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A COMPARATIVE ANALYTICAL STUDY OF *PARTHADYARISHTA* WITH *GUDA* AND STEVIA AS *MADHURA DRAVYA*

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ABSTRACT

In Ayurveda, pharmaceutical preparations are explained under the branch Rasashastra and Bhaishajya Kalpana. *Asavarishtas* are dosage forms prepared by following the principles of *Sandhana Kalpana*. *Asavarishtas* are effective dosage forms which can be preserved for a prolonged duration. *Parthadyarishta* is a formulation in which *Guda* is used as *Madhura Dravya*. The presence of *Guda* in *Arishta* helps in fermentation as well as improving its palatability. An attempt was made to replace *Guda* in the *Arishta* with stevia which is a sugar substitute with cardioprotective action.[1] In order to evaluate the efficacy and stability of *Arishta* prepared using stevia and to compare it to that with *Guda*, analytical study was done.

KEYWORDS: *Sandhana Kalpana, Parthadyarishta, Guda,* Stevia, Analytical Study.

INTRODUCTION

Analytical study of *Asava-Arishta*[2] preparations is crucial to ensure its efficacy for several reasons. *Asava-Arishta* formulations undergo natural fermentation and their chemical composition may vary based on factors like raw material quality, duration of fermentation and environmental conditions. Analytical study helps to ensure the consistency of these formulations by identifying active ingredients, monitoring microbial activity and ensuring the correct alcohol content which plays a crucial role in the stability and efficacy of these medicines.

Standardization is essential to maintain therapeutic efficacy. Some of the analytical techniques also helps to determine the concentrations of bioactive compounds, ensure batch-to-batch consistency and establish standard parameters like pH, alcohol content, specific gravity etc.

Safety is a significant concern, particularly with long-term use. Analytical studies help to detect the presence of toxic substances or heavy metals, ensure the absence of harmful microorganisms, confirm that the fermentation process that produces safe levels of ethanol which guarantees that the product is both safe and effective for therapeutic use.

Fermented formulations have a longer shelf life than other Ayurvedic medicines and analytical study helps in determining the stability over time. The degradation of bioactive compounds, alcohol content and microbial activity helps to establish appropriate storage conditions and to recommend a suitable expiration date.

Parthadyarishta is an Ayurvedic formulation mentioned in *Bhaishajya Ratnavali*, *Hridrogadhikara*. It is indicated in cardio-vascular and respiratory diseases. In this present study, analytical testing of a sample of *Parthadyarishta* prepared with *Guda* and another sample prepared replacing *Guda* with leaves of *Stevia Rebaudiana* Bertoni (which is a sugar substitute) was done.

AIMS AND OBJECTIVES OF THE STUDY

- To do physico-chemical analysis[3] of *Parthadyarishta*[4] prepared using *Guda*[5]
- To do physico-chemical analysis of *Parthadyarishta* prepared using stevia
- To compare analytical parameters of *Parthadyarishta* prepared using *Guda* and that with stevia.

MATERIALS AND METHODS

Raw drugs for the preparation were collected from genuine source after considering authentication by the experts. Necessary processing of raw materials and preparation of formulation of *Parthadyarishta* with *Guda* (sample 1) and that with stevia (sample 2) were done in the laboratory of P.G. Department of Rasashastra and Bhaishajya Kalpana, Alva's Ayurveda Medical College, Moodubidire. Both the samples of *Arishta* were sent to NABL accredited laboratory for analytical study.

Analytical study

Analytical study was carried out with the help of Quality Control Lab of Care-Keralam Ltd., Kinfra Small Industries Park, Nalukettu Road, Koratty 680309, Thrissur District, Kerala, India. Analytical testing of both the samples were done based on methodology mentioned in API standards.

Analytical study included

1. Organoleptic characters
2. Physico-chemical parameters

Table 1: Analytical tests done.

Sample 1 (with *Guda*)	**Sample 2 (with stevia)**
Organoleptic characters – Colour, odour, consistency, taste	Organoleptic characters – Colour, odour, consistency, taste
Total soluble solids	Total soluble solids
pH value	pH value
Specific gravity	Specific gravity
Refractive index	Refractive index
Total sugar percentage	Total sugar percentage
Reducing and non-reducing sugar	Reducing and non-reducing sugar
Alcohol content	Alcohol content
Shelf-life	Shelf-life

1. Assessment of Organoleptic characters

Organoleptic testing refers to the evaluation of medicinal preparations using the senses (sight, taste, smell, touch). Testing the organoleptic characters of *Arishta* includes assessing its sensory attributes such as colour, taste, odour and consistency. Here are the methodology used for testing the organoleptic characteristics of the *Arishta*:

