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Comparative physicochemical study of *Manjishta Kwatha* prepared by using different proportion of water

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ABSTRACT

Introduction: Due to ambiguity in literature regarding *Kwatha* preparation, exact proportion of water needed as per consistency of *Dravya* (Drug) for optimum quality of *Kwatha* is the need for standard pharmaceutical practices. For this purpose *Manjishta* was selected for *Kwatha* preparation using two different proportion of water. **Aim and Objectives:** To find out the difference in physicochemical parameters to access the quality of *Manjishta Kwatha* in order to save time and fuel required for *Kwatha* with the objective to prepare *Manjishta Kwatha* by using two different proportion of water and to compare time and fuel needed. **Methods:** Procurement and Authentication of *Manjishta* were done as per standard protocol. *Manjishta Kwatha* were prepared by using two different proportion of water one by using 16 parts of water and second by using 8 parts of water by reduced $1/8^{th}$ and $1/4^{th}$ respectively. In process and finished products observations were noted as per procedure. Analytical testing was done as per Ayurved Pharmacopeia of India. **Observations and Results:** In physicochemical analysis, the pH value, refractive index and specific gravity have not shown any remarkable difference however total solid content were found to be more in the *Kwatha* which used eight parts of water. The fuel and time consumed were three times more in the sample which used sixteen parts of water. So, *Manjishta* can be considered as *Madhyam* (Medium) consistency drug for *Kwatha* purpose. This study provided the preliminary physicochemical parameters for the *Manjishta Kwatha*. Further it needs to study qualitative parameters with highly sophisticated analytical techniques.

Key words: *Manjishta Kwatha, Rubia cordifolia, pH value, specific gravity, fuel, time, parameters.*

INTRODUCTION

Kwatha Kalpana is the most essential and widely used *Kalpana.* It is the source of most of the secondary dosage forms in *Bhaishjya Kalpana.* Not only *Bhaishjya kalpana* but in *Rasa Shashtra* also, *Kwatha* is the most important source for the purpose of various *Shodhana* and *Marana* techniques. It is an important pharmaceutical dosage form in the treatment of various diseases whether it is prepared by single or multi-drug combination. It can be used as *Anupana* or *Sahapana* form also. Various *Panchkarma* processes are incomplete without the use of *Kwatha*.

Standard operating procedure (SOP) is the most important feature for any pharmaceutical preparation. Typically, in the case of *Kwatha Kalpana*, sometimes vague SOPs are followed hence there is uncertainty regarding its therapeutic efficacy. Due to time - saving approach of the various pharmacist, the quantity of water added and to be reduced is always compromised.

The Pharmaceutical process of *Kwatha* is described in the various texts of *Ayurveda.* As per these references, one part of raw drug and sixteen parts or eight parts of water needs to be boiled together to reduce up to 1/8 or $1/4^{th}$ quantity.[1-2] Also, the addition of water according to the consistency of raw drugs i.e., *Mrudu* (soft), *Madhayam* (medium) and *Kathin* (hard) is mentioned in *Snehapaka* context which is four times, eight times and sixteen times respectively.[3]

Most of the time, these factors are not taken into consideration and water is added as per convenience

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and extraction amount. So excess boiling or insufficient boiling may result in unwanted or absence of important phyto-consituents in *Kwatha*. Also, it consumes unnecessary fuel and time for the processing in case of unnecessary amount of water. So there needs to study the exact proportion of water to be added as per consistency to optimize the quality of *Kwatha*. Hence present study was carried out to find the difference in quality of *Kwatha* prepared by using two different proportion of water. For this purpose, *Manjishta* drug was selected for *Kwatha* purpose as its consistency is not clearly mentioned and usually taken in dry form. *Manjishta* (*Rubia cordifolia*) is known as Common Madder or Indian Madder used in *Yoni Roga* (Gynaecological disorders), *Asti Roga* (Disorders of bones), *Àmaja Shotha* (*Kapha Roga* - *Kapha* predominant diseases), *Meha* (Diabetes), *Raktatisara* (Dysentry), *Kushta* (Skin diseases), *Visarpa* (Cellulitis), *Sarpavisha* (Snakebite), *Bhagna* (Fracture), *Vyanga* (Aging signs), *Arsha* (piles).[4]

