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Research Article

PHARMACEUTICO - ANALYTICAL EVALUATION OF MODIFIED DOSAGE FORMS OF *GOJIHWADI KWATHA*

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ABSTRACT

Cough is an ongoing problem that affects a large proportion of the human community leading them to seek medical attention. It has been identified as the sixth common reason for hospital outpatient department visits. In classics, descriptions of disease *Kasa* clearly correlate with bronchitis and its pathophysiology exactly correlates the mechanism of cough reflex. Ayurveda advocates certain remedies to cure and prevent such diseases. Hence the present study has been contemplated to evaluate and verify the effectiveness of the Classical Ayurvedic remedies with special reference to pathogens causing the respiratory tract infections. Among the latest Ayurvedic formulations the *Gojihwadi Kwatha* which was designed and developed by none other than the famous physician of this era the great *Vaidya Yadavji Trikamji Acharya* has been selected for the study. This present study entitled "Pharmaceutico-analytical evaluation of modified dosage forms of *Gojihwadi Kwatha*" was carried out with a view to standardize *Gojiwadi kwath* and prepare its modified forms viz. *Gojihwadi* syrup, *Gojihwadi* granules, and *Gojihwadi kwath churna.* 12kg *Gojihwadi kwaath churna* was prepared while 6-liter *Gojihwadi* syrup and 3 kg *Gojihwaadi* granules were prepared. *Gojihwaadi* syrup has viscosity of 34.62 cP, total sugar content of 85.07 %w/w, reducing sugar content of 1.42 %w/w, non-reducing sugar content of 83.65%w/w and pesticide residue value within limits of standard parameter. *Gojihwadi* granules have total sugar of 78.44%w/w, an average particle size of 34.70. Total bacterial count, Total fungal count, and specific pathogens (E. coli, Salmonella spp, S.aureus, and Ps.aeroginosa) were absent in *Gojihwadi kwatha churna, Gojihwadi* syrup and *Gojihwadi* granules. So, it can be concluded that all the modified dosage forms of *Gojihwadi kwatha* are safe to use.

INTRODUCTION

Disease is a definable change from a normal phenotype (observable characteristics due to genome and environment), evident via the complaints of a patient (symptoms), and/or the measurements of an observer/physician (signs). The *Nidana* of diseases is broadly classified into exogenous and endogenous.

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One of the common symptoms is *Kasa* (cough). Cough can be either productive or non-productive [1]. The aim of cough is to clear the airways when there is a large amount of inhaled foreign material, excessive mucus secretions or impaired muco-ciliary clearance, and excessive abnormal substances such as edema fluid or pus.

Cough involves an extremely complex reflex arc. It develops through a series of mechanistic, chemical and cellular steps and during these steps, changes in the structure or function at the gross/clinical level might occur, and stepwise molecular abnormalities can lead to changes in cellular

and tissue function. The etiology of cough varies greatly. It is divided in acute and chronic type of cough. Now a days, respiratory infections such as COVID-19 infection causes a lot of trouble for the human being. According to the author it is suitable in respiratory infections where sputum is thick and adhesive in nature and difficult to come out. Bronchitis is inflammation of the bronchi, which are the air passages between the mouth, nose, and the lungs. This disease can be caused by micro-organisms such as viruses, bacteria, and allergens such as air pollution, dust, fumes, tobacco smoke, vapours, etc. The most frequent cause of bronchitis is usually a viral infection. Viral bronchitis is usually self-limiting and therefore can be cured on its own without medications.

Gojihwadi Kwatha is described in the 20th century textbook '*Siddhayoga Samgraha'* written by *Yadavji Trikamji Acharya* described in *Jwaradhikara*. *Gojihwadi Kwatha* is a collection of Ayurvedic and Unani drugs, which acts as bronchodilators, mucolytics and expectorants as well as a soothening agent as is evident from the pharmacological properties of each ingredient. Out of the 16 ingredients, *Draksha, Yashtimadhu, Vasa, Kantakari, Mishreya, Maricha* etc. are described in the ancient classics of Ayurveda. Many of the others like *Unnav, Khatmi, Khubkalam, Jufa* and *Gulbanafsa* are the contributions of Unani system of medicine. The combination is indicated in *Pratishyaya, Jwara* and *Kasa.* In this fast-paced life preparation of fresh *Kwatha* every time is a tedious task. Considering the palatability factor of *Kwatha* as well as its shelf life it has been decided to modify the same formulation to syrup form and compare its efficacy with that of *Kwatha*. Keeping the above facts in mind present study titled Pharmaceutico-analytical evaluation of *Gojihwadi kwatha churna*, *Gojihwadi* granules and *Gojihwadi* syrup has been under taken.

