

REVIEW ON EXTRACTION TECHNIQUES IN AYURVEDA AND MODERN PHARMACEUTICS.

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ABSTRACT:

In Ayurvedic pharmaceuticals and therapeutics, primary *kalpanas* i.e., *Panchavidha kashaya kalpanas* are having a lead role. Further secondary *kalpanas* are developed by utilizing these primary ones. While analyzing these *panchavidha kashaya kalpanas*, various extraction methods are being used in them. Extraction is the separation of medicinally active portion of plant and animal tissues using selective solvents through standard procedures. The extraction process varies according to the drugs used for the formulations. In the modern era, the process of extraction is used in many areas as there is huge utility for the extracts in therapeutic as well as pharmaceutical aspects. In the present paper an attempt is made to highlight the ancient extraction techniques and review the modern extraction techniques.

Key words: Panchavidha kashaya kalpana, Extraction techniques.

INTRODUCTION:

Ayurveda, the ancient science mainly deals with herbal medicines along with animal and mineral drugs. In this ancient science *bhaisajya kalpana* is a main branch which comprises the processing of these drugs. As we all know that drug (*dravya*) is one among the *chathuspadas* of Ayurveda. Various dosage forms are used in the therapeutics based on the *vaya, bala, kala, prakrithi* of individuals. The extraction of the crude drugs came into light after the evolution of *panchavidha kashaya kalpana* which comprises *swarasa, kalka, srutha(kashaya), seetha(hima)* and *phanta*. Various secondary *kalpanas* like *sneha kalpana, sandhana kalpana, arka kalpana* etc developed from these primary preparations.

In extraction by treating the plant or animal tissues by solvent, the medicinally active constituents are dissolved and most of the inert matters remain undissolved¹. The solvent used for extraction is known as *menstrum* and the inert insoluble material that remains after extraction is called *marc*. Various preparations done by using one of the extraction methods are called *galenicals*. Mostly water and alcohol is used as the solvent in extraction.

Water is a solvent for protein, colouring matter, gums, glycosides, sugars, alkaloidal salts, enzymes, many organic acids and most of the organic salts. Waxes, fats, fixed oils and most alkaloids are insoluble in water. Alcohol does not dissolve albuminous matter, gums, waxes, fats, fixed oils and sugars. Moulds and bacteria cannot grow in a solution in which alcohol concentration is 20% or more.²

Solvents such as ether, chloroform, light petroleum, certain acids are rarely used for extraction of active constituents from crude drugs.

Extraction processes can be classified into

- Infusion
- Decoction
- Maceration
- Percolation
- Digestion.

Infusion:³

It consists of pouring water over the drugs and then allowing them to keep in contact with water for the stated period, usually 15 minutes with occasional stirring and finally filtering off the liquid. Marc is not pressed. Boiling water is commonly used as a solvent, since it has a greater solvent action than cold water. Infusions can be classified into fresh and concentrated infusions.

- Fresh infusions:

It is an aqueous solution of active constituents of vegetable drug prepared by process of infusion. Coarse powder of drug is used. Water is used as menstrum as it has more penetration power and dissolves the active constituents of the drug. As per pharmacopoeia fresh infusion should be used within 12 hrs of preparation.

- Concentrated infusion:

They are 8 times stronger than fresh infusions. They are prepared by double or triple maceration. Alcohol in the concentration of 20-25% is used as menstrum. Dilution of 1 volume of concentrated infusion with 7 volumes of water resembles the corresponding fresh infusion in potency.

Decoction:⁴

Drug is boiled with water for a stated period of time usually 10 minutes. After boiling liquid is strained and water is passed through the content of strainer to make the required volume. The process is mainly used for vegetable drugs of hard and woody nature having thermostable water soluble constituents.

Maceration:⁵

Maceration is used when drug is soft, unorganized, unpowderable and to avoid powdering of it.

It can be classified into

- simple maceration
- Maceration with adjustment
- Multiple maceration.

Simple Maceration:

Here wide mouthed bottle or any other container which can be well stoppered is used. Closed container is needed to prevent evaporation of menstrum which is mostly concentrated alcohol. Here no volume adjustment is done. Drug is placed with whole of menstrum in closed vessel for 7 days. Shaking is done occasionally. After 7 days liquid is strained and marc is pressed. The expressed liquid is mixed with strained liquid. Final volume is not adjusted. Final filtration is done to remove insoluble cell contents obtained during pressing of marc.

