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Research Article

A COMPARATIVE PHARMACEUTICO - ANALYTICAL STUDY OF *ASHTASHATHO ARISHTA* ACCORDING TO *USHNAKALA* AND *SHEETAKALA*

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ABSTRACT

Sandhana Kalpana is regarded as valuable therapeutics due to their efficacy and desirable features. *Ashtashathoarishta* is one among them explained in Ayurvedic classics. It is an *arishta* preparation explained by Acharya Charaka in the treatment of Shopha with a specified kala for *sandhanaprakriya*. The time required for fermentation is said to vary according to *ushnakala* (7 days) & *sheethakala* (14 days). The main ingredients of *Ashtashathoarishta* include *Kashmarya, Haritaki, Vibhitaki, Amalaki, Maricha, Pippali, Drakshaphala and Purana guda*. *Ashtashathoarishta* is kept for *Sandhana* in *madhu-lipthabhajana* although most *Asava-arishtas* are kept in *gritha-lipthabhajana*. Generally, *dhatakipushpa* acts as *sandhanadravya* but in case of *Ashtashathoarishta* as Acharaya Charaka has not mentioned about any *sandhanadravyas* separately, *Drakshaphala, purana guda* and *madhu* serves its function. Objective of this research was to compare the Pharmaceutico-analytical study of *AshtashathoArishta* prepared in *ushna kala* and *sheeta kala*. Total 12 samples (three samples of each with *sandhana kala* of 7 days and 14 days in both *ushna* and *sheeta kala*) will be prepared. Samples were tested for pharmaceutical and physico chemical parameters. On the basis of organoleptic study and analytical values of the samples, a comparison is done. All the samples of *Ashtashathoarishta* were analytically compared. The fermentation process is faster in *ushna kala* than in *sheeta kala*. The properties of the samples also vary in both the *kalas*. This revealed that the *kala* has a major role in the fermentation process.

Keywords: *Ashtashathoarishta, sandhanakala, ushnakala, sheethakala*, physico-chemical analysis.

1. INTRODUCTION

Bhaishajya Kalpana is a branch of Ayurveda that basically deals with the preparation of medicinal formulations. The word *Bhaishajya* means *Aushadha* (drug) and *Kalpana* means *Yogana* (planning), i.e., the ideology of making use of different drugs [1]. *Sandhana Kalpana* is a unique dosage form of Ayurveda therapeutics in which acidic and alcoholic fermented formulations are prepared. In order to manufacture these medicines, liquid base drugs such a *swarasa* (juices) and *Kashaya* (decoctions) are kept for fermentation. The drugs are formulated in such a way that the alcohol soluble extracts of herbal drugs are preserved in self-generated alcohol used as medicines [2, 3]. *Prakshepadravya, madhuradravya* (sweetening agents), *sandhanadravya* (fermenting agents) or food particles are kept in a vessel for a long duration to facilitate the fermentation process [4].

Sandhana Kalpana (fermentation) is divided into *Madya Kalpana* and *Shukta Kalpana* based on the end products formed. *Madya Kalpana* or alcoholic preparations includes *Asava, Arishta* (medicated spiritous liquids) etc and *shukta Kalpana* or acidic preparations includes *tushodaka* (fermented bean-husk water), *dhanyamla* (sour gruel) etc. Among these, *Arishta* is superior as it possesses more qualities due to *dravyasamyoga samskara*, is *laghu* (light) and pacifies *doshas* [5]. *Sandhana Kalpana* may also be called as *Asavarishtavijnana* indicating both *Asava* and *Arishta* as two major outcomes of this process [6]. When compared to other dosage forms like *taila* (medicated oils), *gritha* (medicated ghee), *Kashaya* (decoctions), *churna* (powders) etc, these formulations have longer shelf life, quicker absorption, action and better therapeutic efficacy [7, 8].

