

COMPARATIVE ANALYSIS OF VENKARAM (BORAX) BY DIFFERENT PURIFICATION METHODS

B.DEVI*, S.VISWESWARAN², R.SUGUNA¹, M. MURUGESAN³, K. MANICKVASAKAM⁴^{*2}Department of Gunapadam, National Institute of Siddha, Chennai-47, ¹Department of Kuzhanthai Maruthuvam, National Institute of Siddha, Chennai-47, ^{3,4}National Institute of Siddha, Chennai-47. Email: drdevibalu@gmail.com

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ABSTRACT

Venkaram commonly known as Borax which is widely used in Siddha System of Medicines for treatment of Skin diseases, Uterine disorders, Gastric ulcer, Dental disease, Urinary tract infections, External washes for oral ulcer, Eye disease and Burning micturition etc. Siddha system emphasizes the purification methods for every drug and strongly advocates proper purification method, before medicine preparation. The present study is aimed at evaluation of comparative analysis of various purification methods of Venkaram (Borax) mentioned in Siddha text book. As per the text, Venkaram was purified by following methods respectively treating with Lemon juice, treating with Buffalo's urine and Heating process for purification. As there is no detailed standardization work reported so far on purified Venkaram, Physico-chemical property, compound identification by Raman's Spectra, Particle size by Scanning Electron Microscopy (SEM) and element variation by ICP-OES are carried out. This study revealed specific identities and it may be useful to supplement the information with regard to its standardization and identification and in carrying out further research and its use in Indian system of medicine

Keywords: Venkaram, Borax, Purification, Particle Size, Buffalo's urine, ICP-OES, SEM

INTRODUCTION

Venkaram (Borax) $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ is a salt of tetra Boric acid, is an important compound of Boron, which is also known as sodium diborate². In Siddha system of medicine it has been used to treat various diseases like Skin diseases, Uterine disorders, Gastric ulcer, Dental diseases, Urinary tract infections, Eye disease and Burning micturition and etc⁴⁻⁶. Siddha system (Science of life) emphasizes the purification methods for every drug and strongly advocates proper purification method, before medicine preparation. The process of purification is not only targeting the purification but also enhances the potency of the drug and reduces the toxicity of the drug. This study intently describes the various purification methods of borax, which is mentioned in Siddha Materia Medica¹.

MATERIALS AND METHODS

Venkaram(borax) has been procured from Quality Raw drug store in Chennai. The lemon collected from the Germination period of six year old plant, grown in red soil. Buffalo's urine has been collected from the third calving Murrah cross breed variety in the early morning.

Purification process I

Heated Borax (HB)

61 gm of borax heated in earthen pot at 255°C to 300°C till the moisture completely get evaporated. The temperature was measured by Temperature indicator - sensor CR-AL. At the end of the process, it weighed about 53 gm¹.

Purification process II

Buffalo Urine Borax (BB)

200 gm of Borax soaked in 300 ml of Buffalo's urine (above mentioned) for 72 minutes in earthen pot at room temperature¹.

Purification process III

Lemon Borax(LB)

160 ml of lemon juice mixed and grinded with 100 gm of borax for 2 hours in black stone mortar manually and dried at room temperature¹.

All the samples were analyzed in Sophisticated Analytical Instrument Facility, IIT, Ch-36, for Physio-Chemical property, Compounds identification by Raman's spectra⁷, Particle size by

Scanning Electron Microscopy (SEM) and Quantitative Analysis by ICP-OES⁹.

RESULTS AND DISCUSSION

Based on the literature, On the heating process purification, above 62°C, Octahedral borax $\text{Na}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$ is obtained². Hence water band may be completely evaporates at 255°C to 300°C. And also borax fuses, and swells up into a white porous mass, owing to the expulsion of water³.

Compounds identification by Raman's spectra

The given Sample 1-RB has been identified as borax by means of Raman's spectra is identical to borax. Hence we conclude that the sample 1 is genuine borax.