Maceration with adjustment:

Here unorganized drug is placed with 4/5 th of menstrum in a closed vessel for a period of 2-7 days. Shaking is done occasionally. After stated period, liquid is filtered and final volume is made by passing remaining 1/5 th of menstrum through the filter. Marc is not pressed.

Multiple maceration:

Multiple maceration is carried out in the same way as simple maceration, but the menstrum used is divided into 2 parts in double maceration and into 3 parts in triple maceration.

Double maceration:

Drug is macerated twice by using menstrum which is divided into 2 parts, in such a way that same volume is used for each maceration. In double maceration process, the whole drug is macerated for 48 hours with the quantity of menstrum required for the first maceration. After straining the liquid, marc is pressed. Then maceration is done for 24 hours with remaining menstrum required for second maceration. Again liquid is strained and marc is pressed.

The liquids obtained from the two macerations are mixed and allowed to stand for 14 days and allowed to filter.

Tripple maceration:

In this maceration process, the drug is macerated thrice by using the menstrum which is divided into 3 parts in such a manner that same volume is used for each maceration. Whole of the drug is macerated for 1 hour with a part of menstrum required for first maceration and strained. The process is repeated for the next 1 hour with the other part of menstrum. After that repeat the process with third part of menstrum. The liquids obtained from second and third maceration are combined together and evaporated to a specified extend. Then it is mixed with liquid obtained from first maceration. Finally 90% alcohol equal to $\frac{1}{4}$ of volume of the finished product is added. The volume is adjusted with water and allowed to stand for 14 days and filtered.

Percolation:

Percolation is done when the drug is hard and tough. It can be classified as

- Simple percolation
- Percolation for concentrated preparations
 - Reserve percolation.
 - Modified percolation
- Continuous hot percolation/ soxhlation.

Simple percolation:

This process is used for the preparation of tinctures. It consists of 3 stages – imbibition, maceration and percolation.

Imbibition:

Powdered drug is moistened with sufficient quantity of menstrum and is allowed to stand for 4 hours in a closed vessel.

Maceration:

The moistened drug is left in contact with menstrum for 24 hours. In this time, the menstrum dissolves the active constituents of the drug and becomes almost saturated with it.

Percolation:

It consists of the downward displacement of the saturated solution formed in maceration and extraction of remaining active constituents present in drug by slow passage of menstrum through column of the drug. After collecting $\frac{3}{4}$ th of the finished product or when drug is completely exhausted, marc is pressed. Then the expressed liquid is pressed with the percolate, and sufficient quantity of menstrum is added to produce required volume.

Digestion:

The drug is extracted by heating at a particular pressure. This will increase the penetration power of menstrum, so there is complete extraction of drug.

Various extraction techniques in Ayurveda:

In *Ayurvedic* dosage forms various types of extraction principles are used. The method of extraction is opted based on the nature of drug and nature of dosage forms.

Swarasa kalpana:⁶

This is the dosage forms in which fresh juice is expressed from the soft drugs. It comprises the juice collected from the fresh drugs. In case of dry drugs, 1 part of the coarse powder of the drug is kept soaked overnight in double quantity of water and next morning it is macerated well to filter through a cloth. In case of very hard drugs, 1 part of coarse powder of drug is added to 8 times of water and boiled, then reduced to one fourth quantity.

Kwatha kalpana(decoction):⁷

In *kwatha kalpana*, the crude drug is boiled in a specified volume of water (1:8 or 1:16) for a definite time, then reduced to specified volume and filtered. The amount of water added depends on the hardness of the drug used. *Sarngadhara* mentioned that for *mrdu dravya* 4 times water is added, for *madhyama* and *Katina dravya* 8 times water and *athyantha Katina dravya* 16 times of water is added, boiled and reduced. This is for the maximum extraction of the water soluble extractives. The vessel should be kept opened while the preparation of *kwatha*, otherwise it becomes more *guru*.

Hima kalpana(cold infusions):⁸

In this preparation 1 part of drug in coarse powder form is soaked overnight in 6 parts of water and macerated well in the next morning and filtered through a clean cloth. This *kalpana* is generally used for drugs having volatile principles.

