

COMPARATIVE ANALYTICAL STUDY OF DADIMASWARASA (POMEGRANATE JUICE) PRE-PARED BY TWO DIFFERENT METHODS

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ABSTRACT

Introduction: Juice of Pomegranate prepared by Instrument and *Putapaka* method was recommended in *Arochak* and *Atisara* respectively. The difference in process adopted for preparation of juice may affect the physicochemical parameters and active principles which act on different pathologies. **Aim and Objective:** To find difference in physicochemical parameters of Pomegranate juice prepared by Instrument and *Putapaka* method. **Material and Methods:** By instrument method 800 gm of pomegranate arils were required for preparing 500ml juice and for preparing same quantity of juice by *putapaka* method; 2200 gm of arils were required. Both juices were subjected for physicochemical and specific nutrient evaluation tests like carbohydrate, protein, potassium and vitamins. **Results:** Values of Specific gravity, viscosity, Total solid content, Acid percentage, Carbohydrate, protein and Potassium were comparatively higher in pomegranate juice prepared by *putapaka* method and also pH of juice prepared by *putapaka* is more alkaline than juice by instrument method. But Vitamin c and folic acid levels get slightly decreased in the *putapaka* method as compared to juice prepared by instrument method. **Conclusion:** Processes adopted during Instrument and *Putapaka* method alter major physicochemical parameters which act in different pathological conditions of *Arochak* and *Atisara*.

Keywords: Juice of Pomegranate, *Putapaka* method, Nutrient evaluation.

INTRODUCTION

Among the *panchavidhakashaya kalpana*, *swarasa* (Juice) is the first and most potent formulation. There are various methods of *swarasa* preparation from fresh (*Aardra*) and dry (*shushka*) herbes. *Yantranishpidan* (*Swarasa* extraction by using instrument) and *putapaka* (Extraction of *swarasa* by giving specific method of indirect heating) are the

methods of juice preparation from green herbs; while *Nishoshita* (Soaking in water for 12 hrs) and *Agnisiddha* (Open pan reduction of water till specific proportion) are the methods of preparing juice from dry herbs¹.

The selection of method for juice preparation depends upon the nature, condition and therapeutic

usefulness of raw herb. Ancient scholars prepared juice of *Dadimam* (*Punica granatum* Linn. Pomegranate fruit) by using two methods viz. Instrument method and *Putapaka* method. Juice prepared by using *yantra* method was recommended in *Arochaka*² and *Arshoroga*³ (Piles), while juice prepared by *putapaka* method is useful in treating conditions like *Atisara*^{4,5} (Diarrhoea) and *Jwaratisara*⁶ (Enteritis).

The recommendation of juice of pomegranate prepared by different method in different pathological conditions is termed as Bio pharmaceuticals in modern pharmacy. Bio pharmaceuticals deals with change in pharmacological action of drug by change in its mode of manufacturing⁷.

Even though above disease conditions developed due to *agnimandya*; but at different levels. *Arochak*⁸ and *Arsha*⁹ were developed due to improper digestion at *urdhwa amashaya* (Stomach) level; but *Jwaratisara* and *Atisara*¹⁰ were developed due to improper digestion at the level of *adho amashaya* (Small Intestine).

A change in the method of preparation of Pomegranate juice may alter the physicochemical properties which indirectly changes its action. Hence here an attempt is made to analyse the juice of Pomegranate to see effect of different processes adopted while preparing.

Aim and objectives:

To compare the physicochemical property of juice of pomegranate prepared by two different methods.

Material and Methods:

Preparation of Juice of Pomegranate by using Instrument method: (Refer Photo No. 1)

Six ripened pomegranate fruits taste weighing 1150 gm were taken for separating the arils. 800 gm arils were obtained from 6 fruits and crushed in a mixer (Mixer of Popular Company with 500W, 230A 60Hz AC, speed: 18000 RPM.) for one minute and again for 30 seconds at 18000 RPM speed and refined using cotton cloth.

Preparation of Juice of Pomegranate by *Putapaka* method: (Refer Photo No.2)

2200 gm of arils were obtained from 17 pomegranate fruits weighing 4150 gm. Then hard wheat dough was prepared by mixing appropriate water into the wheat flour. This prepared hard wheat dough was wrapped around the arils of pomegranate as a first layer. Then, after proper drying of the first layer, leaves of *vata* (*Ficus benghalensis* Linn.) were wrapped over the wheat dough as a second layer and tied with the help of thread, which was further coated with mud smeared cloth. After drying, it was subjected to heat till it becomes red hot.¹¹ Total 55 minutes required to achieve red hot stage with a maximum temperature of 550°C. After coming to the room temperature, all layers were separated and arils were crushed for extracting the juice from it. Lastly, prepared juice was refined with the help of cotton cloth.

The above prepared juices by both methods were analysed by using different physicochemical parameters like Total solid content¹², Insoluble solid content, Soluble solid content, Percentage of acidity¹³, Specific gravity¹⁴, pH¹⁵, Relative viscosity¹⁶; these tests were conducted as per the protocols for ASU guidelines.