Heated Borax (HB) shows compounds of borax with alkyl halide group (peaks-1250.21)

Borax processed in Buffalo Urine shows compounds of borax with alkyl halide group (peaks-1161.06), alcohols, carboxylic acids, esters, ethers group (peaks-1031.16)

Borax processed in Lemon juice shows compounds of borax with nitriles group (peaks-2001.64-2266.50)

Physiochemical property

Ash value, pH value, Yield of extracts

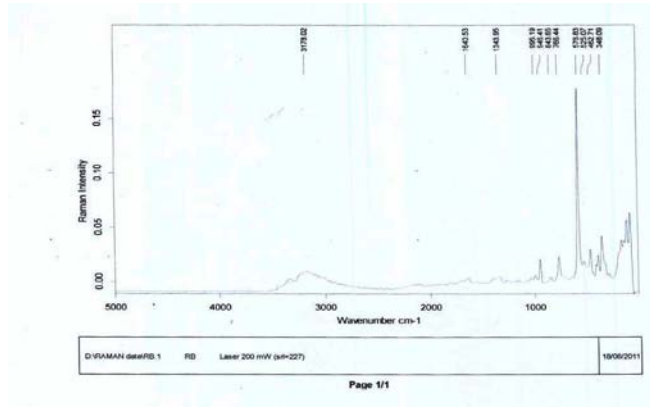
The physiochemical analysis indicated the total ash content of 7.15% in Raw Borax, 6.47% in Heated Borax, 6.10% in Buffalo urine Borax and 6.14% in Lemon Borax. The acid soluble ash content of 8.12% in Raw Borax, 7.38% in Heated Borax, 7.12% in Buffalo urine Borax and 7.2% in Lemon Borax. The water soluble ash content of 5.26% in Raw Borax, 4.42% in Heated Borax, 4.66% in Buffalo urine Borax and 4.6% in Lemon Borax. The moisture content of 8.14% in Raw Borax, 5.12% in Heated Borax, 6.95% in Buffalo urine Borax and 7.8% in Lemon Borax (Table 1).

The pH value is 8.1-8.3 in Raw Borax, 8.1-8.3 in Heated Borax, 7.9-8.3 in Buffalo urine Borax and 7.8-8.1 in Lemon Borax (Table 2).

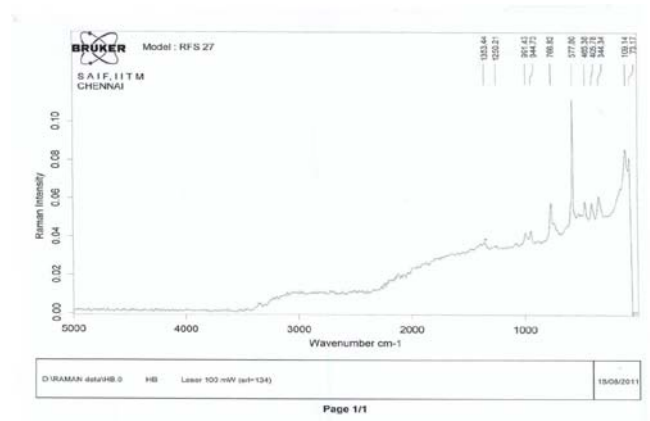
All the samples are solid in nature (Table 2).

Yields of extracts

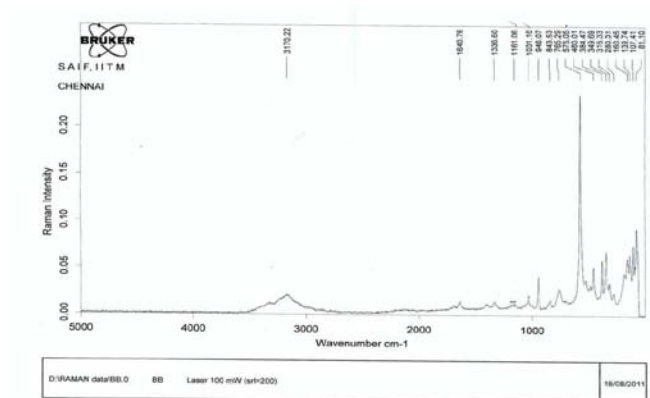
Raw Borax, Heated Borax, Borax processed Lemon gives 75% w/w, Borax processed in Buffalo urine gives 70%w/w yields of extracts (Table 2).



