



Critical Review on Sandhana Kalpana (Biomedical Fermentation)

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Abstract

Ayurvedic medications prepared by Sandhana Kalpana (Biomedical fermentation) are commonly used especially in north India for the treatment of various diseases. Sandhana Kalpana is divided into two types i.e. Madya Kalpana and Shukta Kalpana. Madya Kalpana are said to be alcoholic preparation whereas Shukta Kalpana referred as acidic preparation. Among these two Madya Kalpana is commonly used for curing diseases. Asavarishta, a form of Madya Kalpana have a unique place among all the Sandhana Kalpana due to their quick absorption, high efficacy, high palatability, easy to prepare, easy to store. Sandhana preparations contain self-generated alcohol which acts as preservative having prolonged shelf life and helps in rapid absorption of active ingredients. Dhataki Pushpa, Madhuka Pushpa, Sura beej and yeast are commonly used as Sandhana Dravya for fermentation process. In this review article, Vedic literature of Sandhana Kalpana, method of preparation and various pharmaceutical and analytical parameters for Asavarishta are discussed.

Keywords: Sandhana Kalpana, Fermentation, Madhya Kalpana, Shukta Kalpana, Asava, Arishta.

Introduction

Sandhana is defined as keeping the mixture of herbal liquids like Kashayas, Swarasas etc. or food substances like Guda, honey etc. all together for a specific time period to facilitate fermentation process¹. Specific environment and time is required for completion of this fermentation process, to meet desired characteristics and maximum yield is termed as Sandhana Kalpana. Fermentation is an anaerobic, enzymatic metabolic process which brings about chemical changes by transforming complex organic compounds into simpler and nutritious compounds. The fermentation is the incomplete oxidation of sugar into ethanol and carbon dioxide in the absence of oxygen brought about the enzymes invertase and zymase secreted by yeast cells². This fermentation process facilitates the chemical and biochemical reactions with breakage and reunion of the bonds in the preparation to form a new compound.

History of Sandhana Kalpana since Vedic period³

Rigveda: Soma Rasa is a sweet liquid prepared by fermentation is mentioned in Rig Vedic text. Other than Soma rasa, Sura and other alcoholic preparation were also described in Rig Veda. Som Rasa was used as offering to God whereas Sura was prepared for human consumption.

Atharva Veda: Described Abhishava Prakriya for Arishta preparation which was used in the treatment.

Yajur Veda: Described various Aahara Kalpanas including Sandhana Kalpana.

Kautilya Arthshastra: Separate chapter about Sura is mentioned. Six types of Sura are quoted which were Maireya, Prasanna, Asava, Arishta, Medaka, and Madhu.

Charaka Samhita: 9 Asavayoni and 84 Asavas are described in Sutrasthana, and various Asavarishtas are described in Chikitsasthana. Sura is said as “ShramaHaranamShreshtha”.

Sushruta Samhita: 21 Asavarishta and 46 Madya preparations are described. The addition of botanical ash (Apamarga, Palasha ash) to Asavarishta components can be attributed to Sushruta Samhita.

Ashtang Sangraha & Ashtang Hridaya: Use of Dhataki Pushpa for preparation of Sandhana Kalpana was mentioned. Draksha, Ikshu, Makshika, Shali Vrihi are mainly used for preparation of Madya and Sandhana Kalpana.

Kashyapa Samhita: Abhishava is mentioned as seventh fundamental Kalpana. Abhishava is a synonym of Sandhana Kalpana.

Chakradatta: Ayama kanjika for the treatment of Grahani and Siddhamla Kalpana for the treatment of Amavata and many more products of the Asava- Arishta category are quoted in Chakradatta. This may be considered as a prominent contribution of Acharya Chakrapani.

Sharangdhar Samhita: This Samhita described Asavarishta in detail. Definition, guidelines of preparation and precautions of Sandhana Kalpana is mentioned in this text. Various Asava and Arishta and their method of preparation are described in detail.

Bhaishajya Ratnavali and Yogaratnakara: The text provides information about Sandhana formulation in a better way. Other than Asava-Arishta, Chukra, Sura, Shukta and Kanji is also mentioned.

Ayurvedic Formulary of India: In AFI Part I, II, and III a total of 57 Asava Arishta are described with complete detail of their pharmaceuticals and therapeutics. In this publication by Department of AYUSH, Government of India, the manufacturing process of Asava- Arishta are described in the beginning of the chapter and the ingredients (with their part used) and proportion of every formulae are described systematically.

Classification of Sandhana Kalpana

Sandhana Kalpana is of two types i.e. Madhya Kalpana and Shukta Kalpana.