Specific Nutrient evaluation tests for carbohydrate, protein, potassium, folic acid and vitamin C were also conducted to see the effect of different procedures which were used while preparing juices by two different methods.

Protein analysis¹⁷- After gone through digestion and distillation procedures, titration of samples was carried out. 2-3 drops of phenolphthalein indicator was added to sample and titrated against 0.1N NaOH solution till the pink colour obtained. Burette reading was noted.

Conversion factor- 1 ml of 0.1N NH₃ → 0.0014 g of Nitrogen % of protein → % of N₂ × 6.25

Carbohydrate analysis¹⁸

Test solution (Pomegranate Juice) - 10 ml of sample taken in volumetric flask and 20 ml of 2N H₂SO₄ & 20 ml of water was added to it; hydrolysed for 2 hrs by boiling on water bath. After cooling, neutralised with 1N NaoH and made it 200 ml with water.

Standard solution (Dextrose solution)- 250 mg of dextrose anhydrase dissolved in water to make the volume 100 ml.

Titration- 25 ml of benedict's solution was taken, 1-2 gm sodium bicarbonate added and titrated with test and standard solutions respectively and the reading was noted.

% carbohydrates= $\frac{\text{Standard reading} \times 2.5 \times 200 \times 100}{\text{Test reading} \times \text{Test wt.} \times 1000}$

Potassium analysis by flame photometry¹⁹- Determination of potassium was done by flame photometry method. Firstly photometer was calibrated using standard solutions, and then diluted sample solution was allowed to pass through photometer. When a particular colour of flame appeared, galvanometer reading was noted. Same procedure was repeated during both samples. From the above values, potassium readings in the undiluted samples were calculated.

Spectrophotometric analysis of Folic acid²⁰- Quantification of folic acid in the samples was carried out by using standard folic acid solution and phosphate buffer solution maintained at 7.2 pH. Lactobacillus casei ATCC 7469 was used for assay method and measurement of bacterial growth was recorded by taking the absorbance at 630 nm using UV spectrophotometer.

Vitamin C estimation by Titration method²¹

Vitamin C concentration in pomegranate juice samples was determined by redox titration using iodine solution. Standard ascorbic acid solution, starch solution and iodine solution were made. Firstly, volume of iodine solution was determined required for redox titration of standard ascorbic acid solution. After achieving standard value, pomegranate juice samples were diluted in specific proportion and 1-2 ml of starch solution was added to it as an indicator; then this mixture was titrated against iodine solution till the blackish purple colour acquired by the solution. Volume of iodine solution required for titration was noted. Thus, quantity of ascorbic acid in the sample was calculated by using above standard values of iodine solution required for titrating the standard ascorbic acid.

Observations and Results-

After *putapaka*, outer layer of mud smeared cloth and layer of leaves of *vata* get burnt totally, outer part of wheat dough layer turned to black and hard, but inner part remains as it is. Colour of the pomegranate arils becomes lighter (whitish pink) after *putapaka* which is originally pinkish red in colour.

Yield of the pomegranate juice prepared by normal method using instrument was 62.50% (500 ml from 800 gm arils); which was greater than the yield by *putapaka* method which was 22.72% (500 ml from 2200 gm arils).

The details of organoleptic character, physicochemical parameters and nutrient evaluation were mentioned in Table no.1, 2 and 3 respectively.

Table 1: Organoleptic characters of Juice prepared by Instrument and *Putapaka* method

Organoleptic characters	Pomegranate juice: Instrument	Pomegranate juice: <i>Putapaka</i>
<i>Sparsha</i> (Touch)	<i>Sheeta</i> (Cold), Not much viscous	<i>Ushna</i> (Hot), More viscous
<i>Roopa</i> (Colour)	Pinkish colour	Whitish grey
<i>Rasa</i> (Taste)	<i>Madhura</i> , <i>amla</i> , slight <i>kashaya</i>	Less <i>madhur</i> (sweet), <i>kashaya</i>
<i>Gandha</i> (Smell)	<i>Dadima gandha</i>	No specific <i>Gandha</i>

Table 2: Physicochemical parameters of the pomegranate juice prepared by Instrument and *Putapaka* method

Analytical test	Pomegranate juice: Instrument	Pomegranate juice: <i>Putapaka</i>
Total solid content	17.39 %	18.20 %
Soluble solid content	14.85 %	11.03 %
Insoluble solid content	2.54 %	7.17 %
Specific gravity	2.95	3.29
Percentage Acidity	23.95 %	26.36 %
pH	4.37	7.61
Relative viscosity	1.57 minutes	6.17 minutes

The values of total solid content, Insoluble solid content, and Specific gravity, Percentage of acidity, pH and Relative viscosity were more in Pomegranate juice prepared by *putapaka* method than normal

instrument method. Only soluble solid content was comparatively greater in juice prepared by instrument method.