Chronologically, *sandhana Kalpana* may be revealed in

each period of Indian Civilization, i.e., from Vedic period to till date. In Vedic rituals, the knowledge of fermentation was advanced [9, 10]. The references of *Ashtashathoarishta* is available in *Charaka Samhita Swayadhurogachikitsadhyaya*. *Sandhana kala* (fermentation period) of *Ashtashathoarishta* is mentioned by Acharya Charaka as 7 days in *Ushna kala* (hot climate) and 14 days in *Sheeta kala* (cold climate). The main ingredients are Kashmarya, Hareetaki, Vibhitaki, Amalaki, Maricha, Pippali, Draksha and Purana Guda (mentioned in table 2). An exception in case of *patralepana* (smearing of the container) i.e., *madhuliptabhajana* (ghee smeared container) is mentioned in *Charaka Samhita* [11]. It is explained in *Bhaishajyaratnavaliabhavaprakarana*, chapter 4 (abhavapratinidhi) as; if *purana guda* (old jaggary) is not available, *naveenaguda* (new jaggary) kept in intense sunlight for 4 *yaama* (12 hours) can be used as it serves the properties of *purana guda* [11]. It is indicated in *vatakaphajashotha* swelling caused by *doshas* like *vata* and *pitta*) and *vibandha* (constipation). It also helps in *agnideepthi* (increasing digestion) [10].

The process of *Sandhana Kalpana* depends upon many factors like ingredients, method of preparation, *sandhanapatra* (fermentation container), place of fermentation, *ritu* (seasons) and duration of fermentation etc. Among these, duration of fermentation and *ritu* has a major role in the progress of *sandhana Kalpana*. *Sandhana kala* (fermentation period) vary from formulation to formulation. Commonly 30 days are explained in classics for *sandhana kala* with some exceptions. This indicates that season has a role in determining the duration of fermentation [6]. Thus, the present study is a humble enquiry about the changes in *AshtashathoArishta* prepared in *Sheeta* and *Ushna kala* (hot and cold climate) with different *sandhana kala*.i.e.7 and 14 days. It has comparatively lesser *sandhana kala* and lower number of ingredients than other *arishta* used in similar indications [10]. Nowadays, Pharmacies are focused to prepare effective medicines with lesser ingredients due to scarcity of raw materials with less time and labour. Thus, the primary Pharmaceutico-analytical study can explore more about the formulation *AshtashathoArishta*.

2. MATERIAL AND METHODS

Required drugs: (Acc. to classical reference)

Table 1: Dhupanadravya (For Fumigation)

Drugs	Botanical name	Quantity
Chandana	*Santalum album*	5gm
Usheera	*Vetiveriazizanoides*	5 gm
Karpoora	*Cinnamomum camphora*	5 gm
Pippali	*Piper longum*	5 gm
Maricha	*Piper nigrum*	5 gm
Guggulu	*Commiphoramukul*	5 gm

Table 2: *Dravyas* of *Ashtashatho Arishta* (Ingredients)

Dravya	Botanical name/common name	Part used	Classical Quantity	For preparation
Kashmarya	*Gmelina arborea*	Bark	100 pala(4800 gm	96 gm
Amalaki	*Phyllanthus embelica*	Fruit	100 pala(4800 gm	96 gm
Maricha	*Piper nigrum*	Fruit	100 pala(4800 gm	96 gm
Abhaya	*Terminalia chebula*	Fruit	100 pala(4800 gm	96 gm
Vibheetaki	*Terminalia bellerica*	Fruit	100 pala(4800 gm	96 gm
Draksha	*Vitis vinifera*	Fruit	100 pala(4800 gm	96 gm
Pippali	*Piper longum*	Fruit	100 pala(4800 gm	96 gm
Purana Guda	*Old jaggary*	-----	100 pala(4800 gm	96 m

2.1. Method of preparation

2.1.1. Poorva karma (Pre-procedure)

Step 1: Selection of *sandhanapatra* (fermentation containers)

Six glazed porcelain jars of 3 litre capacity were selected with a lid of correct size to close the vessel after testing for weak spots and cracks.