Previously Ashish *et al.* (2016) has carried out Pharmaceutical and analytical studies on Guduchi *Kwatha* prepared by using 4, 8, and 16 times of water and reduction to one fourth and analysed with HPTLC and HPLC techniques. Study reported that *Kwatha* with 8 times of water has better quality than other batches and *Guduchi* is considered as medium type of *Dravya* depending upon its hardness.[5]

The present study was an attempt to observed the physicochemical difference in *Manjishta Kwatha* prepared by conventional method using eight parts and sixteen parts of water in order to find out time saving and fuel saving technique.

Materials and Methods

Table 1: Collection and Authentication of *Manjishta*

SN	Sanskrit Name	Latin Name	Part Used	Form of drugs	Particle size of drugs
1.	*Manjishta*	*Rubia cordifolia*	Stem	Dry	100 mesh

Manjishta stem was procured from GMP certified Ayurved Pharmacy. It was authenticated and certified from by Botanical survey of India (BSI).

Image 1: *Manjishta* for *Kwatha*

A. *Manjishta* Stem

B. Powdered *Manjishta*

Powder (*Churna*) preparation of *Manjishta* and coding of *Kwatha*

Manjishta stem was pulverized to fine powder and then sifted with mesh size #100

Kwatha was codified as MC1 for conventional method where 16 parts water was used and MC2 for the method where 8 parts of water was used.

Equipment used

Vessel for *Kwatha* preparation used was of stainless-steel having capacity of 5 lit (Length - 20cm, Depth -20 cm, Diameter -18cm), Glass Thermometer (Mercury) for temperature recordings having capacity of 110°C (G H zeal ltd, London-England), Cotton Cloth for filtration. LPG gas as a source of heating having fuel realising capacity of 189g/h,2064 kcal/h (Commercial LPG at 2.92kN/m2(30gf/cm2)

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Ingredients of *Kwatha*

1. *Manjishta* Powder (100 mesh) : 250gm
2. Distilled water for Kalka : 1000ml.
3. Distilled water for *Kwatha*: 4000ml (MC1) / 2000ml (MC2)

Method of preparation of *Manjishta Kwatha* (MC1)

Powdered *Manjishta* was taken into bowl and *Kalka* was prepared using distilled water (1000ml). *Kalka* was soaked for ten minutes before addition of water. *Manjishta Kalka* was then taken into *Kwatha* vessel and water was added which was to be reduced 1/8(500ml). Level was measured with metal scale(6.5cm) Remaining water (3500) was added then. Mixture was stirred properly and kept on fire at low flame. *Kwatha* was stirred at regular interval. Temperature was noted at regular interval. *Kwatha* was filtered through cotton cloth when the required level (1/8th) was achieved.

Method of preparation of *Manjishta Kwatha* (MC2)

The procedure was repeated by using 8 part of water(2000ml) and 1/4th reduction.

Both the experiments of *Kwatha* (MC1 and MC2) were repeated thrice and mean of total time and total fuel used were calculated.

Physicochemical analysis of *Manjishta Kwatha*

The prepared *Manjishta Kwatha* was subjected to physicochemical analysis such as pH Value estimation,[6] Determination of Specific gravity,[7] Determination of Refractive Index,[8] Determination of Total Soluble Solids[9] according to the standard procedures of Ayurvedic pharmacopeia of India.

OBSERVATIONS AND RESULTS

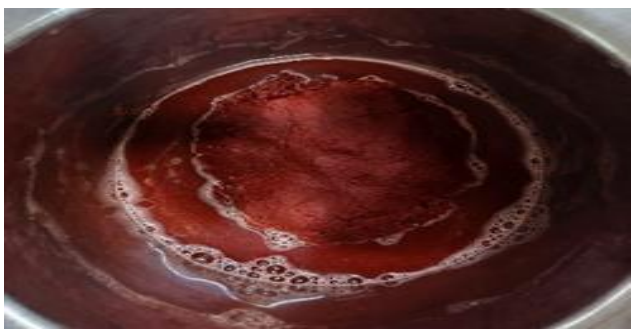
Table 2. Organoleptic Study of Raw Drugs

