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PHARMACEUTICO-ANALYTICAL STUDY OF TURMERIC RHIZOMES WITH SPECIAL REFERENCE TO SHODHANA

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ABSTRACT

Background: Turmeric (*Curcuma longa* linn.) is ethno medicine used in various treatment like wounds, fever, diarrhea, diabetes, urinary disorders, poisoning, cough etc. Although it is nonpoisonous but various classical texts like Chakradutta, Bhaisajyaratnavali, Harmekhala mentioned its shodhana specified in Vatavyadichikitsa. **Aim:** To develop the Standard manufacturing procedure for shodhan process of pilot batches of turmeric fresh rhizomes in context to real time documentation. **Materials and Methods:** Turmeric Raw cleaned rhizomes dried, pulverized and sieved simultaneously fresh cleaned rhizomes processed by dipping in Buttermilk prepared with different ratio of water as Takra and Chhachh as well as fresh rhizomes were also processed by boiling in water in a Dola Yantra then both type shodhita rhizome, dried under sunlight then pulverized and sieved. Comparative sensory and physicochemical of medias and final powders were evaluated. **Result:** Color, odor, texture, taste and physicochemical constants like pH, extractive values, Ash value, acid-insoluble ash value was found varied after shodhana as well as colour, odor, taste and specific gravity, pH and Total solid content of medias also found different after shodhana. **Conclusion:** Variation in the sensory and physicochemical constant of raw and shodhita Haridra shows changes in the physical and chemical states of rhizome after shodhana.

KEYWARDS: Turneric, Shodhana, Buttermilk, Physicochemical analysis, SMP.

INTRODUCTION

The drug is like an instrumental aid to a physician. That is why it has been placed next to physician amongst the quadruples of treatment.[1] Ayurveda involves the use of drugs obtained from plants, animals, and mineral origin. All the three sources of drugs can be divided under poisonous and nonpoisonous category.[2] There are various crude drugs, which generally possess unwanted impurities and toxic substances, which can lead to harmful health problems. Many authors have reported that not all medicinal plants are safe to use since they can bear many toxic and harmful phytoconstituents in them.[3] Shodhana (detoxification/purification) is the process, which involves the conversion of any poisonous drug into beneficial, nonpoisonous/nontoxic ones[4] Shodhana process involves the purification as well as reduction in the levels of toxic principles which sometimes results in an enhanced therapeutic efficacy[5] Ayurveda advocates sodhana (purification) processes like as swedana (heating in boiled acidic or alkaline liquids for prescribed times), bhavana (grinding /trituration with vegetable extractives, acidic and alkaline liquids) which are used to remove unwanted qualities (washable, soluble and volatile impurities) of a drug and it will be made eligible for the administration of the body.[6]

Turmeric is a rhizomatous herbaceous perennial plant (*Curcuma longa*) of the ginger family, Zingiberaceae[7] It is one of the very useful and famous Ayurvedic herbs. It is used in many forms and through many routes of administration, such as – nasal, oral, over the skin etc[8] It is nonpoisonous drug, so conceptually it's not require any purification processes but here purification (shodhana) use to incorporate additional medicinal properties which present in media[9] That's why some texts like Chakaradutta, Bhaisajyaratnavali and Harmekhala, but they did not specify the species as some of species of Turmeric proved toxic like *Curcuma zeodoria.*[10]

It is a first attempt of Shodhana of Haridra rhizomes in order to achieve a therapeutically good quality of Turmeric powder. This study was undertaken to develop the standard manufacturing processes to build reference database for various purified turmeric samples as well as to assess the impact of shodhana on turmeric sample.

MATERIAL AND METHODS

PROCUREMENT OF RAW DRUGS

Raw Haridra rhizome were purchased from vender, Subhash market, and authenticated (authenticated No.-IPGT & RA Phm-6219/17-18) by Dept. of Pharmacognosy, IPGT&RA, and GAU Jamnagar. (Geographical co-ordinate- 22.4707^0 N, 70.05770 E).

MEDIA PREPARATION

Takra and chhachh was prepared as per Bhavaprakash. Curd (prepared from cow's milk) 3660gm with water 915gm (1:4) for Takra and Curd 1700gm with water 1700gm (1:1) for chhachh were taken in wide mouth steel vessel and mixed well then filter through muslin cloth.[11]

PROCEDURE FOR HARIDRA SHODHANA BY NIMAJJANA[12] IN TAKRA & CHHACH (Harmekhala[13])

Porcelain jars A1 and A0 filled with 1779 and 1780gm respectively with Takra for batch TH and plastic jars B1, B2 and B3 filled with chhachh 1017, 928 and 1004gm respectively for batch CH. Cleaned Haridra rhizomes 1004, 507 and 511gm soaked (Nimajjana) in jar A1, B1 and B2 respectively and jar A0 and B0 kept as blank (without rhizomes) then covered by lid tightly and kept aside undisturbed for 10 days. Observations were noted as before, between and after Process.