AIMS AND OBJECTIVES

1. To prepare the modified dosage forms of *Gojihwadi kwatha* like *Gojihwadi* syrup, *Gojihwadi* granules, and *Gojihwadi kwatha churna* following proper SOP.
2. To analyze the prepared samples as per standard parameters laid down in API.

PHARMACEUTICAL STUDY

MATERIALS AND METHODS

- All the raw materials were procured from the pharmacy Department of Rasa shastra and Bhaishajya Kalpana, N.I.A., Jaipur, and at sources available.
- *Gojihwadi kwatha churna*, *Gojihwadi* syrup and *Gojihwadi* granules are prepared as per the reference, in the Department of Rasa shastra and Bhaishajya Kalpana, N.I.A., Jaipur.

Pharmaceutical processes carried out during the study are as follows.

- Preparation of *Gojihwadi Kwatha Churna*
- Preparation of *Gojihwadi* syrup
- Preparation of *Gojihwadi* granules

Preparation of *Gojihwadi Kwatha Churna*

Preparation of *Gojihwadi Kwatha Churna* includes:

- Procurement of all ingredients as per table no.1.
- *Shodhana*- Removing foreign matter from crude drug
- Preparation of *Gojihwadi Kwatha Churna* are also useful in the preparation of *Gojihwadi* syrup and *Gojihwadi* granules with addition of sugar.

Preparation of *Gojihwadi Kwatha*

Reference: General method of *Kwatha*[2] preparation *(Sha.Sm.M.K.2/1)*

Material Required: Gas stove, clean cotton cloth, measuring jar (2 lit), ladle etc.

Ingredients

1) *Gojihwadi kwatha* coarse powder- 1kg
2) Water 16 times- 16 L

Procedure

Gojihwadi Kwatha drugs coarse powder was kept soaked in water for overnight. Soaked in one quarter of total volume 16 L. Next day it was boiled on *Mandagni* without covering its mouth after adding the remaining water 4 L. Water was evaporated slowly and reduced till the quantity became 1/4th. It was filtered with clean cotton cloth and filtered liquid was measured and it was 3 ltr.

Observations

Coarse *Gojihwadi Kwatha* powder became soft when kept soaked for overnight. During the preparation of *Kwatha* little frothing was observed. The temp of the water was recorded while boiling and it was 87.5°C. It took approximately 11 hours heating to reduce the water to 1/4th quantity. The color of prepared *Kwatha* was dark brown.

Preparation of *Gojihwadi* Syrup

Reference: *Anubhuta yoga*

Material Required: Stainless steel vessels (capacity-40 lit, depth-0.7m, circumference -1.5m), gas stove, clean cotton cloth, measuring jar (2 lit), ladle etc.,

Ingredients

1. *Gojihwadi kwatha* coarse powder- 1 kg
2. Water- 16 L
3. Sugar- 5.6 kg (sugar content is 85.07%)

Procedure

Gojihwadi Kwatha drugs coarse powder was kept soaked in water for overnight. Soaked in one quarter of total volume 16 L. *Gojihwadi kwatha* was

boiled on *Mandagni* with 16 L water without covering its mouth. The water was evaporated slowly and reduced to 1/4th. It was filtered with clean cotton cloth and Sugar was added. It was boiled on *Mandagni.* It attained a thicker consistency. The flame was put off. It was filtered with clean cotton cloth and filtered liquid was measured.

Preservatives were added

- 2% sodium benzoate
- 2% MPS
- 1% PPS

Observations

Coarse *Gojihwadi Kwatha* powder became soft when kept soaked for overnight. During the preparation of *kwatha* little frothing was observed. The temp of the water was recorded while boiling and it was 87.5°C. It took approximately 11 hours heating to reduce the water to 1/8th quantity. The color of prepared *Kwatha* was dark brown. Total quantity of prepared syrup is 8ltr.

Precautions

1) Coarse powder of *Gojihwadi Kwatha* should be taken for *Kwatha* preparation.
2) Boiling should be done on *Mandagni*.
3) Utensils, vessels, and filtering cloth should be clean.
4) Stirring should be carried out time to time.