- **Madya Kalpana (Alcoholic preparation):** includes Asava, Arishta, Sura, Sidhu, Varuni. Sura is further divided into Prasanna, Kadambari, Jagala, Medaka, Surabija. Sidhu is of two types Pakwa and Apakwa Sidhu.
- **Shukta Kalpana (Acidic preparation):** includes Shukta, Tushodaka, Sauviraka, Kanjika, Sandaki.

Madya Kalpana (Alcoholic preparations):

Sura: The fermented liquor prepared using cooked rice, barley, etc. It is further classified as⁴:

- Prasanna- the clear supernatant fluid of Sura.
- Kadambari- slightly thicker than Prasanna.
- Jagala- Jagala is thicker and presents lower than Kadambari.
- Medaka- It is thicker to Jagala.
- Surabija- Residue leftover after filtration is Vakkasa, Surabija or Kinwa.

Sidhu: Sidhu differentiates into two types - Apakwa (Shita rasa) Sidhu is juice of sweet substances (like sugarcane juice) fermented without boiling and Pakwa Sidhu is prepared by fermenting sweet juice after boiling them.

Varuni: The liquor prepared with the juice of Tala and Kharjura. It is lighter to Sura.

Asava Arishta Kalpana

Arishta⁵: An alcohol made from fermentation of Pakwa Aushadha is called Arishta.[5]The drugs are coarsely powdered and Kashaya is prepared. The Kashaya is strained and kept in pot, vessel or barrel and sugar, jaggery or honey is added. Drugs mentioned as Prakshepa Dravyas are finely powdered and added. In the end, Dhataki Pushpa should be properly cleaned and added. The mouth of the pot, vessel or barrel is covered with an earthen lid and the edges sealed with clay-smeared cloth wound in seven consecutive layers and kept for specific period of time during which it undergoes a process of fermentation generating alcohol, thus facilitating the extraction of the active principles contained in the drugs. The generated alcohol served as preservatives.

Asava⁶: An alcoholic preparation which is prepared by fermentation of Apakwa Aushadha is termed as Asava.[4]It is usually prepared with Sheeta Virya Dravya. It is comparatively less potent than Arishta.

Then Asava and Arishta containers are kept either in a special room, in an underground cellar or in a heap of paddy, so as to ensure that for the fermentation, a constant temperature is maintained. After the specified period, the lid is removed, and content examined whether the process of fermentation (Sandhana) has been completed. The fluid is first decanted and then strained after two or three days. When the fine suspended particles settle down, it is strained again and bottled.

Pharmaceutical process of preparation of Asava-Arishta:

It can be divided into three stages:

1. Purva karma: Selection of Sandhan Patra, Dhupana, Lepana and collection of mentioned drugs.
2. Pradhana karma: It includes Drava Dravya (preparation of liquid material), Madhura Dravya, Prakshepa Dravya, Sandhan Patra, Sthanvimarsha, Sandhana Kala and temperature.
3. Paschat karma: It includes Sandhan Pariksha, filtration, storage, packing.

Purvakarma:

Selection of Sandhana Patra (vessels or container): The vessel to be used for the fermentation process should be clean. Acharyas have mentioned various Patras to carry out the fermentation process e.g. Lauha Patra (Cha.Chi.7/73), Stone or earthen pot (Sha.Sa.Ma.Kha.10/18-27), wooden container. But these have certain limitations as earthen pots may break, wooden containers require pre-treatment, but still there may be chances of contamination. Hence, with the development of technology in the field of pharmaceuticals, these pots can be replaced by plastic and steel containers.

Dhupana (fumigation): Specific herbs are selected based on their disinfectant and medicinal properties like Guggul, Agar, Jatamansi, Karpura, Maricha etc. These Dravyas are burned inside the vessel with the smoke directed to coat the inner surface.

Lepana (Paste): After fumigation, paste is applied to the container to seal the pores of earthen pot, to prevent the loss of fermented liquid. Usually cow ghee, honey etc are applied as a paste.

Pradhankarma:

Aushadha Dravya: This should be taken as per the formulation.

Drava Dravyas (liquid): The Drava Dravyas used for the preparation of Asavarishta are Jala, Swarasa, Kwatha, Takra, Dadhi, Gomutra, Kanji, Dhanyamla, etc.

Madhura Dravyas (sweetening agents): Guda, Sharkara, Phanita, Matsyandika, Honey, etc. are used. These act as primary source of nutrition for fermenting microorganisms. The conversion of these sugars into alcohol and carbon dioxide is the central process of fermentation. Moreover, final product became palatable due to sweet taste. Acharya Charaka and Sharangadhara have mentioned using 39.06% of sweet substances for the process of fermentation in Sandhana kalpana.