PROCEDURE FOR HARIDRA SHODHANA BY SWEDANA[13] IN WATER (Turmeric - Extension Pamphlet of ICAR[15])

Poultices P1 and P2 (pottali) were prepared by clean muslin cloth carry Haridra rhizomes WA-540gm and WB-525gm respectively. Pots A and B filled with water 7500 ml and 5500 ml respectively and placed over gas stove and keep on boiling. Poultices P1 and P2 were placed in pots A and B respectively, when water temperature comes at 70^0C in both pot. Heat was varied due two different sides of gas stove batch WB get low heat than batch WA Observation was noted down.

In the last Cleaned Haridra (TR, 1060gm) as well as above both type shodhita rhizomes were dried in oven at 60^0c and then Pulverized and sieved through 80# size sieve.

PHYSICOCHEMICAL ANALYSIS

Physicochemical constants, such as pH[16], total solid content (TSC)[17] percentage of total ash (TA)[18], acid-insoluble ash (AIA)[19], water (WSE)[20] and alcohol (MSE)[21] soluble extractives were calculated as per the Ayurvedic pharmacopoeia of India.

OBSERVATIONS

Table No: 1.1 Characters before dipping in Takra and Chhachh.

Samples	Colour	Odor	Taste	Other Observations	Specific Gravity	pH (RT-23^{0}C)
A0	White	Characteristic	Sour	No Bubbling	1.00614	3.35
A	White	Characteristic	Sour	No Bubbling	1.00798	3.35
B0	White	Characteristic	Sour (less than Batch A)	No Bubbling	1.00790	3.42
B1	White	Characteristic	Sour (less than Batch A)	No Bubbling	1.00734	3.42
B2	White	Characteristic	Sour (less than Batch A)	No Bubbling	1.00728	3.41

Table No: 1.2 Characters after 5 days.

Samples	Colour	Odor	Taste	Other Observations Specific Gravity	pH (RT-21^{0}C)
A0	Dull white colour	Bad odor	Not done due to fungal growth	Fully phase separation, water of takra on upper phase and cream at lower phase with slightly fungus growth	3.2
A	Dull white with yellow shine	Bad odor but less than A0	Sour with slightly taste of curcuma	Fully phase separation, water of takra on upper phase and cream at lower phase	3.41
B0	Dull white colour	Bad odor	Sour with slightly bitter	Fully phase separation, water of takra on upper phase and cream at lower phase	3.26
B1	Dull white with yellow shine	Bad odor but less than B0	Sour with slightly bitter	Fully phase separation, water of takra on upper phase and cream at lower phase	3.45
B2	Dull white with yellow shine	Bad odor but less than B0	Sour with slightly bitter	Fully phase separation, water of takra on upper phase and cream at lower phase	3.43

Table No: 1.3 Characters after 10 days dipping in Takra and Chhachh.

Samples	Colour	Odor	Taste	Other Observations	S.G.	pH (RT-22^{0}C)
A0	Dull White	Highly Bad odor	Not done due to fungal growth	Fully phase separation, water of takra on upper phase and cream at lower phase with fungal growth	1.01133	3.1
A	Dull yellowish white	Highly Bad odor	Not done due to fungal growth	Fully phase separation, water of takra on upper phase and cream at lower phase slightly fungus growth	1.01279	3.52
B0	Dull white	Highly Bad odor	Not done due to fungal growth	Phase separation, water of takra on upper phase and cream at lower phase with slightly	1.0115	3.21

				fungus growth		
B1	Dull White (more than A)	Highly Bad odor	Not done due to fungal growth	Phase separation, water of takra on upper phase and cream at lower phase with slightly fungus growth	1.01756	3.59
B2	Dull White (more than A)	Highly Bad odor	Not done due to fungal growth	Phase separation, water of takra on upper phase and cream at lower phase with slightly fungus growth	1.01908	3.57

Fig:1 Images of whole process of Haridra shodhana by dipping in Takra and Chhachh.

Note: Process start from 1.1 and ends with 1.9, sequence wise.

Table No. 2.1.

Time clock(hour)	Temperature of water in WA (in ^{0}C)	Temperature of Water in WB (in ^{0}C)	Addition of warm water in A	Addition of warm water in B
(00:00)	26	26	7500 ml	5500 ml
(00:27)	**72**	**70**	-	-
Poultices immersed in Pots				
(00:37)	76	72	600ml	600ml
(01:17)	86	82	400ml	400ml
(01:57)	92	86	400ml	600ml
(02:57)	92	86	800ml	600ml
(03:27)	92	86	-	-
Poultices were taken out				

Components	Batch WA	Batch WB	Drinking Water
Colour	More yellowish colour than fresh Haridra	More yellowish colour than fresh Haridra	It changes into yellow colour
Odor	Less characteristic than fresh Haridra rhizome	Less characteristic than fresh Haridra rhizome	Characteristic Haridra odor observed
Taste	Less Katu and Tikta than fresh one	Less Katu and Tikta than fresh one	Katu taste of Haridra
Touch	Softer than fresh rhizome	Softer than fresh rhizome	Slightly thicker than fresh one
Surface	Rough and slightly wrinkled	Rough and slightly wrinkled	-
Inner Surface	More yellowish than fresh one	More yellowish than fresh one	-
Other	When it cool it seems less yellowish colour and close to fresh rhizome	When it cool it seems less yellowish colour and close to fresh rhizome	Volume was reduced due to process and pH was also changed

Fig:2 Images of whole process of Haridra shodhana by boiling in water.

