**AYURVEDIC PHARMACEUTICS AND ITS RECENT TRENDS WITH SPECIAL REFERENCE TO BHAISHAJYA KALPANA**

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**ABSTRACT**

*Bhaishajya Kalpana* (Ayurvedic pharmaceutics) deals with processing methods for drug manufacturing and principles of drug collection, synthesis and proper usage of medicines. Over the times drug manufacturing industry has grown replacing classical Ayurvedic small scale drug manufacturing, also there is a need for modification of classical dosage form to improve patient compliance, palatability, enhancement of shelf life etc., This paper outlines the short comings of classical ayurveda dosage forms and their modifications made to overcome those short comings. The primary preparations (*Pancha Vidha Kashaya Kalpana*) and their modifications like Tetra Pak, Syrups, Dry powder, *Ghanavati, etc.* To overcome its least shelf life and other disadvantages similarly other dosage forms like *Gutika, Avaleha, Satva, Sandhana Kalpana, Sneha Kalpana, Bahya Kalpana* etc., can be modified into various advanced dosage forms to overcome short comings of classical dosage forms. Modified and advanced dosage forms will help to popularize Ayurvedic medicines, however classical basic principles of medicine making should not be compromised but can be effectively and judiciously modified and implemented.

**KEYWORDS**

*Bhaishajya Kalpana*, Ayurvedic Pharmaceutics, Dosage forms, Modifications, Primary preparations

**Ⅰ. INTRODUCTION**

*Bhaishajya Kalpana* means the science through which processing methods and using methods of drugs are made which carries the meaning of pharmaceutical science which cover all aspects of drugs from source to procuring, processing, preparing and using finished products for therapeutics1.

Any drugs to be used as medicine cannot be taken in raw form, it has to be converted into a form which would be therapeutically fit for it, also the converted form should have few advantages like palatability, ease of administration, acceptability, portability, increased shelf life etc. In *Bhaishajya Kalpana* there are some fundamental preparations and some secondary preparations2. Fundamental preparations are the *Pancha Vidha Kashaya Kalpana* and secondary preparations are *Vati Kalpana* (Tablets), *Avaleha Kalpana*, *Sneha Kalpana* (Oil and Ghee preparations), *Sandhana Kalpana* (Fermented formulations), *Lavana Kalpana* (Salt preparations), *Masi Kalpana* (Carbonate formulations) etc.,

In recent years advanced technology has introduced in *Bhaishajya Kalpana* and formulations are modified into Tablet, Capsule, *Ghana vati*, Syrups, Ointments, Creams etc., which increases the palatability, shelf life, global acceptance, easy for administration and easy transportation. To compete modern pharmaceutics, these modified formulations of *Ayurveda* were necessary.

The classical formulations can be modified into different dosage form by using advanced technologies, few of the modifications are highlighted in this paper.

**SWARASA KALPANA (EXTRACTED JUICE)**

*Swarasa* is juice taken out from a fresh green herb, well pounded and squeezed through a cloth3. As *swarasa* is a pure herbal extract, it holds chemical constituents in natural form. There is a least chance of alteration of chemical properties of *swarasa* because of very less physical process is involved in preparation which may have the highest pharmaceutical and therapeutical potency of *swarasa*.

The main drawback of *swarasa* is less shelf life which can be overcome by modification of  *swarasa* into *Ghana Vati*, Syrup, Tetra Pak of juice, Dry powder. This modification can increase the palatability, compatibility, shelf life and easy administration of *swarasa.4*

**KALKA KALPANA (HERBAL PASTE)**

A fresh wet drug or a dry drug converted into a paste by crushing it on a stone with little quantity of addition of water is called kalka.5

The demerits of *kalka kalpana* is less shelf life as that of *swarasa* which can be overcome by modification of *Kalka* into Powder form, Tetra pak of *Kalka* (mainly for preservation), Pouch pack of dry powder6. By this modification palatability and shelf life of *Kalka* increases.

