

Ayurvedic Liquid Dosage form *Asava* and *Arista*: An Overview

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ABSTRACT

Introduction: Ayurveda, the science of life, has a strong heritage in India and is being practised for last several thousand of years for treating various ailments. *Asava* and *arista* are considered as unique dosage forms of Ayurveda due to their indefinite shelf life. The self generated alcohol in these preparations potentiates the products pharmaceutically and therapeutically. **Objectives:** These *asava* and *arista* preparations are popular since the Samhita period due to their better absorption, quicker action, longer shelf life and easy palatability. **Methodology:** Different Vedic books, classics and modern texts provide elaborate information about these fermented products with their method of preparation and therapeutic uses. In this review the knowledge available in different treaties and Ayurvedic books from the Vedic period to recent publications of Government of India, i.e., Ayurvedic Formulary of India are highlighted. Further, the methods of preparation and various parameters which mostly affect the preparation of *asava* and *arista* are also discussed. **Conclusion:** This review is aimed at furnishing some of these basic information which may further assist in strengthening the knowledge of academicians and researchers who garner interest in such dosage forms.

Key words: *Asava-Arista*, Historical prospective, Methods of preparation, Parameters.

INTRODUCTION

Ayurveda is the ancient science known to human beings since more than 5,000 years for their healing, prevention and longevity. Ayurveda has been recognised by World Health Organisation (WHO) and became immensely popular in the US, Germany, Italy, Netherlands and many western countries. In India, Ayurvedic science is recognised by conventional medicine on a par with modern medical science.¹ India has a rich source of natural product which constitutes traditional medicine of different therapeutic systems like Ayurveda, Siddha, Unani, Homoeopathy and naturopathy. Herbal medicines and traditional health care system has been developed since many centuries in India. Recently 20,000 medicinal plant species have been recorded and around 500 traditional communities use about 800 plant species for treatment of different ailments.

Investigation report of WHO says that about 70% of Indian population use traditional and alternative medicines for curing different diseases.²

Ayurvedic system of medicine consists of different types of dosage form, among which *Arista* (fermented decoction) and *Asava* (fermented infusion) are considered as superior to other dosage forms due to their easy palatability, accelerated therapeutic action and enhanced drug concentration.^{3,4} *Asava* and *Arista* are included in Ayurveda by Charaka Samhita, Sushruta Samhita, Astanga Hridaya, Bhaisajya Ratnavali, Sarangadhara Samhita, Khadani-igragam, Arsaschikitsa, Yogaratnagaram, *Asavarishtasangragam* and *Astangasangraham*.³ In this review we have discussed the historical

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development, methods of preparation and parameters affecting in the preparation of *Asava-Arista*.

Historical Development of Asava and Arista

Vedic period (1500 – 500 BCE)

Vedic literature such as Rigveda, Yajurveda, and Atharvaveda gives a clear idea about the existence of fermentation process. The fermented milk; the yogurt, is an acidic (mycobacterial) product, was commonly used in the preparation of nutritional dairy product. The wooden containers were used for the preparation of various fermented formulations like strong distilled alcohol and fresh juice of ‘Soma’ the elixir of plant. Soma rasa is a sweet liquid unique formulation, which is obtained with the help of fermentation technique. In Rigveda, alcoholic drink ‘Sura’ was prepared by fermentation process. Soma rasa was offered to God while ‘Sura’ was meant for human consumption.⁶

Kautilya Arthashastra

The use of fruit juice and molasses in Sandhana kalpana preparations were mentioned in Kautilya Arthashastra which were stored for a certain period of time. These liquid preparations obtained by the fermentation method using *kinva*, *surabeeja* (microbial inoculums) which were called as Medaka, Prasanna, *Asava* and *Arista*.^{7,8}

Post Vedic period

During this period, grape and sugarcane juice, juices of Kharjura, bark of herbal trees were used in the preparation of fermented products along with rice, barley and other cereals. Honey, flower of Madhuka (*Madhuca longifolia* Koen), Dhataki (*Woodfordia fruticosa* L. Kurz) were also added to assist the fermentation process.⁸ These fermented medicines were prepared regularly during and after the Vedic period by using the fermentation technique.⁹