Table 3: Nutrient evaluation of pomegranate juice prepared by Instrument and *Putapaka*

Nutrient parameters	Pomegranate juice: Instrument	Pomegranate juice: <i>Putapaka</i>
Protein	0.53 %	0.79 %
Carbohydrate	14.30 %	14.85 %
Potassium	133 mg (per 100 ml)	138 mg (per 100 ml)
Vitamin C	0.5 mg (per 100 ml)	0.3 mg (per 100 ml)
Folic acid	2.32 mg/ 100 ml	2.12 mg/ 100 ml

Protein, carbohydrate and potassium values were more in the juice prepared by *putapaka* method than the normal instrument method. Vitamin C and Folic acid percentage were comparatively higher in the normal pomegranate juice prepared by mixer.

DISCUSSION AND RESULTS-

Ayurveda has advanced pharmaceuticals with specific procedures depending upon nature, quality of herbs and different parameters of patient like *agni, vaya, bala*²². Specific *putapaka* method of juice preparation was recommended when green herbs are thick in nature and with prominent vein structure²³. *Acharyas* used inner coating of wheat flour to maintain the indirect and continuous heat for longer duration and to maintain warmth inside; while less heat is generated in the instrument method. In Instrument method, crushing of material is done under high rotation till uniform paste is formed. Squeezing of uniform paste is done in both instrument and *putapaka*

method. Application of controlled continues heat at lower temperature may help to change the chemical configuration in the herbs.

Pharmaceutically Instrument method of juice preparation has upper hand as it is easy one, requires less time, cost effective with maximum yield. Juice prepared by *putapaka* method had more specific gravity than instrument method which can be further justified by having higher values of total solid content and insoluble solid content. pH of juice prepared by *putapaka* method was more alkaline than juice prepared by instrument method. Potassium content was more in *putapaka* method which may contribute to alkaline pH of juice prepared by *putapaka* method. But contrary acid percentage was more in *putapaka* method. Application of heat in *putapaka* method may cause destruction of heat liable chemicals like Vit. C, Folic acid. That's why there is decrease in percentage of folic acid and Vit. C in juice prepared by *putapaka* method.

Carbohydrate and protein percentage was slightly more in *putapaka* method than instrument method, which may increase nutritional value of juice. Increase in carbohydrate, protein, potassium and acidity percentage in juice of *putapaka* method may be due to decrease in water percentage.

Juice of pomegranate is recommended in *Daha* (burning), *Trishna*, *Jwara* (fever), *Atisara* (Diarrhoea) and also it has properties like *balya*, *tarpan*, *shukrala*, *grahi*, *medhya*, *deepan*, *ruchikara*²⁴ etc. In conditions like *daha*, *balya*, *trishna* juice prepared by instrument method is useful as it contains balance of nutrients (Carbohydrate, protein) and vitamins (Vit. C and folic acid). While juice prepared by *putapaka* method is helpful in conditions like *Atisara* (Diarrhoea), *jwara*, as it provide more potassium, easily digestible carbohydrate and proteins.

Atisara (Diarrhoea), *jwaratisara* (Enteritis) are because of improper digestion of food due to decreased alkaline secretions in intestine or irritation due to acidic food. Alkaline pH of pomegranate juice prepared by *putapaka* method helps to maintain the alkaline nature in small intestine or neutralises the irritation due to acidic food which indirectly prevent the pathology of *Atisara* (Diarrhoea) or *jwaratisara* (Enteritis); this action of pomegranate juice mimics with the action of sodium bicarbonate²⁵ which is used in treatment of diarrhoea.

In same way acidic pomegranate juice prepared by instrument helps in pathologies in gastric region (*Arochak*, *Arsha*) where there is need to maintain the acidic environment to regulate the gastric secretions.

CONCLUSION

Ayurveda used advanced pharmaceuticals depending upon many factors. Juice of pomegranate prepared by different method is useful in different pathological conditions. Application of heat in specific pattern in *putapaka* affect nutrient levels (Carbohydrate, Protein), vitamins (Vit. C, folic acid) and other physicochemical parameters, which may contribute to the different pharmacological action.

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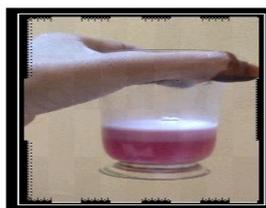
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Photo No. 1 Preparation of pomegranate juice by instrument method



a) Arils of pomegranate fruit



b) Pomegranate juice prepared by instrument method

Photo No.2 Steps of Preparation of Pomegranate Juice by *Putapaka* method



a) Wheat Dough Layer (Inner/ 1st Layer)



b) Layer of *Vatapatra* swirled by thread (2nd Layer)



c) Outermost layer of mud smeared cloth



d) *Putapaka* (Indirect heating)



e) Finished Product after the *putapaka*



f) Final pomegranate juice after *putapaka*

Source of Support: Nil

Conflict Of Interest: None Declared

How to cite this URL: Deshpande Bhakti Renukadas et al: Comparative Analytical Study Of Dadimaswarasa (Pomegranate Juice) Pre-Pared By Two Different Methods. International Ayurvedic Medical Journal {online} 2018 {cited September, 2018} Available from: http://www.iamj.in/posts/images/upload/2016_2022.pdf