The *Upakalpana* (Secondary preparation) of *Kalka Kalpana* is *Choorna Kalpana.*

**CHOORNA KALPANA (POWDER)**

*Choorna* is a dry powder filtered through a fine cloth after pounding or pulverising the dried herbs7. It is an important dosage form in pharmaceutical field with more self-life and administered profusely internally and externally. Stability in powders is more when compared with *Pancha Vidha Kashaya Kalpana's, Choorna* are rapidly absorbed and metabolized as a result of which the onset of action will be early.

It is mentioned in *Charaka Samhita Kalpa Sthana 12th* chapter that potentiation of C*hoorna* may be done by applying *Bhavana* of S*warasa* of the same drug, then this type of C*hoorna* become so potent that their effects could be highly potentiated, and their doses could also be reduced.8

According to S*amhita* shelf life of *Choorna* is two months but can be improved by two years as mentioned in Drug and Cosmetic act, 1945 Rule161B using advanced packaging techniques.9

*Choorna* can be modified into Capsules, Chewable tablets as it gives accurate dosage, increases shelf life and palatability.

CAPSULES

These are the solid unit dosage form of medicament in which the drugs are enclosed in a practically tasteless, hard, soft soluble container or shell made up of suitable form of gelatine. Here hard capsules are used for filling the *Choorna* with particle size less than 10 microns, hard capsules come second to tablets in importance as solid unit dosage form.10

Example: *Yashtimadhu choorna* into capsules

CHEWABLE TABLETS

The drugs will be finely powdered and then mixed with sugar syrup of 3-4 threads consistency. Thus, the mass will be obtained and converted into granules with the help of multi mill. Granules will be mixed with talc, starch, magnesium stearate and then compressed into tablets.11

Example: *Avipattikara churna* into Chewable tablet

GRANULES

*Churnas* with large dose makes inconvenience to the patients to swallow. Some of the *churnas* stick to the tongue and oral cavity due to inherent adhesive nature.

The herbal powders were sieved through sieve no 60, each ingredient with lubricants is weighed and mixed uniformly using the planetary mixer running for 20 minutes. The mixture is subjected for slugging for converting the powder mixture into slugs. The obtained slugs were passed through the dry granulator to get the granules.12

Example: *Triphala churna* into *Triphala granules*

Patients are showing less interest to take herbal C*hurnas* orally because of their astringent, bitter and pungent taste. Unpleasant taste and odour can be masked by using sweetening and flavouring agent.

To make safe for people with diabetes instead of *sharkara*(sugar) Stevia revaudiana which is natural alternative to sugar which does not increase blood sugar level can be used.13

**KWATHA KALPANA (DECOCTION)**

This preparation is obtained by boiling 1 part of coarsely powdered drug with 16 parts of water in earthen vessel and reduced to 1/8th part.

The U*pakalpana* of K*watha Kalpana* are P*aniya, Ushnodaka, Pramathya, Ksheerapaka.*14

*Pramathya* is a thick decoction, obtained by boiling 8 parts of water and 1 part of drug and reducing to half part15. *Ksheerapaka* is a medicated milk prepared with 1 part of prescribed drug with 8 parts of milk and 32 parts of water16.These are the unique preparations, which minimize the effects of *Kashaya Rasa* and to make the preparation palatable, *Ksheera Paka* can be modified into *Ksheera Paka* powder.

KSHEERA PAKA POWDER

1 part of prescribed drug with 8 parts of milk and 32 parts of water, reduced to *Ksheeravashesha*, which is made into powder form by using spray drier17.

Example: *Lashuna ksheera paka* powder

To increase palatability, compatibility and shelf-life K*ashaya* can be modified into *Ghana Vati, Sharkara, Pravahi, Arka*, Granules.