Preparation of *Gojihwadi* Granules

Reference: *Anubhuta yoga*

Material Required: Stainless steel vessels (capacity -5 lit, circumference -1.5m), gas stove, clean cotton cloth, measuring jar, ladle, sieve (80 number).

Ingredients

1. *Gojihwadi kwatha churna*- 1200 gm
   - 600gm *Gojihwadi kwatha churna* without adding *Badar, Anjeera, Draksha* and *Shleshmatak*.
   - 600gm *Gojihwadi kwatha churna* with all ingredients
2. *Prakshepa dravya churna*- 600gm
3. Sugar- 2kg
4. Preservatives: 0.2 % sodium benzoate

Procedure

600gm *Gojihwadi kwatha churna* was prepared without adding *Badar, Anjeera, Draksha* and *Shleshmatak*. It was pounded and converted into finer powder. It was filtered with a sieve of 80 number. 600gm *Gojihwadi kwatha churna* was prepared. *Kwatha* was prepared. *Kwatha* was reduced till 1/8th part. 300gm *Prakshepa dravya churna* was added. It should be boiled on *Mandagni* and a thick consistency is prepared. 2kg sugar and 800ml water were boiled together, and a thick semi-solid consistency is prepared. Both are added together. The mixture is put on fire. It gains a thicker consistency. 300gm *Prakshep dravya churna* is added together. It is filtered and put to dry for 1 day. Granules were prepared.

Precautions

1. All the containers were thoroughly cleaned before use to avoid any contamination and fungal growth on the consistency
2. Continues stirring required to prevent burning of extract at bottom.
3. When the filtrate attains semi-solidness, it is advisable to dry the material in the tray drier by transferring the material to trays.

Observations

It took approximately 10 minutes heating to become semi-solid form.

Gojihwadi kwatha

***Gojihwadi* Syrup**

***Gojihwadi* Granules**

Kwatha

Syrup

Adding *Prakshepa*

***Gojihwadi* Granules**

Packaging of Granules

Organoleptic Characteristic

During the preparation of *Gojihwadi kwatha* frothing was observed. During heating specific smell was found. Gradually consistency was increased, and color darkened to brown.

ANALYTICAL STUDY

The tests pH, specific gravity and refractive index were conducted at Drug testing Laboratory, Department of Rasa Shastra and Bhaishajya Kalpana, National Institute of Ayurveda, Jaipur, Rajasthan, where as total aflatoxins, pesticide residue, total bacterial count, total fungal count, specific pathogens were conducted at S.R LABS, Pratapnagar Jaipur.

MATERIAL AND METHODS: Samples of 200g *Gojihwadi kwatha churna,* 200ml of *Gojihwadi* syrup and 200g *Gojihwadi* granules are subjected to analytical study.

Organoleptic Characters and Physiochemical Parameters

Organoleptic characters of the samples are obtained by using the *Pancha gyaanendriya* (5 sense organs). It is a particularly useful parameter to determine and compare the quality of samples. The parameters which are used are as follows-

a) *Rupa* (Colour)
b) *Rasa* (Taste)
c) *Gandha* (Odour)
d) *Sparsha* (Consistency)

Physico-chemical Evaluation

It includes the following parameters-

a) pH value
b) Total Ash
c) Acid insoluble ash
d) Alcohol soluble extractive
e) Water soluble extractive
f) Loss on drying at 105°C
g) Specific gravity

Table 1: Ingredients of *Gojihwadi Kwatha*

S.No.	Name	Latin Name	Part Use	Proportion
1	*Gojihwa*	*Onosma bractiata*	Leaves	1
2	*Yasthimadhu*	*Glycerrhiza glabra*	Stem	1
3	*Sonf*	*Foeniculum vulgare*	Fruit	1
4	*Draksha*	*Vitis vinifera*	Fruit	1
5	*Anjeera*	*Ficus carica* Linn.	Fruit	1
6	*Badar*	*Zizyphus jujube*	Fruit	1
7	*Vasa*	*Adathoda vasaca*	Leaves	1
8	*Jhupha*	*Hyssop officinalis* Linn.	Flowers	1
9	*Khubkala*	*Sisymbriumirio* Linn.	Seeds	1
10	*Hansaraj*	*Adiantum lunulatum* Linn.	*Panchanga*	1
11	*Banapsa*	*Viola odorata* Linn.	Flowers	1
12	*Khatmi*	*Althoea officinalis*	Stem	1