Step 2: *Samskarana* of *sandhanapatra* (processing of fermentation containers)

Cleaning of vessel: The containers and lids were washed thoroughly for several times and were dried under hot sun for 2 days.

***Dhupana* (fumigation):** *Chandana, Usheera, Karpoora, Pippali, Maricha, Guggulu* were taken in a *sharava* and fire was ignited and fumes are diverted to the containers by keeping them upside down over the fumes.

***Patra lepana* (smearing):** The inner surface of the vessels were smeared with *Madhu* and kept aside. It is done after cooling down the vessel from fumigation.

Step 3: Preparation of Dravya (drugs)

The drugs were properly washed and well dried except Draksha (raisins). Draksha was wiped carefully with a clean cloth. Each drug were taken in required quantity and were separately pounded using *khalwa yantra* and pulverizer except Guda (jaggary).

2.1.2. Pradhana karma (Main procedure)

Step 1: Preparation of *Madhura Dravya* (sweetening agents)

Naveena Guda (new jaggary) was kept in sunlight for 12 hours to make it *purana* (old).

Table 3: Mixing of Madhura Dravya

Ingredients	Quantity mentioned in yoga	Quantity taken for the preparation of 1 sample
Purana guda	1 tula/100 pala(4800 gm)	96 gm
*Jala (*Water*)*	1 *drona* (12,000 ml)	1920

Ninety Six (96) gms of *purana guda* (old jaggary) was dissolved little by little in 1920 ml of luke warm water at room temperature. The mixture is strained through a clean kora cloth.

Step 2: Transferring to the container

Coarsly powdered drugs were transferred to the container in required quantity. The mixture of *madhuradravya* (sweetening agent) was transferred to the container and the ingredients were stirred well.

Step 3: Sealing of containers

The mouth of the container was closed with a clean kora cloth and the lid is placed above it. *Sandhi bandhana* (binding) *w*as done using a three-layered cloth smeared with Multani mitti around the joint.

2.1.3. Paschat karma (post-procedure)

The prepared container is kept in a cardboard box filled with *tusha* (husk). The container is covered in *tusha*up to the neck portion.Following the same procedure, 6 samples were prepared in *sheeta kala* and 6 samples in *ushna kala*.

Step 1: Fermentation test

The *dravyas* (drugs) were found sunken in 7 days sample of *sheeta kala* and 14 days sample of both *sheeta* and ushna kala. In *sheeta kala* 7 days sample, *dravyas* were found floating on the liquid. Effervescence was present in *sheeta kala* samples and absent in *ushna kala* samples. Hissing sound was present during the time of fermentation and reduced or was absent on the day of filtering. Burning candle puts off on the day of opening. Lime water test was negative.

Step 2: Opening and filtering

All the samples were filtered through a starch free muslin cloth. Physico-chemical analysis was conducted.

Keeping *naveenaguda* in sunlight for converting to *purana*

Patra dhupana

Madhu lepana

Mixing of *Madhura dravya*

Transferring to the Containers

Sandhi bandhana

Placing for fermentation

Fig. 1: Method of preparation

Burning candle test

Lime water test

Fig. 2: Fermentation tests

2.2. Analytical study

It includes the physico chemical analysis of *AshtashathoArishta* samples prepared with different *sandhanakala* Some of the tests performed were organoleptic characters, temperature, pH, specific gravity, alcohol content, reducing and non-reducing sugar, total solids, brix, total acidity, microbial contamination, HPTLC (High performance thin layer chromatography)

3. RESULTS AND DISCUSSION

The *arishta* samples were analysed for their organoleptic characters, temperature, pH, specific gravity, alcohol content, reducing and non-reducing sugar, total solids, brix value, total acidity, microbial contamination and HPTLC. Organoleptic characters like appearance, colour, odour, touch and taste was noted.

In *sheeta kala*, the 7 days samples appeared frothy, dark brown colour, with slight alcoholic smell and as found thin and non-sticky in nature. Whereas 14 days sample appeared less frothy, dark brown in colour with strong alcoholic smell and was found thin and non-sticky.