GHANA VATI

The prepared *Kashaya* is reheated slowly keeping in water bath, the heating should be continued till the *Kashaya* gets semisolid consistency, then the mass obtained by the above process is rolled into pills with the help of tablet cutting machine and then it is dried, if necessary, it can be converted into powdered form. *Ghana* *vati* is a superior and convenient dosage form which is equivalent to modern dosage form.

In modern fast lifestyle *kwatha* is not readily accepted because of its unpalatability, higher dose and short shelf life which involves daily preparations. So, by adding preservatives shelf life of *kwatha* can be increased18.

Example: *Kokilakshadi kashaya* into *ghana vati*

SHARKARA (SYRUP)

Is one of the modifications of *kashaya kalpana* where sugar is used for preservation and improvement of taste, this *kalpana* can be easily administered in children also. The prepared *kashaya* is added with double quantity of sugar and boiled over *mandagni* (moderate fire) until the liquid attains *paka* of 2 thread consistency19.

Example: *Pathyakatphaladi kashaya* into Syrup

PRAVAHI KWATHA (CONCENTRATED KWATHA)

Concentrated and fermented formulation is a new modified dosage form prepared by concentrating the *kashaya* due to its increased palatability and stability. Most of the pharmacy have started marketing this type of dosage form in place of decoction20.

GRANULES

*Kwatha* can also be modified in the form of granules. To prepare granules the fresh prepared *Kwatha* should be boiled on mild heat and reduced up to semisolid form. Continuous stirring should be done to get uniform mass. This prepared mass is dried, powdered and passed from sieve number 20, granules are prepared and dried at room temperature and stored21.

ARKA (DISTILLATES)

The vapours obtained during preparation of *kashaya* can be converted into *arka*(distillates) through the process of distillationso that volatile principles can be preserved during *Kashaya* preparation.

Although, *Kashaya* preparations are very popular, they are having some certain demerits like short shelf life, large dose and disagreeable taste, which can be converted into *Arka* preparations22.

KASHAYA SOOKSHMA CHURNA

Without losing its potency can be stored for long time,it is time saving compared to preparation of *Kashaya23.*

**HIMA KALPANA (COLD INFUSIONS)**

Six parts of water is added to the one part of coarse powder of the drug and this mixture is kept as it is overnight, Next day it is macerated well and filtered through a cloth24.The drugs having *sheeta veerya* and volatile principles may lose their active principles by heating, hence for such type of drugs the *Hima Kalpana* is mentioned by which active ingredients can be collected in cold infusion form25.

As the shelf life of *Hima Kalpana* are very less it can be modified into POUCH PACK for easy usage and to prevent contamination26.

The *Upakalpana* (secondary preparations) of *Hima Kalpana* are *Mantha kalpana, Udaka Kalpana* and *Panaka Kalpana*

**MANTHA KALPANA**

It is a cold infusion prepared by churning one part of powdered drug and four parts of cold water are taken in a mud pot/stainless steel pot and mixed properly. After then it is filtered by clean cloth in a pot27.

**PANAKA KALPANA**

It has no reference in classics of *Ayurveda*, but it's mostly used in our tradition it is called *Panaka Kalpana*. In general, these preparations are prepared with any of *Amla*(sour) or *Anamla*(non-sour) fruits. The fruits usually in use are lemon, tamarind, mango, pineapple, grapes, etc.,27

**PHANTA KALPANA (HOT INFUSIONS)**

It is lightest for digestion amongst all the basic preparations. One part of powdered drug is added to four parts of hot water are kept in a mud pot, macerated well and filtered through a cloth after some time. It is softening and extracting the drugs in hot water27.

As the shelf life of *Phanta* *Kalpana* are very less it can be modified into POUCH PACK for easy usage and to prevent contamination28.

The *Upakalpana*(Secondary preparations) of *Phanta Kalpana* are *Arka Kalpana, Mantha Kalpana* according to *Sharangadhara*.

