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

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

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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 therapeutics[1].

The raw drug to be used as a medicine has to be converted into suitable therapeutic dosage form which 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 preparations[2]. 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.

1. **Swarasa Kalpana (Extracted Juice):** *Swarasa*is juice taken out from a fresh green herb, well pounded and squeezed through a cloth[3]. 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 Pack of juice, Dry powder. This modification can increase the palatability, compatibility, shelf life and easy administration of *swarasa*[4].

2. **Kalka Kalpana (Herbal Paste):** Fresh herbal drug or dried drug is converted into a paste by crushing it on a stone with little quantity of addition of water is called kalka[5].

   The demerits of *kalkakalpana* is less shelf life as that of *swarasa* which can be overcome by modification of *Kalka* into Powder form, Tetra pack of *Kalka* (mainly for preservation), Pouch pack of dry powder[6]. By this modification palatability and shelf life of *Kalka* increases. The *Upakalpana* (Secondary preparation) of *Kalka Kalpana* is *Choorna Kalpana.*

3. **Choorna Kalpana (Powder):** *Choorna* is a dry powder filtered through a fine cloth after pounding or pulverising the dried herbs[7]. 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 *Sharangdhara Samhita,* the shelf life of *Choorna* is of two months but can be improved by two years as mentioned in Drug and Cosmetic act, 1945 Rule 161B using advanced packaging techniques[9].

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

- **Capsules:** Capsule are defined as solid unit dosage form of medicament available as small containers (shells) made up of gelatin and enclosing accurately measured drug substance. *Choorna* with particle size less than 10 microns, hard capsules come second to tablets in importance as solid unit dosage form[10].
  Example: *Yashtimadhuchoorna* into capsules

- **Chewable Tablets:** The drugs are finely powdered and then mixed with sugar syrup of 3-4 threads consistency. The mass obtained is 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: *Avipattikarachurna* into Chewable tablet

- **Granules:** This type of preparations consisting of solid, dry aggregates of powder particles. The *choorna* (herbal powders) sieved through mesh no.60 and lubricants is mixed uniformly in planetary mixer afterwards the powder mixture is converting into slugs, then these slugs are converted into granules by using dry granulator[12].
  Example: *Triphalachurna* into *Triphala granules*

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

4. **Kwatha Kalpana (Decoction):** This preparation is obtained by boiling 1 part of coarsely powdered drug with 16 parts of water in suitable stainless-steel vessel, reduced to 1/8th part and filtered.

The *Upakalpana*of *Kwatha Kalpana* are *Paniya, Ushnodaka, Pramathya, Ksheerapaka*[14].

- **Pramathya (Thick Decoction):** It is a prepared by boiling one part of drugs in eight parts of water and reducing to half[15].

- **Ksheerapaka (Medicated Milk):** It is prepared by boiling one part of herbal drug in 8 parts of milk and 32 parts of water till milk part remains[16].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:** The preparation is sane as *Ksheerapaka*, which is further made into powder form by using spray drier[17].
  Example: *Lashuna ksheerapaka* powder

- **Paniya Kalpana:** It is prepared by boiling one part of herbal drug in 64 parts of water and reduced to half part.

- **Usnodaka:** It is nothing but boiling of water. 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. *Ghanavati* 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 increased[18].
  Example: *Kokilakshadikashaya* into *ghanavati*

- **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 consistency[19].
  Example: *Pathyakatphaladikashaya* into Syrup

- **Pravahi Kwatha (Concentrated Kwatha):** It is a modified dosage form of *kashayakalpana*(decoction) which is concentrated and fermented to increase its palatability and stability[20].

- **Granules:** The freshly prepared *kashaya* is boiled over mild fire and reduced till semisolid consistency, this mass is dried, powdered and passed through sieve no.20, to obtain granules[21].

  Converting *kashaya* into granules helps in fixation of dose and to increase its shelf life and palatability.

- **Arka (Distillates):** The vapours obtained during preparation of *kashaya*can be converted into *arka* (distillates) through the process of distillation so 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* preparations[22].

5. **Hima Kalpana (Cold Infusions):** Add six parts of water in 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 cloth[23].

   By heating method, the drug may lose their volatile principles which can be preserved in *HimaKalpana* (cold infusions)[24].