Samhita Period (300 -500 BCE)

Vrihat trayee (three great classics of Ayurveda) namely *Charaka Samhita*, *Sushrut Samhita* and *Ashtang Hridaya* describe in detail about pharmaceutical and therapeutic aspects of fermentation for two types of fermented products, ‘*madya*’ (wines) and ‘*Asava-Arista*’. These formulations were tested biologically and documented in *Vrihat trayee*. These three major classics give information regarding ancient methods of preparation of fermented products.¹⁰

Charak Samhita

In Charaka Samhita, Acharya Charaka described *Asavas* which are prepared from the nine potential herbal sources, such as – Dhanya (cereals), Phala (fruits),

Mula (roots), Sara (exudate), Puspa (flowers), Kanda (branches), Patra (leaves), Tvak (bark), and Sarkara (sugar). According to ‘Charaka Samhita’ eighty four ‘*Asavas*’ could be prepared from these sources.¹¹ Charaka recommended total thirty *Asavarista* for the treatment of various diseases.¹⁰ Chakrapani says that *Arista* is prepared with Aushadha, Kwatha, Madhu etc.¹² Charak elaborately defines the fermentation process, method of preparation, specifications for the use of container, precise time required for fermentation, parameters for specific testing process, outcome of the product and therapeutic uses of finished product. Charaka defines *Soma* as ‘*Aushadbinam Shreshtha*’ which means best amongst all medicinal preparations and *Sura* as ‘*Shramaharanam Shreshtha*’ as the most refreshing drink.¹³

Sushruta Samhita

Several fermented products were mentioned in *Sushruta Samhita* which was used during surgical procedures as anaesthetics and medicines for the treatment of different diseases,¹¹ Sushruta Samhita mentioned 21 fermented *Asava-Arista* and 46 *Madya* products such as *Madya*, *Sura*, *Prasanna*, *Jagala*, *Surasava*, *Madhvasava*, *Shukta*, *Dhanyamla* in his text. Sushruta Samhita used botanical ash (Apamarga, Palasha ash) as ingredients of *Asava-Arista* preparation for certain therapeutic purposes,^{14,15} Acharya Sushruta describe *Asava* as *Madya*, which includes different medicines, *Guda* and *Dhataki puspa* etc.¹⁶ ‘Susruta’ Sutra 44th chapter, mention the term ‘*Arista*’ viz.,-‘*Arista Dravya Samyoga Samskaradadbiko gunail*’ which means it possesses better properties and effects than any other formulation due to ‘*Dravya Samyoga*’ (combination of different types of drugs) and the ‘*Samskara*’ (special processing). ‘Dalhana’, the commentator of ‘Susruta’ was the first scholar described the difference between the ‘*Asavas* and *Aristas*’. According to ‘Dalhana’, ‘*Aristas*’ is predominance of ‘*dravyas*’ (drugs) where as in ‘*Asavas*’ *drava* (liquid) is more important. *Sushruta Samhita* reveals predominant use of liquid ingredients for *Asava* preparation and solid ingredients for the *Arista* preparations. ‘Susruta’ Sutra 45th chapter describes about the ‘*Medya Varga*’ which included twenty seven types of fermented preparations (*Sandhana kalpana*) and ‘*Asavaristas*’. This text classified the *Sandhana kalpana* in ‘*Madya*’ and ‘*Sukta*’ groups according to their alcoholic and acidic contents for the first time.¹⁰

Ashtanga Hridaya and Sangraha

Herbal medicines were fully developed during this period. Dhataki pushpa (*Woodfordia fruticosa*) was introduced as an initiator of the formulation for the first time in *Ashtanga Hridaya*, along with other ingredients.⁸

Draksha (grapes), Ikshu (sugar cane), Makshika (honey), Shali (rice), Vrihi (grains) were the five sources of materials used to prepare Madya and fermented product as mentioned in Ashtanga Sangraha.¹⁷ In this text only eight 'Asavarista yogas' are found to be mentioned. Thus, a total 17 *Asava*–*Arista* were quoted in Ashtanga Sangraha and 8 in Ashtanga Hridaya. *Asavarista* have not been differentiated on the basis of their method of preparation i.e boiling or without boiling. There are some *Asava* which are prepared by boiling and *Arista*, without boiling.¹⁰