- **Colour:** Examination of the colour of the *Arishtas* under normal lighting conditions was done. Observation of clarity or turbidity of the liquid and checking for the presence of any visible particles, suspended solids or sedimentation was done which can indicate the quality of fermentation.
- **Consistency:** The consistency of *Arishta* is generally liquid, but may vary between formulations. Examination of the flow and viscosity was done to check if it aligns with traditional standards.
- **Odour:** Evaluation of aroma of the *Arishta* samples was done by gently swirling the sample and inhaling the vapours. It should generally possess a typical fermented, slightly

alcoholic smell. Bad odours or sour smells might indicate spoilage or improper fermentation.

- **Taste:** Tasting of a small amount of the *Arishta* samples were done. Generally, it should be palatable, mildly alcoholic and slightly sweet due to fermentation. The taste profile may also have bitter, astringent or spicy notes depending on the herbal ingredients. *Arishta* develop a typical taste after fermentation, which can be compared to the standard reference for each formulation.

2. Assessment of Physico-chemical parameters

1. Total soluble solids[6]

For *Asavarishtas* with sugar or honey

50 ml of *Arishta* was added to evaporable dish. It was dried to thick extract using water bath. It was added with 10 ml of dehydrated ethanol. It was dried using water bath. To this, 1 g of diatomite was added and dried at 105 ^{0}C for 3 hours and cooled using desiccator for 30 mts. It was weighed and the weight of diatomite was deducted from it to obtain total soluble solids.

For *Asavarishta* without sugar or honey

Adding diatomite and drying was not done. Remaining procedures were same.

2. pH[7]

Potentiometric meter known as pH meter fitted with electrodes was used to find pH. The electrodes were immersed in solutions to be examined and pH were measured at the temperature as for the standard solution. Both the pH were compared.

3. Specific gravity[8]

It is the ratio of density of a substance to density of water**.** Pycnometer is used to determine this**.** For finding specific gravity, weight of sample present in pycnometer was divided with the weight of water at 25 ^{0}C.

4. Refractive index[9]

It is the ratio of sine of angle of incidence to angle of refraction of a beam of light passing from air into solution. Refractometer is the instrument used for measuring it.

5. Reducing sugar[10]

Suitable amount of the sample was taken and neutralised with sodium hydroxide solution (10

percent in water). The neutralized solution was evaporated to half the volume on a water bath at 50^0C (to remove the alcohol). The solution was then cooled and 10ml of the clarifying solution 1 (i.e., Dissolve 21.9g of zinc acetate and 3ml of glacial acetic acid in purified water and make the volume to 1L) followed by 10 ml of the clarifying solution 2 (Dissolve 10.6g of potassium ferrocyanide in water and make upto 100ml) were added. Mixing and filteration through a dry filter paper was done and volume was made upto 100ml. 10ml of the fehling's solution was taken from a burette and sugar solution was added in a drop wise manner and heated to boiling over the hot plate (maintained at 80 ^{0}C until the fehling's solution appeared to be nearly reduced. 3-5 drops of 1 percent methylene blue was added and titration was continued till blue colour was discharged. Readings were noted and percentage of glucose was calculated.

6. Non-reducing sugar[11]

Same method was used but instead of fehling's solution, 15 ml of 0.1 N Hydrochloric acid was used and instead of methylene blue, phenolphthalein was used.

7. Total sugar[12] – sum of both.

8. Alcohol content[13]

25 ml of formulation was measured by using measuring cylinder and transferred to distillation flask having capacity of 500 ml. The measuring cylinder was washed with 150 ml of water and it was added to the flask. Some porcelain pieces were added to the flask and distilled. About 90 ml of distillate was collected from this. 25 ml of distillate was taken and diluted to 100 ml with water and with the help of a specific gravity bottle and determined the specific gravity of liquid at 25°C. Using the alcohol content table with specific gravity, v/v alcohol content in the samples were determined. The % alcohol content was calculated by using the multiplication factor.

9. Shelf-life[14]

All these tests were done repeatedly under accelerated conditions on 0^{th}, 1^{st}, 3^{rd} and 6^{th} month along with assessment of microbial contamination.

RESULTS

Table 2: Organoleptic characters.