Sandhana Dravya (fermentation initiators): These are the drugs which provide the medium for the fermentation to start. e.g. Dhataki Pushpa, Madhuka Pushpa, Surabeeja/ Kinwa etc. Nowadays yeast is commonly used as fermenting agent in Sandhana Kalpana.

Prakshepa Dravya: These are added to the formulation to enhance flavor of the product, and also have precise therapeutic action.

Proportion of Dravyas⁷: According to Sharangdhara, if the quantity of ingredients for fermentation is not specified, 1 Drona (12.288L) of Drava Dravyas, and 1 Tula (4.8 kg) of jaggery should be taken. The quantity of honey should be half that of jaggery, while Prakshepa should be added one-tenth of the quantity of Drava Dravya.

Fermentation: After the addition of the Sandhana Dravyas the pot is closed with a lid, sealed with mud smeared cloth and kept undisturbed in a specified location for a specific period of time until chief desired characteristics are found.

Signs of onset of fermentation⁸: hissing sound present, burning candle is put off, lime water turns milky white, mild alcoholic odour and taste.

Temperature required for fermentation: Sandhana kalpana is done where the temperature variation is minimum. In the ancient time, containers for preparation of Asava–Arishta were placed in Dhanya Rashi (Kanakbindu Arishta - Charaka Chikitsa Sthana 7/76-79), Bhugarbha, Chaulyagara (Kharjurasava - Gada Nigraha 7/266-274), Koshtasara (Kumaryasava - Gada Nigraha 6/1-14) etc. This practice ensured optimum temperature, direct avoidance of light and air etc were maintained. Specific microorganisms require specific temperature for optimum growth and product formation. In general, optimum temperature needed for initiation of fermentation is in the range of 20-35°C.

Time required for fermentation completion: Duration of fermentation varies with formulation, which ranges from 7 days (Ashtashatarishta - Charaka Chikitsa Sthana 12/32- 33) to 180 days (Guggulu Asava Gada Nigraha 6/213-221). Fermentation also depends upon climate variation i.e. it takes 7-10 days in hot climate and around 30 days in cold climate. Moreover, fermentation time duration also depends upon amount of sweet agents and type of vessel used.

Pashchat Karma:

Fermentation should be checked for chief desired characteristics, then the liquid should be filtered and kept for a few days to allow the sediments to settle down at the bottom and again filtered to separate the sediments.

Signs of completion of fermentation⁸: Prakshepa Dravya sink to the bottom, hissing sound absent, strong alcoholic odour and taste, the burning candle continues to burn if brought near the fermenting media, No change is found in the lime water test.

Dose⁹: Sharandhara Samhita has prescribed the dose of Asava-Arishta as 1 Pala (48 ml).

Alcohol percentage: Percentage of alcohol varies with specific ingredients present in the formulation. Asava are comparatively less potent having less than 12% alcohol whereas Arishta are highly potent having 12%-15% alcohol. Some of the preparations like Mritsanjivani Sura and Mahadrakshasava are having 16% of alcohol.

Shelf life: According to Ayurvedic classics, Sandhana Kalpana is said to be retained for many years but according to the latest amendment in drug and cosmetic act, the shelf life of Sandhana Kalpana is 10 years.

Analytical parameters for Asava Arishta: Alcohol percentage, Viscosity, Sugar percentage, Thin layer chromatography (TLC), HPTLC, pH value, Physical testing, Microbial study, Specific Gravity, Shelf life study.

Shukta Kalpana (Acidic preparation)¹⁰:

Shukta: The liquor prepared with roots, tubers, and fruits added with Sneha and Lavana.

Tushodaka: Uncooked Yava is pounded along with Tusha and kept for Sandhana.

Sauviraka: Fermentation of Yava, which is boiled after removing its husk (Nistusha).

Kanjika: A fermented product prepared with fermentation of Manda of half boiled Kulmasha, Dhanya and other drugs like Shunthi, Haridra, Jeera etc.

Sandaki: A fermented product prepared with leaves of radish (Mulaka), mustard (Sarshapa), etc. with 8 times of water.

Conclusion

Sandhana Kalpana is a unique Ayurvedic dosage form which is widely used for various therapeutic purposes due to its various advantages such as potency, palatability, quick action, the convenience of administration, and longer shelf life. Microbes mediate this process, and enhance therapeutic properties, which may be due to microbial biotransformation of the initial ingredients of Asava-Arishta into more effective therapeutics as end-products, alcohol-aqueous environment, which is also produced by microbes. Moreover, improvement in drug delivery in the body increases due to alcohol-aqueous environment. These products in general possess preservative properties and potentization of drug due to biotransformation mediated by native microbes.

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