Name of drugs	Organoleptic Characteristics				
	Shabda	**Sparsha**	**Rupa**	**Rasa**	**Gandha**
Manjishta	NS	Dry and smooth	Faint red	*Tikta Madhur*	Specific

Table 3: In Process observations of *Manjishta Kwatha* (MC1)

Time	Time in minutes	Temp	Observations during process
12.00pm	00	30°C	Initially white foam with brown tint was seen throughout surface of *Kwatha*
1.00pm	60	84°C	Darker brown foam over surface, not seen active boiling
2.00pm	120	100°C	Foam separated with thin layer over the surface.
3.00pm	180	98°C	Foam started disappearing, not seen active bubbling for boiling
4.00pm	240	98°C	Foam disappeared, thin layer of *Manjishta* particles are seen over surface
5.00pm	300	97°C	No foam, Mild boiling was seen
6.00pm	360	98°C	Thin particle layer was formed over surface of *Kwatha*
7.00pm	420	98°C	*Kwatha* started concentrating with dark red shade
8.00pm	480	98°C	Thin layer formed over surface of *Kwatha*
9.00pm	540	98°C	More Concentrating *Kwatha* with active boiling
10.00pm	600	95°C	Solidified concentrated *Kwatha* liquid with mild boiling
10.45pm	645	90°C	Dark red solidified *Kwatha* with spilling droplets

Image 2: Steps of *Manjishta Kwatha* by Conventional method (MC1)



A. *Manjishta Kalka*

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B. Appearance of foam

C. Concentrating *Kwatha*

D. Noting of marking

E. Final stage of *Kwatha*

F. Packed *Kwatha* (MC1)

Table 4: In Process observations of conventional method of *Manjishta Kwatha* (MC2)

Time	Time in minutes	Temp	Observations during process
12.00pm	00	40°C	Initially red foaming was seen throughout surface of *Kwatha*
12.30pm	30	76°C	Active boiling with thick red foaming
1.00pm	60	98°C	Marked Boiling with decrease in foam
1.30pm	90	98°C	Foam started disappearing,
2.00pm	120	96°C	Getting concentrated with reddish layer
2.30pm	150	96°C	Getting concentrated with reddish layer
3.00pm	180	95°C	Dark red brown with spilling of *Kwatha* outside
3.30pm	210	96°C	Spilling continued till level achieved

Image 3: Steps of *Manjishta Kwatha* by Conventional method (MC2)

A. *Manjishta Kalka*

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B. Initial stage of *Kwatha*

C. Concentrating *Kwatha*

D. Measuring of Level

E. Final stage of *Kwatha*

F. Packed *Kwatha* (MC2)

Table 5: Time and Fuel required for *Manjishta Kwatha*

SN	Group Name	Quantity of *Kalka* (gm)	Quantity of Water (ml)	Total time in minutes	Total fuel Used (in gms)
1.	MC1	250	4000	645	2031.75
2.	MC2	250	2000	210	661.5

Table 6: Organoleptic Characteristics of *Manjishta Kwatha*

SN	Group Name	*Shabda*	*Sparsha*	*Rupa*	*Rasa*	*Gandha*
1.	MC1	NS	*Drava*	Dark Red	*Madhur Tikta*	Specific
2.	MC2	NS	*Drava*	Dark red brown	*Madhur Tikta*	Specific

Table 7: Physicochemical parameters of *Manjishta Kwatha*

SN	Sample Name	pH	Specific Gravity (g/mL)	Refractive Index	Total Solid Content (%)
1.	MC1	5.18	1.015	1.341	2.99
2 .	MC2	5.16	1.013	1.341	3.39

DISCUSSION

There are many challenges in *Kwatha* preparation in terms of exact Particle size, Vessel to be used, Temperature, the proportion of water to be added, etc.

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which directly affects its quality and processing cost. Hence, there need to optimize the process by studying various factors which validate the *Kwatha* procedure. So, present study has been conducted to evaluate the physicochemical parameters of *Manjishta Kwatha* by using three different proportion of water which is widely practiced in Pharmacies.