**ARKA KALPANA (DISTILLATION)**

The drugs should be powdered and crushed well and soaked for two to four hours with sufficient quantity of water which is transferred to the distilled apparatus and ten parts of water is added to it. This is the process by which the active constituents of drug and volatile oils are collected27.

In recent days advanced techniques were used to prepare arka preparations by using distillation apparatus which can ease the process of distillation.

**LAVANA KALPANA (SALT PREPARATION)**

It is one of the types of pharmaceutical preparations described in *Ayurveda* for various disorders, *lavana* has the ability to penetrate quickly into minute channels. These are the preparations consisting of *lavana* and ash of the drugs obtained after igniting the drug and salt in the closed chamber, the inherent properties of *lavana* are best utilized for therapeutic benefits through a specialised pharmaceutical procedure29.

The demerits of *lavana kalpana* is less shelf life and its hygroscopic nature which can be overcome by better packaging techniques which improves the shelf life of the product.

**MASI KALPANA (CARBONIZED PREPARATIONS)**

*Masi Kalpana* is the form of medicine which can be prepared by heating herbal content up to transfer into carbonized form. It is used externally and internally which is cost effective, less time-consuming preparation and having quick results.

Itis a dosage form in which the bulk of raw materials is reduced to a greater extent by the application of certain quantum of energy. Due to this treatment, hidden chemical constituents become prominent, which is therapeutically active30.

The demerits of *Masi Kalpana* are same as *Lavana Kalpana* which can be overcome by better packaging techniques which improves the shelf life of the product.

**KSHARA KALPANA (ALKALINE PREPARATIONS)**

*Kshara* are derivatives of plant drug ashes in the form of solutions or crystals all of which have the basic quality of being alkaline. It is derived from certain plants as well as minerals and animal products which contain more alkaline substances by evaporation method, which may be used as single, or compound, or mixture form. There is a wide range of description described by *Chakradatta* is being used widely by surgeons and appreciated its effectiveness.

The general method of preparation of *Kshara* is *panchangas* or *kasta* (according to specification) of *ksharayukta* plant are collected and dried properly. Collected into *loha patra*(iron pan) and burnt to ash form, till all particles are burnt properly. Then this ash is dissolved in 4 times or 6 times of water in an earthen pot and rubbed with hands properly for some time. Then these contents are kept as it is without any disturbance for night or 3 hours, then supernatant water portion is separated to another pot (sedimented ash content should be thrown out), then this separated water should be filtered for 21 times with three folded cloths. The filtrate is further heated till white colour soft *kshara* is obtained and it is preserved in glass container31.

*Kshara* is hygroscopic in nature which can be conquered by applying advance packaging techniques.

**AVALEHA KALPANA(LICKABLES)**

This is the semi solid preparation of drug by the addition of jaggery, sugar or sugar candy and boiled with prescribed drug of decoction or juice etc.,

The substance which is taken by licking with good palatability, this indicates the absorption and metabolism of this pharmaceutical dosage starts from the mouth itself, because of the presence of more quantity of glucose, fructose, etc., *Avaleha* acceptancy is more with comparing to other varieties of Ayurvedic dosage forms. In recent years *avaleha* is gaining popularity since it is easily consumable32.

The general method of preparation of *avaleha* is first *guda(jaggery), sharakara*( sugar) is dissolved well in the *kashaya*(decoction) or any liquid and strained to remove foreign particles, this solution then boiled over moderate fire(*mandagni*) when the *paka* is *tantuvat* (thread like) when pressed between thumb and index finger or when it sinks down in glass of water without getting easily dissolved, it should be removed from the fire. Then *churna* of drugs are added in small quantities and stirred continuously to form homogeneous mixture33.

To improve palatability, compatibility the *avaleha* can be modified into Granules, Chewable candies, Chocolates etc., which is easy for transportation also.