Sharangadhara Samhita

This classic text elaborately describes methods of preparation of various formulations from barley, rice, sugar cane juice, grape juice, etc. This text has important contribution in making the procedure for the preparation of Sandhana kalpana where definite proportions of the ingredients are not mentioned.¹⁸ Sharangadhara Samhita describes 'Asava' as 'anagni siddha apakvaanusddha' which is prepared with freshly extracted juice of plants by *heema* (cold infusion) where direct heat is not used at any stage of preparation. *Arista* is prepared from decoction which requires agni sannikarsha, where direct heat for boiling of ingredients is necessary for the preparation. *Sharangadhar* has clearly elaborated the differences between the methods of preparations.¹⁹ Difference in methods of preparation of *Asava* and *Arista* contributes to its pharmaceutical properties and potency. *Sharangadhara* recommends *Aristas* due to its potential for early absorption,²⁰ with *laghu guna* (lightness) which is achieved due to direct use of fire in the process. *Asava*–*Arista* formulations were prescribed for medicinal purposes where as 'madya' was referred for exhilarating (alcoholic) drinks which may or may not have therapeutic uses.²¹ Sharangadhara Samhita is a unique text of Bhaishajya Kalpana and were made according to disease wise. Sharangadhara Samhita mentioned total 13 *Asava* and *Arista*, among which 4 are *Asava* and 9 are *Arista*.⁵

Kashyapa Samhita

Different formulations were mentioned during this time period, which denotes the existence of Sandhana kalpana and preparation techniques.²² Brihatrayi explained separately Sandhana Kalpana (fermented product) but Kashyapa Samhita included it in 7 basic Kalpana of Bhaishajya Kalpana.⁵ The term Abhishava (a fermented drink) was included in seven basic kalpanas (dosage forms) to indicate a Sandhana kalpana.

Chakradatta

Many more fermented products of the *Asava*–*Arista* category are quoted in Chakradatta. Ayamakanjika

were used for the treatment of grahani and Siddhamla kalpana for the treatment of amavata. This may be considered as contribution of Acharya Chakrapani.²³

Gada Nigraha

Acharya Shodhala had written Gada nigraha text in 12th century and this text was followed by Acharya Sharangadhara. Total 60 *Asavarista* are mentioned in part-I, 6th Chapter i.e Asavadhikara⁵. In this classical text, various herbal compound medicines were formulated and used in the treatment of diseases. In the chapter Asavadhikar, total 60 *Asavaristas* (fermented drugs) are mentioned where different pharmacodynamic actions of drugs are elaborated and therapeutic potential of Sandhana kalpana is also mentioned.²⁴

Yogaratanakara

Yogaratanakar gives a detailed description of *Asavaristas* in madya kalpana.²⁵ All these descriptions given by Yogaratnakara are similar to the narrations given in the previous classical treatise about *Asavarista*. Total number of formulations of Sandhana kalpana in this book is larger as compared to the earlier classics which may be interpreted as a greater acceptability of these formulations among physicians and patients during this period. Yogaratnakaara mentions 12 *Asavaristas* in the text.⁵

Bhaishajya Ratnavali

This compendium gives the information about Sandhana formulations which is treated as a handbook for routine use by the physician. This book gives the information regarding preparation of formulation. Total of 50 Sandhana kalpanas are mentioned of which 15 are *Asava*, 29 *Arista*, 2 chukra, 2 sura, 1 shukta, and 1 kanji kalpana.²⁶ Acharya Govind Das has mentioned 44 *Asavaristas* out of which 12 are *Asava*, 31 are *Arista* and remaining 1 is sura. The formulation of *Asavaristas* is strictly followed by the definition of *Asavarista* given by Acharya Sharangadhara. Sura is used in formulation for the first time by Acharya e.g Mrigamadrasava.²⁷

