ORIGINAL ARTICLE

Physico-chemical study of *Arjunarista*

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Abstract

Background: *Arjunarista* is an important formulation used in cardiovascular disorders. **Aim:** To standardized *Arjunarista* on some analytical parameters. **Materials and Methods:** *Arjunarista* was prepared as per *Sandhana kalpana* (Bio-medical fermentation) using *Arjuna twak (Terminalia arjuna)*, *Draksha phala* (*Vitis vinifera)*, *Madhuk puspa (Madhuca indica), and Jaggery (Saccharum officinarum)*. Two variations were considered for analytical standardization of *Arjunarista,* i.e., pot (earthen and porcelain) and *dhataki puspa* (addition and deletion). In this way, four batches of *Arjunarista* were prepared. Analytical standardization was carried out in the term of organoleptic and physico-chemical character for all four batches. Organoleptic character includes color, odor, taste, and consistency. **Results:** All batches of *Arjunarista* having dark brown color, vinegar and alcoholic odor, sweet, sour, and astringent taste, and the highest consistency was present in Batch I and rest have a similar consistency. The physico-chemical parameter includes pH, specific gravity, total solid contents, and ash content. pH of *Arjunarista* was 3.60, 3.58, 3.70, and 3.84 of Batch I, Batch II, Batch III, and Batch IV, respectively, specific gravity 1.09, 1.08, 1.06, and 1.07 of Batch I, Batch II, Batch III, and Batch IV, respectively, total solid content 72.00%, 62.33%, 74.33%, and 74.33% of Batch I, Batch II, Batch III, and Batch IV, respectively, and ash content 1.03, 1.11, 0.80, and 1.27 of Batch I, Batch II, Batch III, and Batch IV, respectively. **Conclusion:** Organoleptic characters were similar in all batches and pH, specific gravity, and ash contents of different batches showed slight variation between them.

Key words: *Arjunarista, dhataki puspa*, standardization

INTRODUCTION

Concept regarding standardization and quality control of *Ayurveda* drugs can be traced back to the ancient times. The *Vaidyas* of ancient days used to collect the herbs by themselves according to seasonal variation (including time of collection and place of collection) and utilized them in the preparation of medicines. Due to this, qualities of finished drugs have been described in classics were based on their *siddhi lakshan* (which is the best indicator of completion of process and quality of the product). As per the global demand for the *Ayurvedic* product, need of evaluation of their quality on scientific parameters and they have to be viewed and answered looking at the advancement of science and technology of current scenario. The World Health Organization also has been encouraging and promoting these traditional medicines since last few decades. Traditional system of medicine comprises various types of medicines including fermented forms such as *Aristas* and *Asava*. *Aristas* are an important group of formulations used in *Ayurveda* for the treatment of various types of disorders. *Arjunarista* is used internally for treatment of cardiovascular disorders.[1] It nourishes and strengthens the heart muscle and promotes cardiac functioning by regulating blood pressure and cholesterol. It was prepared by the bark of *Terminalia arjuna*, *puspa* of *Madhuca indica*, fruit of *Vitis vinifera*, *puspa* of *Woodfordia fruticosa* and *Saccharum officinarum*.[2]

In this study, *Arjunarista* was prepared by considering two variations, i.e., with *dhataki puspa*, without *dhataki puspa* and earthen, porcelain pot. Due to this, it might be possible that some physico-chemical parameters may differ to each other which affect the quality control and quality assurances. To understand these changes, this study was carried out to assess the quality of *Arjunarista* by physico-chemical parameters published by CCRAS, Government of India.[3]

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MATERIALS AND METHODS

In this study, two variations were taken into consideration, i.e., pot and *dhataki puspa*. In pot variation, two types of pot used in the study, i.e., earthen pot and porcelain pot and, in *dhataki puspa*, presence and absence of *dhataki puspa* were considered. In this way, four batches of *Arjunarista* were prepared, and in each batch, three samples were prepared thus total number of the sample were 12. 12 samples of a different batch of *Arjunarista* were subjected to analyze by its organoleptic and physico-chemical properties.