For *Kwatha* purpose, *Manjishta* was moistened with water in order to make bolus which required four times of distilled water than weight of *Manjishta*. This step helps to avoid absorption of water used for *Kwatha* by *Manjishta* powder.

As mostly coarse powder is used in *Kwatha* preparation for optimum quality, this study used fine powder for *Kwatha* in order to observed the particle size theory. The concentration of active constituents depends upon the size of the particle. Less the size of particles, more will be the surface area which ultimately encourages phyto constituents to enter in the solvent (water) and vice versa.[10] Previously Apeksha A. Patil et al. (2017) carried out comparative Pharmaceutico-Analytical Study of Mustakadi Pramathya and *Kwatha* with the parameters such as pH, specific gravity, Viscosity and total solids in which more concentration of phyto-constituents was seen in Pramathya as compare to *Kwatha*.[11]

In pharmaceutical process of *Kwatha* preparation, initially the temperature was low then eventually the temp raised which was kept between 90°to 100°C. (Table no. 3&4) Hence vigorous and fast boiling was avoided in order to save thermolabile phytoconstituents in the *Kwatha* as *Mandagni* (low heating pattern) is already mentioned in terms of *Kwatha* preparation.

In this study, *Kwatha* was prepared using two different proportions of water i.e. 16 parts (MC1) and 8 parts (MC2). In MC1 group, it required 645 minutes and 2031.75 Gm. fuel, whereas 210 minutes and 661.5Gm. fuel for the MC2 group. (Table no. 5) As proportion of water was more in MC1 hence, it was more time and fuel consuming process as compare to MC2. There needs about 1000ml of water for Kalka preparation of 250gm powder of *Manjishta*. In the organoleptic study, a specific *Manjishta* smell was observed. The Color of *Kwatha* was Red to dark red-brown. *Manjishta* has *Madhurtikta* Taste which was specific to all two groups of *Kwatha*. (Table no. 6)

In physicochemical analysis of *Manjishta Kwatha* (Table no. 7), pH value observed was closer to alkaline pH. It is in the range of 4.93 to 5.18. Minimum difference was noted in pH of MC1 & MC2 group. The pH value denotes the acidic and alkaline nature of drugs. As the *Kwatha* is known to have expired in 24 hrs. its weak acidic and weak alkaline nature is considered in the standard setup.

In *Manjishta Kwatha*, Specific gravity was more than one in both groups. It is used to define the weight or density of a liquid as compared to the density of an equal volume of water at a specified temperature. MC1 group have shown higher specific gravity than MC2 group as it consumed more fuel. As the specific gravity of water is 1 and if specific gravity is more than 1 then it indicates dissolved solutes in the solvent. Hence more the Specific gravity more will the concentration of that liquid. In case of *Kwatha*, temperature, particle size, duration of boiling, etc have impact to increase or decrease concentration of *Kwatha*. So, the specific gravity will change accordingly.

Refractive index of both the groups of *Manjishta Kwatha* were more than 1 and no significant variations was observed. Generally, it is used to measure the concentration of a solute in an aqueous solution. Total solid content decides the soluble contents in solvent. In *Manjishta Kwatha*, it was observed that conventional MC2 has good TSC (3.39%) than MC1 group.

In physicochemical analysis, it was observed that heating and proportion of water plays important role in varying parameters of finished product. *Manjishta Kwatha* (MC2) have observed higher values in physicochemical parameters that can ensure standards of classical methods with hardness of *Manjishta* which confirms it as *Madhyam Dravya*. Also, it required less fuel and time as compare to other group wherein 16 parts water was used.MC1 process needed 207.14 % more fuel as compared to MC2 process.

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CONCLUSION

This study offers preliminary evidence regarding the alteration of physicochemical parameters by using different proportion of water in *Kwatha*. Comparative physicochemical analysis of both the *Kwatha* observed percentage of total solid contents was high in *Kwatha* where eight parts of water was used in *Kwatha* preparation. Hence, the fuel can be saved by this method. To compare the exact analytical difference there needs to study qualitative parameters such as presence of therapeutic markers in the *Kwatha* preparation. Further study can be conducted using highly sophisticated analytical techniques.

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