Pharmacopoeial standards for Ayurvedic formulations

This text sets standard limits of physico-chemical parameters of 36 *Asavaristas* formulations. This text also describes the therapeutic indication and dose of each formulation.²⁸ Another text book 'A manual of Indian Pharmacopoeia' mentions 21 *Asavaristas* with their therapeutic uses.²⁹

The Ayurvedic Pharmacopoeia of India

The Ayurvedic Pharmacopoeia of India, Part-II, vol-II mentions 24 *Asavaristas* with their composition, methods of preparation and physico-chemical testing parameters.³⁰

Ayurvedic Formulary of India

This compendium mentions 57 *Asavaristas* in Parts I (37), II (3) and III (17), under the publication by Department of AYUSH, Government of India, with complete detail of ingredients with their parts, proportion of each formula and therapeutic uses.³¹⁻³³ The list of *Asava* and *Arista* according to different treaties and Ayurvedic books is given in Table 1.

SANDHANA KALPANA

Sandhana Kalpana is the process of mixing of liquid substances such as sugarcane juice, kasayas with guda, kinva which are kept for some time. The synonym of Sandhana is '*Abhisavana* or *Abhisava*'. It is the process of acceleration of chemical and biochemical reaction which may be classified into *Samyoga* and *vibhaga*. Drug possesses '*tamoguna*' predominantly and causes derangement of the mind which is called *madakari*, for example sura and other *madhy kalpanas* (alcoholic beverages). *Madhya* is an exhilarating and nourishing product. It eliminates fear, grief and exhaustion. It promotes confidence, energy, intelligence, contentment, nourishment and strength.^{34, 35}

Preparation of Asava and Arista

Preparation of *Asava* is carried out by Hima (Cold decoction)/ Jala, Swarasa (expressed juice) process. In the preparation of *Asava* the drug is coarsely powdered and added to water, to which the prescribed quantities of honey, jaggery /sugar are added. It contains dilute solutions of the readily soluble constituents of crude drugs.³⁵

Arista is prepared by soaking the drugs in water for a period of time (8hrs) before decoction, which facilitates the better extraction of active principles into kasaya (decoction) and thereby increase in potency.³⁶ It involve boiling of crude drugs in a specified volume of water for a defined time period. Then it is allowed to cool and filter. This decoction is called as "quath" or "kwatha". For kwatha preparation, the percentage of water depends upon the nature (hardness) and quantity of the drug. The ratio of crude drug to water is generally 1:4 or 1:16. During boiling the volume is reduced to one-fourth of its original volume. Then, the concentrated extract is filtered and used as such or processed further.³⁷ Kasaya is transferred to Sandhana patra and sugar, jaggery or honey are added to it followed by fermentative agent and Prakshepa dravya.³⁵

Singificance of Asava and Arista

Asavaristas preparations have a unique place in all the *madhya kalpanas* and other *kalpanas* mentioned in Ayurveda. Due to their quick action and high preservative quality these are more appreciated among all the formulations. Alcohol and CO₂ are produced during the fermentation process due to chemical changes. Sugar which is present as sweetening substance is reduced and converted to alcohol. The produced alcohol facilitates dissolution of the active principle into the liquid media. Thus the self generated alcohol preserve the active principles of the drug for prolong period by protecting them from different micro-organisms.³⁵

Parameters Affecting Preparation of Asava and Arista

Effect of temperature

Temperature affects the fermentation process of *Asavarista* formulations. In Draksharishta formulation, jaggery was added to the decoction of herbal ingredients, stirred it well and boiled for two minutes in first batch, and in second batch jaggery was added when the decoction was cooled down to 40°C. Then all the preparation kept in porcelain jar and kept for fermentation. It was observed that physico-chemical parameters were found to be less in cold *Arista* than hot *Arista*. Cold *Arista* showed alcohol content of 7.64% whereas no alcohol formation was observed in hot *Arista* on the day of filtration. Tannin contents were found to be same in both formulations. Lower pH values and higher acid value were observed in hot *Arista* than the cold *Arista*. This result concluded that yeast cells were destroyed while the formulation was hot due to high temperature. Hence it was not favourable for fermentation process.