13	*Kantakari*	*Solanum xanthocarpum*	*Panchang*	1
14	*Atasi*	*Linumus itatissimum* Linn.	Seeds	1
15	*Sleshmatak*	*Cordia dichotoma* Forst.	Fruit	1
16	*Maricha*	*Piper nigrum*	Fruit	½

Table 2: Organoleptic Characters and Physico-chemical Parameters of the *Gojihwadi Kwatha Churna*

S.No.	QC Parameters	Reference	Results
1.	Description	API	***Kwatha churna*** **Colour:** Brownish, yellowish color **Taste:** Pungent, sweet **Odour:** Characteristic
2.	Foreign Matter	API	Nil
3.	Loss on drying	API	0.05%
4.	Alcohol-soluble extractive	API	23.20%
5.	Water-soluble extractive	API	31.20%
6.	Total ash	API	10.33%
7.	Acid insoluble ash	API	1.67%

Table 3: Organoleptic Characters & Physico-chemical Parameters of the *Gojihwadi* syrup

S.No.	QC Parameters	Reference/ Test Method	Results
1.	Description	API	**Syrupy liquid** **Colour**: Brown **Taste**: Sweet **Odour**: Characteristic
2.	Foreign Matter	API	Nil
3.	pH [3]	API	6.0
4.	Specific gravity[4] at 25°C	API	1.31
5.	Refractive index [5]	API	65

Table 4: Organoleptic Characters & Physico- Chemical Parameters of the *Gojihwadi* granules

S.No.	QC Parameters	Reference/Test Method	Results
1.	Description	API	**Granules** **Colour**: Brownish color **Taste**: Sweet **Odour**: Characteristic
2.	Foreign Matter	API	Nil
3.	Loss on drying	API	0.15 %
4.	Alcohol-soluble extractive	API	25.60 %
5.	Water-soluble extractive	API	34.57 %
6.	Total ash	API	2.0 %
7.	Acid insoluble ash	API	0.01%

Table 5: Analytical test result of *Gojihwadi kwatha churna*

S.No.	Test parameters	Result	Limits
A.	**Physiochemical analysis**		
1.	Particle size identification by sieve (#20 No)	34.62	NS
2.	HPTLC	-	NS

B.	**Total aflatoxins[6]**		
1.	Aflatoxin B1	BLQ (LOQ 0.008)	NMT 0.5
2.	Aflatoxin B2	BLQ (LOQ 0.008)	NMT 0.1
3.	Aflatoxin G1	BLQ (LOQ 0.008)	NMT 0.5
4.	Aflatoxin G2	BLQ (LOQ 0.008)	NMT 0.1
C.	**Microbiological analysis [7]**		
1.	Total bacterial count	<10	100000
2.	Total fungal count	20	1000
D.	**Test for specific pathogen**		
1.	E. coli	A	A
2.	Salmonella spp.	A	A
3.	S.aureus	A	A
4.	Ps.aeroginosa	A	A

Table 6: Analytical test result of *Gojihwadi* syrup

S.No.	Test parameters	Result	Limits
A.	**Physiochemical analysis**		
1.	Viscosity	34.62	NS
2.	Total sugar	85.07	NS
3.	Reducing sugar	1.42	NS
4.	Non-reducing sugar	83.65	NS
5.	HPTLC	-	NS
B.	**Pesticide residue**		
6.	Alachlor	BLQ (LOQ 0.01)	0.02 (Max)
7.	Aldrin	BLQ (LOQ 0.01)	0.05 (Max)
8.	Alpha endosulphan	BLQ (LOQ 0.01)	3.0 (Max)
9.	Azinphos methyl	BLQ (LOQ 0.01)	3.0 (Max)
10.	Beta endosulphan	BLQ (LOQ 0.01)	3.0 (Max)
11.	Bromopropylate	BLQ (LOQ 0.01)	0.2 (Max)
12.	Chlorpyrifos	BLQ (LOQ 0.01)	0.1 (Max)
13.	Chlorpyrifos methyl	BLQ (LOQ 0.01)	0.5 (Max)
14.	Cis chlordane	BLQ (LOQ 0.01)	0.05 (Max)
15.	Cypermethin	BLQ (LOQ 0.02)	1.0 (Max)
16.	Deltamethrin	BLQ (LOQ 0.01)	0.5 (Max)
17.	Diazinon	BLQ (LOQ 0.01)	0.5 (Max)
18.	Dieldrin	BLQ (LOQ 0.01)	0.05 (Max)
19.	Dichlorvos	BLQ (LOQ 0.01)	1.0 (Max)
20.	Dithiocarbamates	BLQ (LOQ 0.05)	2.0 (Max)
21.	Endosulphan sulfate	BLQ (LOQ 0.01)	3.0 (Max)
22.	Endrin	BLQ (LOQ 0.01)	0.05 (Max)
23.	Ethion	BLQ (LOQ 0.01)	2.0 (Max)
24.	Fenitrothion	BLQ (LOQ 0.01)	0.5 (Max)
C.	**Microbiological analysis**		
25.	Total bacterial count	<150	100000
26.	Total fungal count	10	1000
D.	**Test for specific pathogen**		
27.	E. coli	A	A