PARAMETRS	SAMPLE 1 (with *Guda*)	SAMPLE 2 (with stevia)
COLOUR	Dark brown	Dark brown
ODOUR	Alcoholic smell	Alcoholic smell
CONSISTENCY	Liquid	Liquid
TASTE	*Madhura Pradhana Kashaya Rasa*	*Madhura Pradhana Kashaya Rasa*

Table 3: Physico-chemical parameters.

PARAMETERS	SAMPLE 1 (with *Guda*)	SAMPLE 2 (with stevia)
Total soluble solids	30.75 % w/v	10.25 % w/v
pH	4.05	4.03
Specific gravity	1.0473	1.0210
Refractive index	1.3825	1.3465
Total sugar	22.26 % w/v	0.00 % w/v
Reducing sugar	20.44 % w/v	0.00 % w/v
Non-reducing sugar	1.82 % w/v	0.00 % w/v
Alcohol content	6.05 %v/v	2.92 % v/v
Shelf-life	Stable upto 2 years	Stable upto 2 years

Results of Stability test done

Table 4: SAMPLE 1: *Parthadyarishta* with *Guda.*

Temperature : 40+_ 2^0 C and Relative Humidity : 75 +_5 %

Test parameters	First month (% Deviation from Zeroth Month Study)	Third month (% Deviation from Zeroth Month Study)	Sixth month (% Deviation from Zeroth Month Study)
Appearance	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Colour	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Consistency	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Odour	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Froth formation	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Alcohol content	3.64%	11.09%	18%
pH	5.01%	8.17%	10.29%
Specific gravity	0.045%	0.072%	0.063%
Total sugar	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study
Migration of content and intact pack	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study
TLC Profile	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study

Total plate count for Bacteria	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits
Total Yeast and Mold count	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits

Table 5: SAMPLE 2: *Parthadyarishta* with stevia.

Temperature: 40+_ 2^0 C and Relative Humidity: 75 +_5 %

Test parameters	**First month (% Deviation from Zeroth Month Study)**	**Third month (% Deviation from Zeroth Month Study)**	**Sixth month (% Deviation from Zeroth Month Study)**
Appearance	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Colour	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Consistency	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Odour	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Froth formation	No Deviation from zeroth month study	No Deviation from zeroth month study	No Deviation from zeroth month study
Alcohol content	2.64%	11.57%	19.23%
pH	5.34%	5.82%	9.25%
Specific gravity	0.18%	10.26%	0.12%
Total sugar	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study
Migration of content and intact pack	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study
TLC Profile	No deviation from zeroth month study	No deviation from zeroth month study	No deviation from zeroth month study
Total plate count for Bacteria	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits
Total Yeast and Mold count	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits	Deviation from zeroth month study is within API limits

DISCUSSION

Organoleptic characters: Both the samples were dark brown coloured liquids with alcoholic smell and tastes were *Madhura Pradhana Kashaya Rasa*. This complies with API standards.

Physico-chemical parameters

Total soluble solids

The residue obtained when a prescribed amount of preparation is dried to constant weight is

called as total soluble solids. This gives an idea about the amount of extract of raw drugs present in the sample and its efficacy. Here, total soluble solids of sample 1 was 30.75 % w/v and sample 2 was 10.25 % w/v. Both were within the normal ranges as per API standards.

pH value

This is very essential especially in case of *Asavarishta* where the normal pH range will be 4-5 and lower pH indicates the acidic fermentation, which is not desirable. The control of pH is very important for achieving optimal productivity from the *Sandhana* process. pH of sample 1 was 4.05 and sample 2 was 4.03 which were within normal ranges according to API standards.

Specific gravity

The specific gravity of a liquid is the weight of a given volume of the liquid at 25°C (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighing being done in air. The presence of dissolved substances in both the samples is expected to change the specific gravity. Specific gravity of sample 1 was 1.0473 and sample 2 was 1.0210 which were within normal ranges as per API standards.

Refractive index

The refractive index (n) of a substance with reference to air is the ratio of the sine of the angle of incidence to the sine of the angle of refraction of a beam of light passing from air into the substance. The consistency of the media and solutes present in the media bring the difference in the refractive index. So, it is an important parameter for differentiating the fermented product. The refractive index of sample 1 was 1.3825 and sample 2 was 1.3465 which were within normal ranges as per API standards.

Reducing sugar

A reducing sugar is any sugar that is capable of acting as a reducing agent because it has a free aldehyde group or a free ketone group. All monosaccharides are reducing sugars, along with some disaccharides, oligosaccharides and polysaccharides. Reducing sugar is responsible for the formation of alcohol in *Arishta*. Reducing sugar in sample 1 was 20.44 % w/v which shows the presence of mono or disaccharide sugar due to the base *Guda* in the formulation. Reducing sugar in sample 2 was 0.00 % w/v which shows the absence of mono or disaccharide sugar in the sample as the base was stevia.

