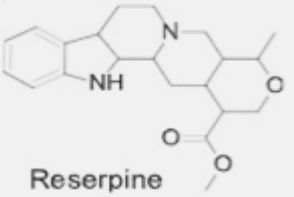
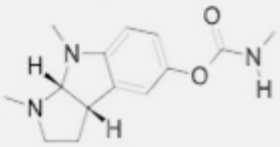
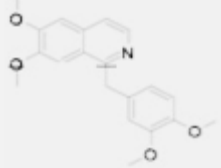
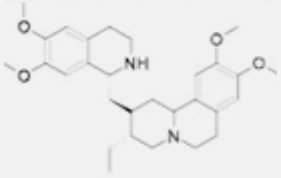
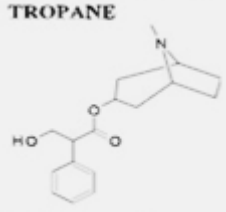
NUX-VOMICA, SARPAGANDHA, OPIUM WAS EXTRACTED WITH LIQUID-LIQUID EXTRACTION PROCESS

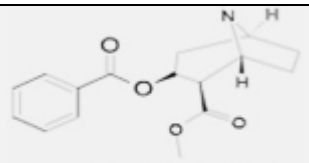
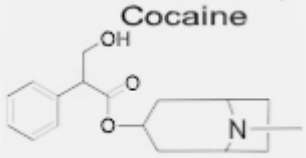
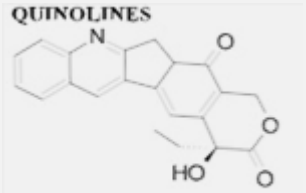
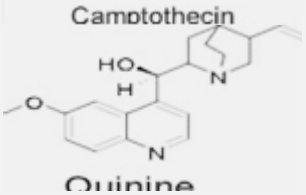
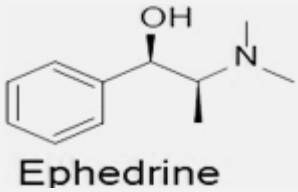
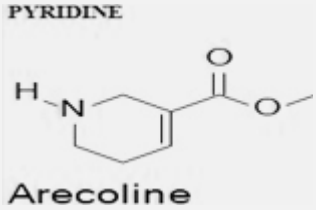
Enzyme-Assisted Extraction: Enzyme-assisted extraction can be observed that it is a blessing to reduce the control of the standard methods. It is an eco-friendly viewpoint and assist to lower the matter have to do with nature. Cellulases, hemicellulases, and pectinases are the enzyme to extract the bioactive. Enzymes are obtained from bacteria and fungi as well as from organs of animals or fruits or green extract. Enzyme-assisted extraction is a specificity process due to mechanism of enzymatic action. Enzyme- assisted extraction is mainly dependent on the capacity of enzyme to separate the cell wall element and to interfere with the constructional complication of cell wall. These procedure permits to uncomplicated breaking of complex of absorption in the volume mixture. Due to formation of an enzyme-substrate unbreakable compound enzyme separate the cell wall. The enzyme couples to substrate with the transform in verification of the enzyme that allows greater interactivity with the substrate. These further the separate response. In these procedures some conditions such as temperature of response, pH of technique, enzyme application, molecule size of substrate, and duration of extraction are important [30, 31].

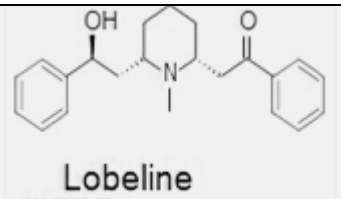
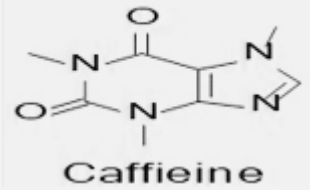
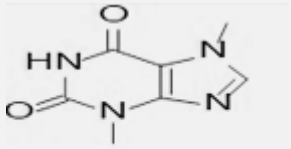
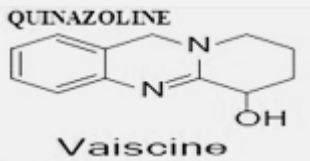
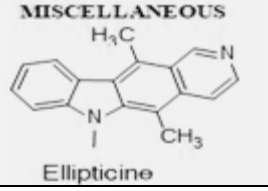


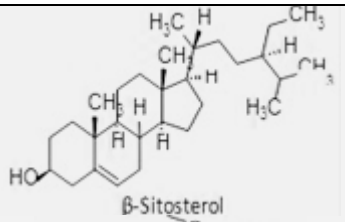
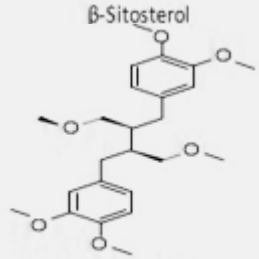
ALOE WEED, PILOCARPUS WAS EXTRACTED WITH ENZYME-ASSISTED EXTRACTION PROCESS

TABLE 2: CLASSIFICATIONS OF ALKALOIDS FROM PLANT SOURCE [31-93]