   As the shelf life of *Hima Kalpana* are very less it can be modified into POUCH PACK for easy usage and to prevent contamination[25].

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

6. **Mantha Kalpana:** It is the preparation obtained by churning one part of powdered drug in four parts of cold water in mud/stainless steel vessel and then filtered[26].

7. **Panaka Kalpana:** These preparations are prepared with *amla* (sour) or *anamla* (non-sour) dravyas with cold water,[26]

8. **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 water[26].

   As the shelf life of *PhantaKalpana* are very less it can be modified into POUCH PACK for easy usage and to prevent contamination[27].

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

9. **Arka Kalpana (Distillation):** The drugs are powdered, crushed well and soaked in water which is transferred to the distilled apparatus then ten parts of water is added to it. This is the process by which the active constituents of drug and volatile oils are collected[26].

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

10. **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 procedure[28].

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

11. **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.

By this method of preparation, the chemical constituents become prominent which is therapeutically active[29].

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.

12. **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.

In general, *kshara* is prepared as follows, the *panchangas* or *kasta* (according to specification) of *ksharayukta* plant are collected and dried properly. Collected into *lohapatra* (iron pan) and burnt to ash form, till all particles are burnt properly, the ash obtained is dissolved in 4 or 6 times of water, macerated and left undisturbed for overnight or 3 hours, then supernatant water portion is separated to another vessel (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 container[30].

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

13. **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 consumable[31].

The general method of preparation of *avaleha*is *guda(jaggery), sharakara*(sugar) is liquified in the *kashaya*(decoction) or any liquid media and it is filtered, then boiled over moderate fire to obtain proper *paka* later fine powder of other drugs are added and stirred continuously to form homogenous mixture[32].

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 permitted flavour, sugar, glucose and water which forms thick syrup and boiled till it reaches desired concentration. It is then heated again; this mass is properly mixed by kneading and it is utilized to manufacture candy and draped in aluminium foil [33].
  Example- *Vasavaleha* into *Vasa* candy

- **Granules:** The preparation of *avaleha* into granules, which assist to fix dosage forms, easy administration and increases shelf life.

  In granule preparation, it is further heated on moderate fire in the range of 95°-100°C up to 2-3 thread consistency, then after self-cool sufficient quantity of honey is added and mixed properly to get uniform mass and this mass is passed through mesh no-48 to attain granules[34].
  Example: *Kushmandavaleha* into *Kushmanda* granules

14. **Sharkara Kalpana (Syrups):** It is a palatable liquid formulation, *yavakutachoorna*(coarse powder) of drug is 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 $1/8^{th}$ 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 palatable[35].

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

- **Colouring Agents:** Annatto extract, Canthaxanthin, β-carotene, Caramel, etc.[36]

- **Flavoring Agents:** Vanillin, Ethyl vanillin, Menthol, Apple, Cinnamon, Banana, Orange, Pineapple etc.[37]

- **Preservatives:** Sodium benzoate, methyl, ethyl, propyl, butyl, benzyl esters of p-hydroxybenzoic acid etc.[38]

15. **Satva Kalpana (Starch):** It is the procedure used to extract starch of the drug. The stem of the plant is washed, outermost layer is removed and it is crushed well, to this required

quantity of water is added and it is rubbed with hands thoroughly and soaked for whole night. After soaking it is again rubbed and fibrous contents are removed, then this water is kept aside to allow the starch to settle down. The water is decanted carefully without disturbing the settled starch and it is stored in glass bottle[40].

In large scale production cutting, crushing, washing, rubbing etc, become strenuous work. To get better of this new advanced technology has been used which is easy and provide maximum yield.
Example-*Guduchisatva*

16. **Gutika Kalpana (Tablets):** The drugs used to prepare *vati* are dried and made into fine powders, this powder is taken in a *khalvayantra* triturated with addition of prescribed liquids into a soft paste.

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[40].

- **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:** The lozenges are 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 isomalt[41].
  Example: *Vyoshadivai* into lozenges

17. **Guggulu Kalpana:** *Guggulu* formulations in ayurveda is a unique preparation which itself is an excellent medicine (gummy extract of Commiphoramukhul) as well as natural binder.