Note: Process start from 2.1 and ends with 2.12 sequence wise, 2.11 and 2.12 represents WA and WB respectively.

Fig: 3 Images of whole process of From Raw Turmeric rhizome to Turmeric powder.

RESULT

Table: 3 Final obtained Raw and shodhita turmeric powders.

Samples	Q. Taken (gm)	Q. Obtained (gm)	% Obtained	% Loss
TR	1060	258	24.33	75.67
TH	1004	211	21.01	78.99
CH	1012	194	19.16	80.84
TWA	540	98	18.14	81.86
TWB	525	94	17.90	82.1

Table: 4 Comparative Physicochemical characteristics of Takra and Chhachh.

Samples	pH (RT-23^{0}C) (BS)	pH(RT-23.7^{0}C) (AS)	TSC(AS) %	SG(BS)	SG(AS)
TA	3.35	3.52	7.272	1.00798	1.01133
TA0	3.35	3.17	6.813	1.00614	1.01279
CB	3.42	3.59	4.953	1.00790	1.0115
CB0	3.42	3.25	4.3106	1.00734	1.01756

Note: TA and TA0= Takra in jar A, A0 respectively, CB and CB0= Chhachh in jar B1+B2 and B0 respectively

Table: 5 Comparative physicochemical characteristics of Water before and after shodhana.

Samples	pH (RT-26^{0}C) (BS)	pH (RT-24.3^{0}C) (AS)	TSC (BS) %	TSC (AS) %	SG(BS)	SG(AS)
WA	6.99	7.47	0.053	0.1519	1.00011	1.000647
WB	6.99	7.38	0.053	0.1236	1.00011	1.000103

Note: BS = before shodhana, AS= after shodhana, SG = Specific gravity, RT= room temperature and % = Percentage, TSC= Total solid content.

Table: 6 Physicochemical Constant result expressed as % w/w except pH (n=3; ±SD).

Samples	pH	WSE (w/w)	MSE(w/w)	TA	AIA
TR	4.98±0.0081	20.664±0.3721	10.639±0.1221	8.027±0.1675	0.494±0.0252
TH	4.96±0.0047	15.891±0.0817	8.446±0.0392	7.988±0.0781	0.734±0.0391
CH	4.94±0.0061	15.863±0.0704	8.672±0.0236	7.767±0.0698	0.684±0.0362
TWA	5.026±0.0094	14.437±0.0716	8.877±0.0483	7.542±0.1993	0.625±0.0138
TWB	5.01±0.0076	14.568±0.0886	8.921±0.0446	7.492±0.1675	0.687±0.0190

Note: n stands for number of experiments and ±SD stands for Standard deviation.

DISCUSSION

It is believe that media used in the process of Shodhana play an important role in either breaking down or destroying the chemical constituent that is not required.[22] Here, we used dipping in buttermilk having acidic pH and on other hand swedana in water neutral pH. Hence, variation in pH and other physicochemical constant of obtained shodhita turmeric powder can be seen in Table-6. Most interesting thing is that turmeric rhizome resist the pH of buttermilk of both type in blank jars' buttermilk shows less pH than jars filled with rhizome of turmeric in butter milk. Nimajjana[23] is slow process where no mechanical force and pressure were applied on other hand in swedana[24] (boiling) in water create pressure which leads to penetrate in the rhizome and taken out the impurities. Hence, water shodhita turmeric quantity is less than butter milk shodhita turmeric powder even colour, odor and taste is different. Turmeric shodhita by water is mainly used by spices industries while butter milk shodhita turmeric powder is not use generally. Classical texts Bhaisajyaratnavali[25] and Chakardutta[26] mentioned shodhan of Haridra in Vatavyadhirogadhikara and Vatavyadhichikitsa but they did not use butter milk and water as media for shodhana. They used Panchapallava Kwatha, Mundi Kwatha, Gandhodak and Goumutra (cow's urine) which are used in vatavyadhichikitsa also. Buttermilk and Turmeric both used as digestive and in the treatment of liver disease[27],[28], so the efficacy of buttermilk shodhita turmeric can be evaluated clinically/preclinically in the treatment of Liver disorders.

CONCLUSION

Shodhana process may change the therapeutic efficacy of drug, it might be the one of the factor so that classical texts gave purification process for nontoxic drugs. Variation the sensory and physicochemical constants shows effect of purification processes. This, Standard manufacturing procedure (SMP) for shodhan process of pilot batches of turmeric rhizomes specifies the variation in the sensory evaluation as well as the numerical values of the obtained quantity with variation in the physicochemical constants. Changes in the

organoleptic and physicochemical constants of media before and after shodhana specify SMP in context to real time documentation. Eventually, the discussion shows future suggestions and necessary clinical aspects regarding shodhita Turmeric powder.

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