In *ushna kala* all the samples appeared as thin non sticky dark brown colour liquid with strong alcoholic odour and no froth.

pH was found in descending order in *sheetakala* 7 days, 14 days, *ushna kala* 7 days, 14 days samples respectively. Increase in pH indicates the acidic nature of the samples that increases with the days of fermentation. In *sheeta kala* samples specific gravity increased from 7 days to 14 days but in *ushna kala* samples it remained the same in both samples. This lowering may be due to breakdown of sugar into alcohol.

Alcohol content was found more in 14 days samples than in 7 days samples in both the *kalas*. Also the alcohol content of *ushna kala* samples was more than *sheeta kala* samples. This explains that the *arishta* has more alcohol content in *ushna kala* than *sheeta kala*.

Reducing sugar was found increasing in *sheetakala* samples from day 7 to day 14, but in *ushna kala* samples,

it is found in decreasing order. Non reducing sugar was found reduced in 14 days samples than in 7 days samples of both the *kalas*. In *sheeta kala*, the total solid content was found slightly increased in 14 days samples than in 7 days samples whereas in *ushna kala* samples, it almost remained the same. Also the total solids in *sheeta kala* samples are higher than in *ushna kala* samples. From this, it is understood that the total solid content increases along with the period of fermentation. More the fermentation period, more is the total solid content of the *Ashtashathoarishta*.

Brix value increased from day 7 to day 14 in both *kalas*. Also the total acidity was found increased from day 7 to day 14 in both the *kalas*. One degree of brix is 1 gram of sucrose in 100 gms of the solution and represents the strength of solution percentage by mass.

Microbial limit test was also conducted. The total bacterial count and total yeast & mould count was found under the standard limit. No presence of *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa* and *Staphylococcus aureus* was found.

In *sheeta kala*, 7 days sample, 9 peaks and areas were found at 254 nm and in 366 nm, only 7 peaks and areas were found. In *sheeta kala*, 14 days sample, 9 peaks and areas were found at 254 nm whereas in 366 nm, only 8 peaks and areas were found. In *ushna kala* 7 days sample, 9 peaks and areas were found at 254 nm whereas at 366 nm, only 5 areas and peaks were found. In *ushna kala* 14 days samples, 9 peaks and areas were found at 254 nm whereas in 366 nm, only 6 peaks and areas were found. There was difference in the Rf values of the samples at 254nm and 366 nm. The HPTLC analysis of *AshtashathoArihsta* at 254 nm & 366 nm reveals multiple peaks with varying intensities, indicating the presence of different compounds. The Rf values of the peaks vary, indicating differences in the migration rates of the compounds during the HPTLC analysis. This suggests that the components have different affinities for the adsorbent material and the solvent system used. By performing further in depth analysis, we may get clear insights of the composition and potential therapeutic properties of *AshtashathoArishta*.

Table 3: Organoleptic parameters of *sheeta kala* samples

	***Sheeta kala* 7 days**			***Sheeta kala* 14 days**		
Parameters	**Sample 1**	**Sample2**	**Sample 3**	**Sample 1**	**Sample 2**	**Sample 3**
Appearance	Frothy	Frothy	Frothy	Less frothy	Less frothy	Less frothy
Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown
Odour	Alcoholic smell	Alcoholic smell	Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell
Touch	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky
Taste	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet

Table 4: Organoleptic parameters of *ushna kala* samples

	***Ushna kala* 7 days**			***Ushna kala* 14 days**		
Parameters	**Sample 1**	**Sample2**	**Sample 3**	**Sample 1**	**Sample 2**	**Sample 3**
Appearance	Not Frothy	Not Frothy	Not Frothy	Not Frothy	Not Frothy	Not Frothy
Colour	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown	Dark brown
Odour	Strong Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell	Strong Alcoholic smell
Touch	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky	Thin, non-sticky
Taste	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet	Astringent sour sweet