Organoleptic Parameters

The *Sparsh, Roopa, Rasa, and Gandha* of the samples were perceived by the *Gyanendriya* (Sense organ) and analyze based on the experiences.

Physico-chemical Parameters

Determination of pH

pH meter was used for every sample of *Arjunarista* just after the calibration with buffer solution having acidic solution pH 4 and basic solution pH 7. After calibration of instrument, pH of different batches of *Arjunarista* was taken with it. In this way, pH of all batches was recorded.

Specific gravity (at 25°C)

A pycnometer was used for measurement of specific gravity of liquid materials. It was filled up to the mark with water at 25°C and weight was taken. Then, the bottle was cleaned, rinsed, and filled with sample at the same temperature and weighted. The specific gravity was determined by dividing the weight of sample expressed in gram by the weight of water expressed in gram.

Total solid content

About 5 ml of each sample of different batches of *Arjunarista* was taken separately in a previously dried and weighed dish, evaporated on water bath and further dried in an oven at 80-100°C till constant weight, weight of the residue obtained after the complete evaporation was the total solid content of the sample. The percentage of total solid content in the sample was determined and expressed as percentage w/w.

Ash content

Ash content is a measure of the amount of inorganic compound present in the sample. To determine the ash content, measured amount of dry solid obtained from *Arjunarista* sample was taken in a tarred silica dish and incinerated by gradually increasing the heat, not exceeding dull red heat, until free from carbon. Then, the dish was allowed to cool in a desiccator and weighed. The percentage of ash content (w/w) was calculated with reference to 10 ml of *Arjunarista.*

RESULTS

Organoleptic Character

Organoleptic characteristics of prepared *Arjunarista* revealed that this is palatable to use because of sweet taste combined with a fine aroma which masks unpleasant taste and odor of added herbal ingredients [details about organoleptic characters are summarized in Table 1].

Physico-chemical Parameters

Physico-chemical parameters, such as ash value, acid insoluble ash, loss on drying, extractive values using water, were determined using standard procedure [details about physico-chemical characters are summarized in Table 2].

DISCUSSION

Organoleptic evaluations for *asava-rista* quality are subjective, sensory judgments based on the experience of the evaluator. They can involve eyeing, feeling, chewing, and tasting of the products to judge product appearance, color,

Table 1: Organoleptic character of all samples of *Arjunarista*

Parameters	B-I			B-II			B-III			B-IV		
Samples	E1 (D–)	E2 (D–)	E3 (D–)	E1 (D+)	E2 (D+)	E3 (D+)	P1 (D–)	P2 (D–)	P3 (D–)	P1 (D+)	P2 (D+)	P3 (D+)
Color	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB	DB
Odor	V/A	V/A	V/A	V/A	V/A	V/A	V/A	V/A	V/A	V/A	V/A	V/A
Tas												
As	++	++	++	++	++	++	+	+	+	+	+	+
Sw	–	–	–	–	–	–	–	–	–	–	–	–
So	+++	+++	+++	+++	+++	+++	+	+	+	++	++	++
Conc	+++	+	++	+	++	+	+	+	+	+	+	+

B: Batch, DB: Dark brown, LB: Light brown, V/A: Vinegar/alcoholic, Tas: Taste, Conc: Consistency, As: Astringent, Sw: Sweet, So: Sour, E: Earthen pot, P: Porcelain pot, (D–): without *dhataki puspa*, (D+): with *dhataki puspa*

Table 2: Physico-chemical parameters of all samples of *Arjunarista*

Parameters	B-I			B-II			B-III			B-IV		
Samples	E1 (D–)	E2 (D–)	E3 (D–)	E1 (D+)	E2 (D+)	E3 (D+)	P1 (D–)	P2 (D–)	P3 (D–)	P1 (D+)	P2 (D+)	P3 (D+)
pH	3.50	3.62	3.70	3.62	3.57	3.55	3.52	4.02	3.58	3.74	3.87	3.92
Sp. gr.	1.08	1.11	1.09	1.07	1.09	1.09	1.05	1.10	1.04	1.08	1.08	1.07
TSC w/w (%)	75	74	67	65	64	58	78	67	78	75	73	75
AC. w/w (%)	1.02	0.98	1.09	1.17	1.06	1.11	1.25	0.30	0.87	0.85	1.59	1.39