The combination of excipients plays important role in disintegration time of *guggulu* tablets. Excipients for tableting includes Diluents, Glidants, Disintegrants, Lubricants etc.,

18. **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 finely powdered and triturated or grinded with the specified liquid and rolled into the shape of *varthi*[42].

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

19. **Sneha Kalpana (Oil and Ghee Preparations):** *Sneha kalpana* is prepared by boiling one part of *kalkadravya* (paste),4 parts of *snehadravya*(oil or ghee) and 16 parts of *dravadravya* (liquid media). In ancient literature there is immense description regarding manufacture of *Sneha Kalpana*, for preparing *taila* and *ghritakalpana* 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 dravya*[43].The *Sneha Kalpana's* are modified into ointment, liniment, cream, soft gel capsules 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 blends[44].
  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 *ghrita*[45].
  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 added[46].
  Example: *Murivenna* cream

- **Soft Gel Capsules:** *Taila* or *ghrita* which are indicated for internal administration, can be modified into soft gel capsule by using gelatin mass shell in Rotary die encapsulating machine[47].These capsules are odour or taste masking which is easy to administer.
  Example: *Ksheerabala*101capsule

20. **Sandhana Kalpana (Fermented Preparations):** *Sandhana kalpana*are the fermented or self-generated alcoholic preparations, obtained by dissolving sweetening agents like sugar or jaggery in a *kashaya* (herbal decoction) or *swarasa*(fresh juice) added with *prashepakadravyas*(moderately fine powder of herbal drugs). It is mentioned in our ayurveda claassics that it has infinite shelf life (older the medicine more s its efficacy).

Asava-arishtas preparations have occupied major place amongst all *Madhya Kalpana's*. These preparations are more popular and appreciated because of their quick action, higher efficacy and prolonged shelf life[48].

Our ancient classical texts have recommended to use earthen or wooden containers for the process of fermentation, but these have certain limitations. Therefore, in present era steel or plastic containers are used.

However, diabetic patients are reluctant to use these products due to the higher percentage of sugar/jaggery are present in them.

Due to the enzymes present in the yeast converts sucrose into glucose and fructose at primary level then fructose further converts into ethanol and carbon-di-oxide, the natural generated alcohol is ethanol.

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 diabetics[49].

21. **Bahya Kalpana (External Applications):** The preparations used for topical application. These are modified into *Lepas, Malahara, Upanaha, Shatadautha and Saharadauthaghrita etc*[50]

- **Lepa Kalpana:** *Lepa* is a paste form of medicine, which is used externally. To prepare *lepa*, the drugs are made into fine powder and blend with liquid or any other media and made into paste.
  Now a days *lepa* is modified in the form of cream, ointment, *lepaguti*, gel, herbal sheet mask etc.,

- **Ointment:** These are semisolid preparation of drugs either dispersed or dissolved in a suitable base meant for application to skin or mucous membrane[52].
  Example: *Tiladi lepa, kukumadilepa*ointment

- **Cream:** Creams are semi solid emulsions which contain mixtures of oil and water. Creams are easily removed from the skin because they contain water soluble bases and hence are more convenient to use[52].
  Example: *Avalgujadi* cream

- **Lepa Guti:** It is a modified form of *lepachoorna* where drugs of *lepa*are powdered, triturated with suitable liquid and rolled into bigger size tablets which is dried and preserved. By this method of dosage form the shelf life and potency can be preserved more than *lepa choorna*[52].

- **Gell:** It is a semi solid preparation applied to the skin and mucous membrane. Holding time of gel are higher when compared to lepa[52].
  Example: Hibiscus hair gel

- **Herbal Sheet Masks:** Sheet mask is one of the latest or novel dosage form prepared by adding herbal extracts in different concentration to the essence base. It has occlusive treatment mechanism which has good absorption and penetrative action[52].

22. Malahara Kalpana: *Malahara* also known as malham or marham taken from Unani system of medication. It is a medicinal preparation used for external application. In this preparation of *malahara* the base may contain *sarjarasa*, *sikhtataila, shatadhautha /sahasradhauthaghrita,* in which medicinal drugs are mixed uniformly. It can be further modified into Ointment, Cream, Gel by adding medicinal powder, medicated ghee or oil, volatile oils, etc[53]

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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