Non-reducing sugar

Non-reducing sugar is mainly sucrose which is non-fermentable by yeast. In sample 1, it was 1.82 % w/v which shows the presence of sucrose which may be responsible for the sweetness of *Arishta* and in sample 2, it was 0 % w/v which shows there is no sucrose in the sample.

Total sugar

It is the total percentage of sugar present in the sample which include both reducing sugar and non-reducing sugar that may be responsible for the sweetness of the sample. In sample 1, it was 22.26 % w/v and in sample 2, it was 0 % w/v.

Alcohol content

The ethanol content (%v/v) in the liquid is the number of volumes of ethanol contained in 100 volumes of liquid. Alcohol content shows the extent of fermentation in *Arishta* and may affect shelf-life. In sample 1, the alcohol content was 6.05 %v/v which indicates the presence of large amount of glucose which got converted into alcohol as it contains *Guda* as *Madhura Dravya.* In sample 2, the alcohol content was 2.92 %v/v which indicates the presence of less amount of glucose which got converted to alcohol as it contains stevia as *Madhura Dravya.*

Shelf-life

Accelerated stability test was done on both the samples. It is the formal stability testing method that exposes a product to exaggerated storage conditions to increase the rate of chemical degradation and physical changes. It helps to determine whether a product's stability has been compromised by exposure to extreme storage conditions.

According to stability study results of both the samples :

1. Organoleptic characters: No deviation from zeroth month sample
2. Physico-chemical parameters: Deviation within permissible limits as per API
3. Total yeast and mould count: Deviation within permissible limits as per API
4. Total plate count of bacteria: Deviation within permissible limits as per API
5. Migration of content and intact pack: No visual migration observed
6. TLC profile: No spot disappeared or no secondary spot appeared compared to zeroth month sample.

Based on the above data, it was concluded that both the products can be stable upto 2 years.

CONCLUSION

Analytical studies are essential for the quality control, safety, efficacy, standardization, and scientific validation of *Asava* and *Arishta* preparations. This plays a critical role in integrating these traditional formulations into modern healthcare practices. This study has helped in obtaining preliminary standards of analytical parameters for *Parthadyarishta* prepared with stevia which can be used for further study. It was found that the *Parthadyarishta* prepared with stevia was analytically similar to that of *Parthadyarishta* prepared with *Guda* except for few mild variations in which majority were within normal limits. Hence, it can be concluded that *Parthadyarishta* prepared using stevia is analytically a substitute for that with *Guda.* Clinical study can be carried out to understand the therapeutic effectiveness of *Parthadyarishta* prepared with stevia. Real-time stability test can be carried out to give insight into long-term shelf-life of the sample under normal conditions.

REFERENCES

1. María I Ragone, Patricia Bonazzola, Germán A Colareda et al., Cardioprotection of Stevioside on Stunned Rat Hearts: A Mechano-Energetical Study, Phytomedicine, 2017, Pubmed.com
2. Sharangadharacharya, Sharangadhara. Deepika Commentary by Adhamalla, ed: Reprint, Varanasi: Chaukhambha Krishnadas Academy, 2000; 233.
3. Ministry of AYUSH, Government of India, The Ayurvedic Pharmacopeia of India, Pharmacopeia commission for Indian Medicine and Homeopathy 1st edition 2008, Part-2 volume-2, 35.
4. Das Govind, Bhaishajya Ratnavali, hindi commentary by Mishra siddhinandan, Published by Chaukamba Surabharati Prakashan, Varanasi, Edition, 2012, Chapter 33, 673.
5. Bhavamisra, Bhavaprakasha Nighantu, with hindi commentary by Shastri Viswanathadwivedi, Published by Mothilal Banarasidas, Delhi, Edition-1977, 453.
6. Ministry of AYUSH, Government of India, The Ayurvedic Pharmacopeia of India, Pharmacopeia commission for Indian Medicine and Homeopathy 1st edition 2008, Part-2, 2: 47.
7. Ibid, 221.
8. Ibid, 213.
9. Ibid, 212.
10. Ibid, 212.
11. Ibid, 265.

12. Ibid, 266.
13. Ibid, 225.
14. Vibhav Tiwari, Kumar B.M.N, Vineet Sharma et al., Accelerated stability study and quantitative estiatimation of Piperine in Draksharishta, International Journal of Research in Pharmaceutical Sciences, 2017, Google scholar.