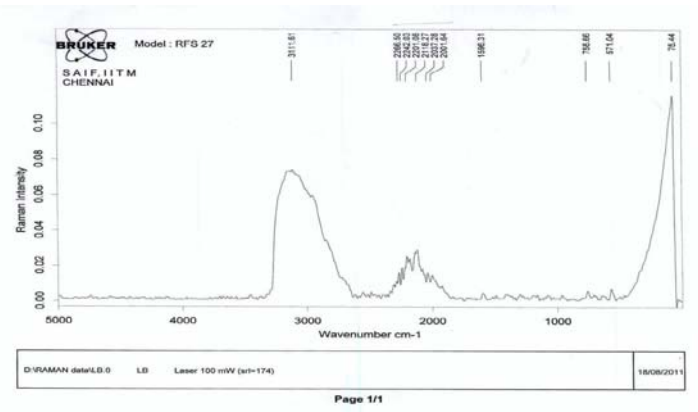
Graph 1: Raw Borax



Graph 2: Heated Borax



Graph 3: Buffalo urine Borax



Graph 4: Lemon Borax

Table 1: Physicochemical properties

Parameters	RB	HB	BB	LB
Total ash value	7.15 %	6.47%	6.10%	6.14%
Acid insoluble ash	8.12 %	7.38%	7.12%	7.2%
Water soluble ash	5.26 %	4.42 %	4.66 %	4.6%
Moisture content	8.14 %	5.12 %	6.95.%	7.8%

RB: Raw borax HB: Heated borax BB: Buffalo urine borax LB: Lemon borax

Colour

Among the 4 samples Raw Borax, Heated Borax, Lemon Borax are white in colour, both under ordinary and ultraviolet light. Buffalo urine Borax is dull white in colour (Table 2).

The particle size of Raw Borax is 2.5-1.5 micron (Fig 1), Heated Borax is 1-0.5 micron(Fig 2), Buffalo urine Borax is 0.5-0.1micron (Fig 3) and Lemon Borax is 1.5-1micron (Fig 4). The decreased particle size is directly correlated with solubility and bioavailability for sustained therapeutic effect due to easy solubility⁴.

Particle size

Table 2: Colour, Nature and Percent yields of extracts

Samples	Extract solvents	Colour	Nature	Yield of extract (%w/w)	pH
RB	Water	White	Solid	75	8.1-8.3
HB	Water	White	Solid	75	8.1-8.3
BB	Water	Dull White	Solid	70	7.9-8.3
LB	water	White	Solid	75	7.8-8.1

RB: Raw borax HB: Heated borax BB: Buffalo urine borax LB: Lemon borax

Particle size analysis by SEM method



Fig. 1: RB



Fig. 2: HB



Fig. 3: BB



Fig. 4: LB

Quantitative analysis

The proportions of elements present in the drugs are responsible for its bioactivity.

Table 3: Elements variation analysis(quantitative) by ICP-OES method

Compounds	RB(mg/L)	HB(mg/L)	BB(mg/L)	LB(mg/L)
As	BDL	BDL	BDL	BDL
B	35.215	30.463	23.156	23.135
Ca	40.225	30.463	75.41	12.36
Cd	BDL	BDL	BDL	BDL
Fe	1.88	1.56	1.354	0.143
K	195.33	145.52	132.55	12.62
Na	83.35	72.856	320.123	252.30
P	25.29	20.98	100.4	10.48
S	20.112	0.457	12.455	2.455
Hg	BDL	BDL	BDL	BDL
Lead	BDL	BDL	BDL	BDL

RB: Raw borax HB: Heated borax BB: Buffalo urine borax

LB: Lemon borax BDL: Below detection limit

CONCLUSION

High amount of iron (1.56 mg/L) present in borax treated with heat, high amount of sulphur (12.455 mg/L), calcium (75.41 mg/L), phosphate (100.4 mg/L) present in borax treated with buffalo urine (Table 3). This present study insight the analytic variations in Physiochemical properties, Particle size analysis and Elements variation aspects of Raw and purified Venkaram (Borax). This will be a baseline study to standardize Venkaram and Venkaram based medicines.

The present study may be useful with regard to its standardization and identification and in carrying out further research and its use in Siddha system of medicine.

Future Perspectives

The Venkaram (Borax) preparations like Venkara parpam (Borax calx), Venkara kattu etc. will analyzed both laboratically and clinically to validate the unique changes and safety, efficacy in therapeutically.

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