CANDIES

The prepared *avaleha* is added with prescribed quantity of sugar, glucose and water which forms thick syrup and boiled till it reaches desired concentration this is again heated to convert it into thick mass, this prepared thick mass is subjected to discharge plate followed by addition of flavour, all mixtures was properly mixed by kneading with the help of batch roller to form die, this die is utilised to manufacture candy, which is further subjected to pillow pack machine to form candy and wrapped in aluminium foil34.

Example- *Vasavaleha* into *Vasa* candy

GRANULES

Converting *Avaleha* into granules help in fixing the dose, easy to administer, and also increases the shelf life. The steps are same in *Avaleha* preparation but in granule preparation they are further heated on moderate fire, maintaining the temperature in the range of 95oC–100oC till two to three thread consistencies are formed. When the temperature of the contents reached room temperature (35oC), a prescribed quantity of honey is added, the mixture is again stirred thoroughly to prepare a uniform mass. This mass is passed through mesh no-48 to obtain granules35.

Example: *Kushmandavaleha* into *Kushmanda* granules

**SHARKARA KALPANA(SYRUPS)**

It is a palatable liquid formulation, *yavakuta choorna* (coarse powder) of drugis dipped in 8 parts of water and kept for one night, Next day morning, the contents are heated with *mandagni*(moderate fire) till the total quantity of the contents reduced to 1/8th quantity, then contents are filtered with cloth to that 4 parts of *sarkara*(sugar) is added and again slowly heated till *tantuyukta* (2 threads) *paka* is obtained.

On account of their taste and flavour these are very much liked by the patients. According to modern science syrup contains 66% sugar and 7% alcohol otherwise these could not be preserved for long time. They also advice to add some flavouring agents to make such preparations palatable36.

Some of the preservatives, colouring and flavouring agents are.,

COLOURING AGENTS

Annatto extract, Canthaxanthin, β-carotene, Caramel, etc.37

FLAVORING AGENTS

Vanillin, Ethyl vanillin, Menthol, Apple, Cinnamon, Banana, Orange, Pineapple etc.38

PRESERVATIVES

Sodium benzoate, methyl, ethyl, propyl, butyl, benzyl esters of p-hydroxybenzoic acid etc.39

**SATVA KALPANA (STARCH)**

*Satva Kalpana* is one of the most important pharmaceutical preparations of *Ayurveda*. *Satva* or *Sara* means the essence or active part of the drug, this process ensures extraction of Strach of the plant which is active therapeutic property of ingredient is used.

The stem is rinsed with water and removed its outer layer to avoid interferences during preparation of *Satva. Then* the stem is crushed, add specified quantity of water, rubbed well with hands thoroughly and kept overnight for soaking, Next day the material is again well rubbed, till there is disappearance of stickiness, the fibres are removed, the remaining material is strained through sterile cloth. The strained material is collected in a stainless-steel container and allowed for the sedimentation. When the solid particles of materials were found sedimented the Suprenant liquid portion is decanted carefully. After decantation the starch obtained is again mixed with little quantity of water and allowed again for sedimentation. Then liquid portion is removed by decantation process, this process is repeated for 7 times and finely clear white powder is obtained.

When *Satva* has to be prepared on large scale(commercial), utensils having large capacity are required. Cutting of large amount stem into small pieces become strenuous work, Crushing the stems manually becomes more tedious, yield of *Satva* is also less, it is inconvenient for preparing the S*atva* as mentioned above classical method. With the advancements in the technologies, various advance instruments have been developed in the area of manufacturing, The multi mill is useful for dry and as well as wet grinding, the process of crushing the stems could be done easily and thus can provide maximum yield of *satva40.*

Example-*Guduchisatva*

**GUTIKA KALPANA (TABLETS)**

The drugs used to prepare *vati* are dried and made into fine powders These are put into a *khalwa yantra* and triturated into a soft paste with prescribed liquids, then it is made into pills by rolling between thumb and index finger, before rolling the pills one should ensure that the prepared pills is not sticking into a fingers when rolled.