Phanta kalpana(Hot infusions):

In *phanta kalpana* the coarsely powdered drug is infused with 4 parts of boiling water and kept until it becomes luke warm. Then the mixture is macerated well and filtered using clean cloth.

Mantha kalpana:

Mantha kalpana is a variety of *phanta kalpana*. Here 1 part of coarsely powdered drug is soaked in sufficient quantity of water for 2 to 4 hours. Then to the softened drugs 4 parts of water is added and churned well either manually or mechanically, filtered and used. *Mantha* is expected to have medium consistency.

Pramathya:

It is a liquid preparation slightly different from that of *kwatha kalpana*. *Pramathya* is the decoction obtained by boiling 1 *pala* of *aushadha dravya* in *kalka* form with 8 *pala* of water and reduced to one-fourth. It is filtered and used.

Ksheerapaka:

Ksheerapaka is the one of the dosage forms which uses milk along with water as the extraction medium. The principle behind *ksheerapaka* is to enhance properties of milk by adding the drugs which are having *teekshna* property and *kashaya rasa*. Intention here is to bring down the *teekshnata* and mask the *kashayatha* of the drugs with the help of *madhura rasa* and *madhura vipaka* of *kshira*.

Arka kalpana(Distilled formulation)⁹

Arka is a unique preparation in which essential oils from herbal drugs are extracted through distillation method. Here the drug is coarsely powdered if dry and crushed if wet, to soak it in sufficient quantity of water for 2 to 4 hours. The well soaked drug is transferred to the distillation apparatus and 10parts of water is added to it. The mixture is continuously heated till 60% of the distillate is collected.

Asava and Arista(fermented preparations):

Here the extracts are obtained by fermentation of plant materials. Alcohol generated in the process act as the preservative. They are termed as *sandhana kalpana*.*Sandhana* is the process of fermentation where the *dravadravya*(*kwatha*, *swarasa* or any other liquid preparation), *madhura dravya*(jaggery, honey or sugar), *prakshepa dravya*(fine powder of medicinal drugs) and *sandhana dravya*(*dhataki pushpa*,*madhuka pushpa*) in an inert vessel and sealed for a specified time period to facilitate the process of fermentation. Generally heat sensitive and flavoured drugs are subjected for *Asava* preparations and thermostable drugs are subjected for *Arishta* preparations.

Rasakriya(concentrated decoction):

It is a solid extract prepared by heating the decoction constantly on low temperature. When it attains semisolid consistency it is called *rasakriya*.

DISCUSSION:

There are various extraction procedures utilized in the *ayurvedic* pharmaceuticals. Mainly decoction and infusions are used. These methods are used depending on the nature of the drugs which are utilized. A drug will produce different phytoconstituents in different extraction techniques. Thus it depends upon the *yukthi* of the physician to select the extraction process based on the disease and the patient. In *kwatha kalpana* , *acharyas* have explained different ratios of water based on the hardness of the drug and hence the active principles in the crude drugs will be made available. *Hima kalpana* mainly advocates the use of drugs which are having volatile principles which may be lost while boiling or in contact with hot water. *Phanta kalpana* is the less time consuming process among the other dosage forms. It is the most *laghu kalpana* among the *pancha vidha kashaya kalpana*. *Mantha kalpana* is the triturated extraction instead of heating and it is having a medium consistency i.e, neither too thick nor thin and it is having having good nutritional value.*Ksheera kalpana* contains both water soluble and fat soluble principles and also it improves the palatability of various drugs which are *teekshna* and *katu rasa pradhana*. *Arka kalpana* is the distillation of various volatile raw drugs with water and it is having good therapeutic value, less dosage and long shelf life. *Sandhana kalpana* is having long shelf life due to the self generated alcohol and it is having high therapeutic value. *Rasakriya* is the concentrated extract of the *kashaya kalpana* and it is also having long shelf lie compared to the *kwatha*.

CONCLUSION:

Panchavidha kshaya kalpanas are the primary dosage forms in *Ayurvedic* pharmaceuticals utilizing various extraction procedures. Various secondary dosage forms are developed from these primay preparations by doing many modifications. Various extraction procedures which are explained in the modern pharmaceuticals were utilized by *Ayurveda acharyas* in the ancient period to improve the palatability, shelf life of the crude drugs. All the dosage forms have their own importance due to its specific therapeutic value, palatability, increased shelf life and convenient dispensing.

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