Alkaloidal Class	Alkaloids	Source AndFamily	Extraction Method	Active Constituen Ts
INDOLE  Ergoline Ring	Ergot	*Claviceps purpure* Family:- *Graminae*	Soxhlet extraction, Solidphase extraction	Ergometrine ergotamine
 Vinca	Vinca	*Catharanthusroseus*	Maceration, percol ation,soxhlet extraction	Vincristine, vinblastine
 Nux Vomica		Family: - *Apocynceae*		
 Reserpine	Nux vomica	*Strychnosvomica*	*Nux*	Liquid-liquid extraction, soxhlet extraction,
 Physostigma		Family: - *Loganiaceae*		decoction
ISOQUINOLINE  Papaverine	Sarpagandha	*Rauwolfiaserpentina* Family: *Apocynceae*	Liquid-liquid extraction, maceration, Soxhlet	Reserpine, rescinnamine
 Ipeacaunha	Physostigma	*Physostigma venonosum* Family: *Loganiaceae*	Maceration,liquid-liquid extraction, solid phase extraction	Physostigmine, physovenine
TROPANE  Hyoscy amine	Opium	*Papaver Somniferum* Family: *Papaveraceae*	Solid extraction, phase ultrasound assisted extraction, liquid-liquid extraction, maceration, percolation	Narcotine, papavrine

 Coca Leaves, Cocaine	Ipeacaunha	*Cephaelis pecacuanha And C. acnminata* Family:- *Rubiaceae*	Solid phase extraction, supercritical fluid extraction, maceration	Emetine, cephaeline
	Datura	*Datura metel* Family: *Solanaceae*	Maceration	Scopolamine, hyoscyamine, atropine
	Coca leaves	*Erythroxylon coca* Family: *Erthroxylaceae*	Microwave-assisted extraction, maceration, solid liquid extraction	Cocaine, cinnamyl cocaine, α-truxilline
	Bella donna herb	*Atropa belledonna* Family: *Solanaeae acuminatal*	Ultrasound assisted extraction assisted extraction, maceration	Atropine, hyoscyamine
 Camptothecin	Cancer tree	*Campthotheca acuminatal* Family:- *Nyssaceae*	Ultrasound assisted extraction, maceration	Camptothecin
 Quinine	Cinchona	*Cinchona calisaya, C. officinali, C. ledgerana, C. succirubra* Family: *Rubiaceae*	Ultrasound assisted extraction, sol idliquid extraction	Quinine, quinidine, cinchonine, cinchonidine
AMINO ALKALOIDS (PROTO-ALKALOIDS)	Colchicum	*Colchicum autumnale* Family: *Liliaceae*	Soxhlet extraction, solid-liquid extraction	Colchicine, demecolcine
 Ephedrine	Ephedra	*Ephedra gerardiana, E. equisetina, E. sinica* Family:- *Ephedraceae*	Supercritical fluid extraction, soxhlet extraction	Epherdrine ,pseudoephedrine
	Gloriosa	*Gloriosa-superba* Family: *Liliaceae*	Solid-liquid extraction, maceration, ultrasound assisted extraction, soxhlet extraction, microwave-assisted extraction	Colchicine
 Arecoline	Betel nut	*Areca catechu* Family:- *Palmae*	Maceration, soxhlet extraction, microwave-assisted extraction, ultrasound assisted extraction, supercritical fluid extraction	Arecoline,arecaidine

 Lobeline	Indian tobacco	*Lobelia nicotianefolia* Family: *Campanulaceae*	Maceration, percolation, decoction	Lobeline, lobelanidine
PURINE  Caffieine	Cocoa	*Theobroma cocoa* Family:- *Sterculiaceae*	Soxhlet extraction, maceration, microwave assisted extraction, ultrasound assisted extraction, supercritical fluid extraction	Theobromine, caffeine
	Coffee herb	*Coffea Arabica* Family:- *Rubiaceae*	Decoction,soxhlet extraction, infusion, microwave-assisted extraction	Caffeine, trigonelline
 Theobromine	Kola	*Cola nitida* Family: *Sterculiaceae*	Maceration, infusion, soxhlet extraction	Caffeine, theobromine
	Pilocarpus	*Pilocarpusjaborandi* Family: Rutaceae	Enzyme-assisted extraction	Pilocarpine,pilosin
	Ashwagandha	*Withania somnifera* Family: *Solanaceae*	Maceration, percolation, decoction, soxhlet extraction, ultrasound-assisted extraction, microwave-assisted extraction	Withanine, somniferine, withanolide
	Kurchi	*Holarrhena antidysentrica* Family: *Apocynaceae*	Maceration, percolation, soxhlet extraction	Conessine, isoconessine
	Veratrum	*Veratrum albu mand Vertarum viride* *Family: Liliaceae*	Soxhlet extraction, supercritical fluid extraction, microwave-assisted extraction	Germidine, protoveratineA and B
	Aconite	*Aconitum napellus* Family: *Ranunculaceae*	Solid phase extraction, soxhlet extraction	Aconitine,neopelline
QUINAZOLINE  Vaiscine	Vasaka	*Adhatoda vasica* Family: *Acanthaceae*	Maceration, percolation, soxhlet extraction	Vaiscine, vasicinone
MISCELLANEOUS  Ellipticine	Bhirngraj	*Ecipilta-alba* Family: *Asteraceae*	Soxhlet extraction, infusion o maceration	Ecliptine, wedilolactone

 β-Sitosterol	Aloe weed	*Evolvulusalsinoides* Family: *Convolvulaceae*	Decoction or infusion, enzyme assisted extraction	Shankhapushpi, β-sitosterol
 Phyllanthin	Bhuimla	*Phyllauthus amarus* Family: *Euohorbiaceae*	Accelerated extraction	Phyllanthin

CONLUSION: In the present review we see the plants have their nutritive value which helps to cure the acute as well as chronic diseases. Alkaloids are the huge and multiple classes of pharmacological activities. But there is no proper classification of alkaloids because of various structure and classes of alkaloids are present. That's why extraction of alkaloids are important to know the traditional as well as new process of extraction are invented which are less time consuming, less solvent involvement and for pure extract. Here also classify the natural or plant origin of alkaloids and their various extraction processes with biological sources and chemical structures.

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CONFLICTS OF INTEREST:

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