*Vati kalpana* is easy to swallow, palatable, it can be preserved for a longer period than *choorna*, volatile principles can be retained for longer duration and easy to carry which can be further modified into chewable tablet.41

CHEWABLE TABLETS

These are prepared by wet granulation method, the drugs are finely powdered to a wet dough mass by adding die calcium phosphate and polyvinyl pyrrolidine and dried in drier, then the mass is converted into granules with the help multi mill, granules are mixed with talc, starch, magnesium stearate and compressed into tablets.

LOZENGES

Administration of the hard-boiled lozenges as better consumer preference due to their taste, aroma, flavour and elegant appearance with attractive colours. The lozenges were formulated using the conventional candy moulding process consisting of heating and congealing methods. The manufacturing procedure involves preparation of syrup from sugar and liquid glucose under gentle heating at the temperature range of 140-150°C, till it reaches a glassy consistency and maximum water is removed. Then the temperature is reduced to 90-100°C; During this stage, glycerine is added to provide fluid nature and then the powdered drug is added and mixed thoroughly to form homogeneous mixture. Then this molten syrup is moulded to required shapes. Each of lozenge formulation contains about 80%of the lozenges base such as sugar, liquid glucose and isomalt42.

Example: *Vyoshadi vati* into lozenges

**GUGGULU KALPANA**

*Guggulu* is a *niryasa* gummy extract of Commiphora mukhul as a main effective ingredient and binding agent of the preparation which mainly contains gum, resins and free acid. *Guggulu* formulations of *Ayurveda* are unique, as *Guggulu* is a natural binder as well as an excellent medicine itself. There are many challenges in manufacturing high quality *Guggulu* formulations. Hence the formulations were reviewed for their constitutions so that addition of proper disintegrants, and skipping additional binders can be employed while small and large-scale production of *Guggulu* formulations.

The combination of excipients is important as there is always a challenge of exceeding the normal limits of disintegration time in case of *guggulu* tablets. Excipients for tableting includes Diluents, Glidants, Disintegrants, Lubricants etc.,

**VARTHI KALPANA**

*Varthi* basically comes under *Vati Kalpana*, the difference is in shape and use. They are elongated with tapering ends and used externally. The drugs are made into fine powdered form, these are mixed uniformly in syrup made up of jaggery and moulded into required size and shape of *Varthi*. They are also made by grinding the fine powder of drugs with the fluids specified in the formula to form a soft paste, then this is made into *varthi* form according to required size and shape43.

This method of preparation consumes more time and power for large scale productions. So advanced technologies and packaging techniques plays important roles which enhances product quality and shelf life

**SNEHA KALPANA (OIL AND GHEE PREPARATIONS)**

In ancient literature there is immense description regarding manufacture of *Sneha Kalpana,* for preparing *taila* and *ghrita kalpana* first of all *taila* and *ghrita* are supposed to undergo the process called *moorchana samskara*. By this therapeutic effect of *sneha* increases and dissolve more active principle by *kalka* and *drava dravya44.*The *Sneha Kalpana's* are modified into ointment, liniment, cream, etc., for easy administration

OINTMENT

To prepare ointment *taila* or *ghrita* is taken in stainless steel vessel and heated indirectly. Specified quantity of hard paraffin and white petroleum jelly is added and stirred continuously until it melts and blends45.

Example: *Murivenna* ointment

LINIMENT

To prepare liniment, *taila* or *grita* is taken in a glass vessel. In another glass jar mix menthol crystals, camphor or methyl salicylate is added, mix it with stirrer and kept for one day as closed. Next day we can take the mixture and blend with the prepared *taila* or *ghrita46.*

Example*: Murivenna* liniment

CREAM

To prepare cream, simultaneously oil phase and water phase have to be processed. In oil phase, oil or *ghrita* is taken in stainless steel vessel and heated mildly. To that stearic acid, emulsifying wax, acetyl alcohol, propyl paraben has to be added and stirred continuously. In water phase water is taken in a stainless steel vessel and heated mildly, to that disodium edetate, allantoin, glycerine, polyquaternium/10, methyl paraben has to be added and stirred continuously and filtered, this filtered liquid is added to oil phase slowly and continuous stirring is done until desired consistency is obtained, to this PEG-Dimethicol, DL-Panthenol are added47.