Table 1: List of Asava Arista mention in different Classics and Ayurvedic books

Name of treatise	Number of Asava and arishta
Charak Samhita	30
Sushruta Samhita	21
Ashtanga Hridaya	8
Ashtanga Sangraha	17
Sharangadhara Samhita	13
Gada Nigraha	60
Yogaratanakara	12
Bhaishajya Ratnavali	44
Pharmacopoeial standards for ayurvedic formulations	36
A manual of Indian Pharmacopoeia	21
Ayurvedic Pharmacopoeia of India	24
Ayurvedic Formulary of India	57

Where as in cold decoction, yeast cells were not destroyed and assists the fermentation process.^{38,39}

In the ancient time, containers for preparation of *Asavarista* were placed in Dhanya Rashi (Ex-Kanakbindu arista), Bhugarbha (Ex-Kharjurasava), Koshtasara (Ex-Kumaryasava), etc in order avoid minimum temperature variation. Optimum temperature in the range of 20-35°C is suitable for initiation of fermentation.^{40,41}

Fermentation time

Duration of fermentation vary according to different seasons. Literature revealed that fermentation takes place in 6 days during autumn and summer seasons, 10 days in winter and 8 days in rainy and spring seasons. Generally in hot tropical climate 7-10 days are enough and 30 days in cool temperature climate.⁴² Duration of fermentation ranges from 7 days to 180 days with different formulation.^{10,43}

The effect of fermentation time was studied in Amritarishta which was kept for one year. Results revealed that the specific gravity, total solid content and sugar content were gradually decreased with increase in time. Alcohol content was found to be increase up to six months. The pH value remains constant.⁴⁴ In Drakshasava, fermentation was started on 5th day and completed on 25th day.^{39,45}

Use of various containers and preparation conditions

Earthen pot and several other vessels were used traditionally for fermentation. Besides earthen pots several other vessels were used for preparation of different *Asavarista* formulation which includes glass, aluminium, tinned-copper, stainless steel, porcelain jar, gold vessel. In the preparation of Amritarishta, results showed that decoction prepared in aluminium vessels showed presence of traces of aluminium. This study concludes that vessels of tinned copper were the better choice for fermentation process than aluminium.⁴⁶ Earthen and wooden containers have certain limitations as earthen pots may break, while wooden containers require pre-treatment and there may be chances of contamination. Hence, with the advancement of pharmaceutical technology these pots were replaced by plastic and steel containers. The final product of this container were analysed for the efficacy and the study concluded that plastic and steel containers are suitable for carrying out the Sandhana process.^{47,48}

Draksharishta and Drakshasava prepared in glass vessels and earthen pots showed no significant difference in alcohol production. Preparations in glass vessels showed more acidic than prepared from earthen pot. There was no change observed in TLC pattern and analytical values. It was observed that earthen pot causes evap-

oration due to its porous nature which resulted in limited solubility of compounds. This alteration in pH may affect the performance of organisms.^{49,50}

Proportion of carbohydrates (Madhura Dravya)

Rate of fermentation was affected by nature and concentration of carbohydrates. Microorganisms in *Asavarista* formulation require water, nutritive material as growth promoter and source of energy for their fermenting activity. Carbohydrate acts as the main source of nutrition. The viscosity of the media increases with increase in concentration of carbohydrate. According to Acharya Charaka and Sharangadhara 39.06% of sweet substances are suitable for the process of fermentation in Sandhana kalpana. Easy and early fermentation process begins by addition of only 40% of sweet substances and the remaining quantity of sweet substances is added after initiation of fermentation process.⁵¹

Significance of Sandhana Dravya (Fermentor)

Fermentors are microorganism, which initiates the process of fermentation. Dhataki pushpa was introduced by Acharya Vagbhata as fermentor in the manufacturing of *Asavarista*. Besides Dhataki pushpa some other drugs were also used in Sandhana Kalpana which include Madhuka pushpa (Kutajarishta) and Surabeeja/Kinva (Sura).