Table 5: Analytical parameters - Mean value

Parameters	*Sheetakala* 7 days	*Sheetakala* 14 days	*Ushna kala* 7 days	*Ushna kala* 14 days
pH	3.49	3.47	3.19	3.16
Specific gravity	1.03	1.05	1.03	1.03
Alcohol content	2.9%	3.2%	3%	3.4%
Reducing sugar	4.9	7.1	5.8	2.8
Non-reducing sugar	0.3	0.1	0.03	0.01
Total solids	9.9	11.7	9.8	9.1
Brix	13	15	11.3	13
Total acidity	1.14	1.26	1.28	1.31

Table 6: Microbial limit test

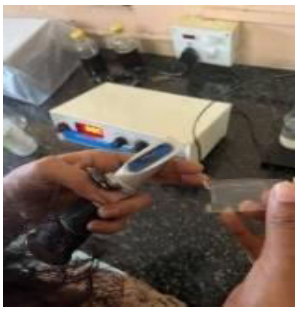
Microbial contamination	*Sheeta kala* 7 days	*Sheeta kala* 14 days	*Ushna kala* 7 days	*Ushna kala* 14 days
Total bacterial count	230 cfu/g	290 cfu/g	40 cfu/g	50 cfu/g
Total yeast and mould count	10 cfu/g	10 cfu/g	20 cfu/g	70 cfu/g
Escherichia coli	Absent	Absent	Absent	Absent
Salmonella typhi	Absent	Absent	Absent	Absent
Pseudomonas aeruginosa	Absent	Absent	Absent	Absent
Staphylococcus aureus	Absent	Absent	Absent	Absent

Table 7: Instrumental analysis - HPTLC

Samples	254 nm		366 nm	
	Peaks	Areas (AU)	Peaks	Areas (AU)
Sheeta kala 7 days	9	51580.4	7	19147.2
Sheeta kala 14 days	9	50648.6	8	22225.3
Ushna kala 7 days	9	54418.4	5	29278.9
Ushna kala 14 days	8	59789.3	6	277796.2

pH


Specific gravity


Brix value


Alcohol content


Total solids


Total acidity


Reducing sugar

Fig. 3: Analysis of Arishta

4. DISCUSSION AND CONCLUSION

Ayurveda is an ancient medical system which means science of life. *Sandhana Kalpana* (fermented liquids) are one of the best dosage forms of Ayurveda in practise since thousands of years. The preparations occupy a unique position in pharmaceutics on account of their superiority to other preparations with the qualities like longer shelf life, quicker absorption and high therapeutic efficacy. The word *sandhana* means union, combination, joining etc. Here, the ingredients such as *dravadravya* (liquids and solids) etc are kept in a container for a specific period of time to initiate the process of fermentation.

*Asavas*and*arishtas* are self-generated herbal formulations, first differentiated by *Acharya Chakrapani* in his Treatise *Chakradatta*. According to *Acharya Sharangadhara, Asavas* are *dravapradhana* in nature, prepared by fermentation of *apakwaoushadha* (without heating) whereas *arishtas* are *dravyapradhana*, prepared using *pakwaaoushadha* (with heating) in the form of *Kashaya* (decoctions). *Aristas* are generally *Kashaya katu rasa* (astringent and in taste), *kaphavatahara* (pacifies kapha and vata doshas), *deepana* (increases digestion) etc. *Agni Samskara* (contact with the fire) brings *laghutwa* (lightness) in*arishta*. Asavas are preferred for their *sitavirya*, drugs with volatile principles etc. Also, *Asava* is mana *shareeraagnibalaprada* (good for mind and body, increases digestion, and strength), *aswapnashokanashana* (induces sound sleep and reduces grief), *aruchi hara* (cures tastelessness)etc.

The study can be concluded that in *ushna kala*, the fermentation process is faster whereas in *sheeta kala*, it is slower. The properties of the samples also vary in both the *kalas*. This revealed that the *kala* (seasons or climate) has a major role in the fermentation process.

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Conflcit of interest

I declare that I have no conflicts of interest. I have no financial ties to any companies that could benefit from the research findings.

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