Example: *Murivenna* cream

SOFT GEL CAPSULES

Soft gelatin capsules are thicker and require additional ingredients such as glycerine to obtain their soft texture. In short, these processes take place simultaneously, such that rotary die encapsulating machine feeds the gelatin ribbon as the wedge injects fill material. At the same time, the die system cuts and hermetically seals the two halves of the gelatin ribbons together. These capsules are packed by blister packaging or glass bottles. Delivering low melting point compounds and improving the ease of oral medication due to the lack of taste and odour48.

Example: *Ksheerabala101* capsule

**SANDHANA KALPANA (FERMENTED PREPARATIONS)**

There are many fermented preparations found mentioned in Ayurvedic pharmaceutics since ancient times. The term *sandhana* denotes the process of acceleration of chemical and bio-chemical reactions which may be classified from Ayurvedic point of view under two main heads viz., *samyoga* and *vibhaga*.

*Asava-arishtas* preparations have occupied major place amongst all *Madhya Kalpana's*. These preparations are more popular and appreciated because of their quick action, high preserving qualities. Usually, herbal remedies lose their potency after some time period, hence ancient ayurvedic scholars has mentioned these *kalpanas* by which active principles of the medicinal drug will be preserved for prolong period in alcoholic media. It facilitates the dissolution of the active principles into the liquid media and also serves as a preservative49.

All classical texts recommended the use of earthen and wooden containers for the fermentation process, but these have certain limitations as earthen pots may break, while wooden containers require pre-treatment and also may be chances of contamination. Hence, with the development of technology in the field of pharmaceutics, these pots were replaced by plastic and steel containers. To address the question of equal efficacy with the specific variety of containers for carrying out the *Sandhana* process.

The different fermentation media are *Dhataki Pushpa, Madhuka Pushpa, Surabeeja/Kinva*, Yeast.The use of *kinva* or *surabeeja* as an accelerator of fermentation process is evident from *Rigveda* and *Kautilya Arthashastra* as well (42nd *Prakarana* - *Suradhyakshaha*, 2:25:17, *Kautilya Arthashastram*).

The effect of addition of yeast (Saccharomyces cerevisiae) shows completion of fermentation process very quick, the fermentation started on the second day and was completed within one month. In Other media, fermentation may be delayed because of natural growth and multiplication of yeast cells as well50.

However, diabetic patients are reluctant to use these products due to the higher percentage of sugar/jaggery are present in them. The fermentation process of sugar-free *Asava* formulation and composition is completely different from the traditional *Asavas*. It has been prepared using anti-diabetic herbs as its fermenting initiators instead of sugar, jaggery or honey which makes it safe for consumption by diabetics51.

**BAHYA KALPANA (EXTERNAL APPLICATIONS)**

The preparations used for topical application.These are modified into *Lepas, Malahara, Upanaha, Shatadautha and Saharadautha ghrita etc52*

LEPA KALPANA

Medicines in the form of a paste used for external application are called as *Lepa. The* drugs are first made into a fine powder form. Before use on the body, it is mixed with some liquid or other medium indicated in each preparation and made into a soft paste.

*Lepa* in textual form is not convenient in present era, common problems with ayurvedic *lepas* are stains after its application, smell, sensitivity, greasiness, fluidity, frequency of flow, etc so it is very necessary to do study and research in *Lepa Kalpana.* For the convenience of new dosage forms like Cream or Ointment, *Lepa guti*, Gel, Herbal sheet mask has been developed.