A study was conducted to know the effect of addition of yeast (*Saccharomyces cerevisiae*) and Dhataki pushpa to fermenting media. The result revealed that the sample containing yeast showed onset and completion of fermentation process as started on the second day and completed within one month. Whereas samples contain Dhataki puspa, fermentation started on the fifth day and completed in second month. This difference may be due time taken by the yeast cells of Dhataki puspa for natural growth and multiplication.⁴⁷ In another study both Dhataki puspa and isolated strain of *Saccharomyces cerevisiae* from same flower were used as inoculum for fermentation. Result showed that flower of Dhataki was capable to initiate alcoholic fermentation as normally achieved by the use of pure yeast culture.⁵² Flower of Dhataki puspa was found to contain high percentage of tannins (22%). During anaerobic fermentation, these phenolic compounds brought enzymatic conversion to simple phenols and alcohol. This may justified the extensive use of *W. fruticosa* in *Arista* preparation to produce alcohol.⁵³

Metal/Minerals in Asava and Arista

Fine powders of metals (Loha churna) and minerals are added as ingredient for the preparation of Sandhana

kalpana due their vital therapeutic effects. It is observed that some microorganisms consume these metals under optimum growth conditions. In Lohasava, loha churna are converted into minute particles by the action of alcohol and show high content of iron i.e 0.0612 %.⁵⁴

Merits of Sandhana Kalpana (Biomedical Fermentation)

Undesirable sugars are removed from the plant materials by fermentation process and make the product more bio-availability by eliminating side effects such as gas and bloating. As the fermentation process undergoes a gradient increase of alcohol level, it extracts a wide range of active ingredients from the herb than any other methods of extraction. Yeast acts as natural cleansing system because of natural binding of yeast cell wall with the heavy metals and pesticide residue. Fermentation not only removes the contamination but also reduce the toxicity of some toxic components in plants. Herb cells are ruptured by fermentation process and exposed openly to the menstruum where the cell walls are broken down by bacterial enzyme which further assists in the leaching process. Fermentation process creates an active transport system which removes the constituents from the herbal material to the menstruum.⁵⁵

CONCLUSIONS

Asavarista formulation is considered as medicated wine where microbial transformation initiate alcohol formation which helps in extraction of therapeutic attributes and thereby increases the bioavailability of the ingredients. In these dosage forms multiple phytochemicals having therapeutic values are transformed into liquid form to provide safe, potent and better administered liquid form. This fermented product is well standardized since Samhita period. Microbes involved in the fermentation process increase therapeutic property by the microbial biotransformation of the initial ingredient of *Asavarista* into more effective therapeutics. The hydro-alcoholic extraction of phytoconstituents from the herbs shows improvement in drug delivery in the body of consumer. Biotransformation in the formulation is mediated by native microbes, which potentiates the drug and preserves the formulation. From this review it may be concluded that *Asavarista* are the best formulation in Ayurvedic preparation as they possess better keeping quality due to self generation of alcohol by fermentation.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

ABBREVIATIONS USED

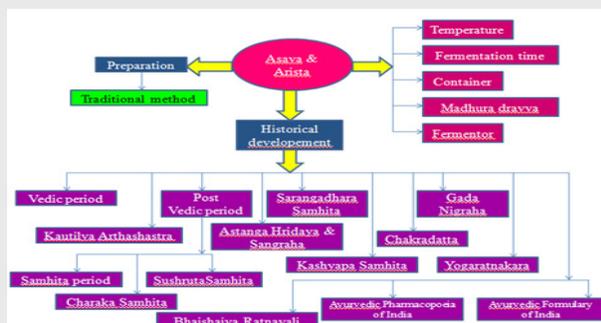
WHO: world health organization; **BCE:** Before common era.

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PICTORIAL ABSTRACT



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SUMMARY

- Due to self generation of alcohol during formulation *asava* and *arista* preparations are treated as medicated wine in which therapeutic attributes are extracted and thereby augments the bioavailability of the phytochemicals. Various factors play important role during formulation of these dosage forms facilitating transformation of multiple phytochemicals having therapeutic values into a safe, potent and better administered liquid form. Bio-transformation in the formulation is mediated by native microbes, which potentiates the drug and preserves the formulation.

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