TSC: Total solid content, AC: Ash content, Sp.gr.: Specific gravity, B: Batch, E: Earthen pot, P: porcelain pot, (D–): Without *dhataki puspa*, (D+): With *dhataki puspa*

integrity, texture, and flavors. The value in these judgments depends on the experience of the evaluator with the specific products in question. This experience is obtained in handling specific *asava-rista* items in a variety of conditions and with repetitive reinforcements over time. Specific product experience is necessary because sensory attributes for *arista* quality can vary per product and species. In a commercial setting, control samples for comparison are not always practical. Thus, the evaluator must learn and reinforce a memory for comparable judgments.[4] The pH value indicates the relative conc^{n} of hydrogen atoms in the solution compared with that of standard solution that represents the relative acidity or alkalinity of solution. The control of pH is extremely important if optimal productivity is to be achieved during the *Sandhana* process.[5] Moreover, the pH response at various stages of the *Sandhana kalpana* differs and may be an important marker as well as an early indicator in case of any gross variation or spoiling of the formulation besides indirect indicative of the speed of the fermentation reaction. pH of all the 12 samples was recorded periodically using pH meter after completion of fermentation reaction with the help of electronics pH meter. The average pH of all samples Batch I, Batch II, Batch III, and Batch IV was 3.60, 3.58, 3.78, and 3.84, respectively. pH indicates that *Arjunarista* formulation has weak acidic properties [Table 2]. There was no significant variation found between all samples of *Arjunarista*; this indicates that variation of pot either porcelain or earthen and variation (addition/deletion) of *dhataki puspa* do not play a significant role in pH changes during the process. pH indicates that *Arjunarista* formulation has weak acidic properties [Table 2]. Specific gravity indicates the ratio of the density of a substance to the density of water. In prepared *Arjunarista,* there were number significant changes observed in relation to specific gravity.[6] This indicates that density of all batches of *Arjunarista* does not significantly differ to each other in pot variation as well as addition/deletion of *dhataki puspa*. The total solids content is a measure of the amount of solids suspended or dissolved in a process liquid or slurry. Conversely, the moisture content is a measure of the amount of water (and other components volatilized at 105°C) present in such samples. The results of chemical analyses of processed *Arjunarista* samples are typically reported on a dry weight basis.[7] The total solids content of samples is used to convert the analytical results obtained on another basis to that of a dry weight basis**.** Total solid is applied to the residue obtained where the prescribed amount of the preparation is dried to constant weight.[8] All batches/samples of *Arjunarista* prepared in porcelain pot do not have a significant difference in relation to solid content which was either prepared with *dhataki puspa* or without *dhataki puspa* but the average total solid content of Batch I was more than Batch II show some difference regarding it, but these changes are not statically significant. Ash is the inorganic residue remaining after the water, and organic matter has been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a sample. Analytical techniques for providing information about the total mineral content are based on the fact that the minerals (the "analyte") can be distinguished from all the other components (the "matrix") within a sample in some measurable way. The most widely used methods are based on the fact that minerals are not destroyed by heating, and that they have a low volatility compared to other sample.[9] There was no difference in ash contents between all batches of *Arjunarista*; this shows that pharmaceutically prepared *Arjunarista* have a small percentage of minerals, but these are almost similar in all batches, i.e., pot variation and addition/deletion of *dhataki puspa* do not play a significant role at the level of ash value.

CONCLUSION

In the analytical study, we find that organoleptic properties were similar in all batches/samples. pH, specific gravity, and ash contents of different batches/samples showed slight variation between them, but these changes were not significant. Total solid contents in batch II was lower than three batches.

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