OINTMENT

There are two methods for imparting the ingredients into the ointment base that is trituration and fusion. In trituration method the finely sub divided insoluble medicaments are evenly distributed by grinding with the small amount of base followed by dilution, in fusion method the ingredients are melted together in descending order of their melting point and stirred to get homogeneous mixture.

Example: *Tiladi lepa*

CREAM

Cream is viscous semi solid ointment like preparation they may be oil-in-water (aqueous creams) water-in-oil (oily creams) Creams are easily removed from the skin and clothing because they contain water soluble bases and hence are more convenient to use.

LEPA GUTI

Herbal *lepa churna* preserves its potency up to one month if kept in an airtight container there is a possibility of deterioration of powder if exposed to moisture, hence *lepa guti* can be converted into *varti*, which can be stored for one year

GEL

Gel are semisolid preparations intended for application to skin or mucous membranes, it is composed of two inter penetrating system in which colloidal particles are uniformly distributed throughout a dispersion medium forming a three-dimensional matrix. Retention time of gels are higher than the other dosage forms.

HERBAL SHEET MASKS

Sheet mask is one of the latest and newest trends which popular in Asia, compared with another form of mask, sheet mask has occlusive dressing treatment (ODT) mechanism that has a good absorption and penetration profile, preparations of sheet mask are made by adding herbal extracts in various concentration to the essence base. It can be carried everywhere53.

MALAHARA KALPANA

*Malahara* is a formulation that is quoted in the Ayurvedic classical text of *Rasatarangini*. In this study, the formulation is modified and prepared to make the preparation more acceptable and increase the bioavailability by keeping its therapeutical activity intact. In this preparation of *malahara* the base may contain *sarjarasa*, *sikhta taila, shatadhautha /sahasra dhautha ghrita,* in which medicinal drugs are mixed uniformly. It can be modified into Ointment, Cream, Gel by adding medicinal powder, medicated ghee or oil, volatile oils, etc54

SHATADHAUTHA AND SAHASRADHAUTHA GHRITHA

The washing of *ghrita* for hundred or thousand times in copper or steel vessel, this process is meant for enhancement of properties of ghee for external application. There is the reference of two methods of preparations, they are as follows, Heated ghee is poured in cold water, this is the best example of emulsion i.e., oil in water. When heated ghee in cold water, the *ghrita* is broken up into globules which denotes *ghrita* as dispersed phase and water denotes a continuous phase. After some time, the ghee is become solid form on the surface of the water, then ghee is collected after washing.

*Ghrita* added along with water, it is nothing but water oil emulsion because water is in dispersed phase and oil is in continuous phase. Here, washing is continually done by the water by stirring leads to swelling of *ghrita* up to feint green colour.55

**Ⅱ. DISCUSSION**

Ayurvedic classical dosage forms marks important hallmark in the development of pharmaceutics. These dosage forms are developed after meticulous research done analysing the properties of the drugs, available techniques of drug preparation to provide maximum therapeutic benefit to the patients. However patient compliance has drastically changed over the times, as a result of changed lifestyle. The advancement in technology has provided scope for modifying the classical dosage forms. The altered dosage forms will have advantages like enhanced shelf life, improvement of patient's compliance, acceptability etc. Ayurvedic formulations are gaining popularity globally. To enhance the popularity and improvise acceptability of ayurvedic formulations, modified dosage forms can contribute significantly. However, the basic principles of Ayurvedic pharmaceuticals must not be compromised, which can reduce the efficacy, safety of the formulations. The modifications should be backed by researches so that modified dosage forms should be safer to use, should have optimum active constituents of drugs. Future research can be done to develop newer dosage forms like herbal injections, aerosals, dermal patches etc.

**Ⅲ. CONCLUSION**

Ayurvedic classical dosage forms can be modified into different advanced dosage forms without compromising the basic principles of Ayurveda using advanced technology. The modifications will help in improvising patient compliance, acceptability, advantageous to industry and eventually help in popularization of Ayurveda and its globalization.

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