28.	Salmonella spp.	A	A
29.	S.aureus	A	A
30.	Ps.aeroginosa	A	A

Table 7: Analytical test results of *Gojihwadi* granules

S.No.	Test parameters	Result	Limits
A.	**Physiochemical analysis**		
1.	Total sugar	78.44	NS
2.	Particle size identification by sieve (# 20 No)	34.70	NS
B.	**Microbiological analysis**		
8.	Total bacterial count	5000	100000
9.	Total fungal count	100	1000
C.	**Test for specific pathogen**		
10.	E. coli	A	A
11.	Salmonella spp.	A	A
12.	S.aureus	A	A
13.	Ps.aeroginosa	A	A

DISCUSSION

The causes of *Kaphaj Kasa* described in Ayurvedic classic *Syasukha, Swapnasukha, Diwaswapna,* excess consumption of *Madhura, Snigdha, Abhishyanda* and similar *Kapha prakopak ahaar*. These are now in modern form such as fast food, junk food sedentary life and many others. These all causes vitiate *Kapha, Pitta* and *Vata*. It depends on intensity of indulgence of respective factors. *Acharya Charaka* has described details of pharmaceutical procedure regarding *Kwatha* in *Viman sthana* viz. The collected drug should be examined carefully, cut into pieces, washed well with water, and kept in a vessel containing cow urine diluted with water of half of its quantity. This should be boiled and during the process of boiling constantly stirred with the help of a ladle. When the aqueous part of it comes to its proper level and the active principles from medicinal plants are taken out, then the vessel should be removed from fire and filtered properly. During the preparation of *Gojihwadi* syrup to attain more extracts, the *Churna* is put in water.

In *Kwatha* preparation, frothing could have been caused by saponification matter. The syrup is thick due its sticky ingredients. The reason for using ¼ part is that the sticky ingredients like *Shleshmatak* etc can make it very thick. During the preparation of *Gojihwadi* granules, *Prakshep dravya* is used in fine powder form because fine powder is needed to convert semi-solid form into solid state. *Anjeer, Badar, Draksha* and *Shleshmatak* is removed from *Prakshep dravya,* because they are sticky ingredients (it is difficult to attain their fine powder state). *Kwath churna* have brown colour due the natural colour of the ingredients. LOD is 0.05% is due to low moisture content. Total ash is 10.33% is due to the presence of herbal ingredients. *Gojihwadi* syrup is brownish in colour, sweet in taste and has a characteristic odour. pH value is 6 due to the herbal content of this preparation. Granules absorb moisture from the atmosphere due to presence of sugar. Total ash of granules is low because herbal content is low in comparison with *Kwath churna.* The bacterial count and fungal count are below the normal range in all three preparations. All 4 pathogens are absent the 3 preparations. Therefore, it can be concluded that are safe to consume.

CONCLUSION

Gojihwadi Kwatha is described in *Jwaradhikara* in the textbook '*Siddhayoga Samgraha'* written by Yadavji Trikamji.

- *Gojihwadi* contains *Jupha, Banapsha, Khatmi, Khubkala* and *Anjeer*. Details of these drugs were not found in Ayurvedic *Samhitas,* but easily available in the Unani literature.
- In Unani books like *Dravyagunadarsha, Chikitsa*, etc., many formulations such as *Sharabat-e- jufa, Sharabat-e-majun* were found which were only slightly different in its contents and proportions to *Gojihwadi* of *Siddha yoga sangraha*.
- 12kg *Gojihwadi kwaath churna* was prepared while 6-liter *Gojihwadi* syrup and 3kg *Gojihwaadi* granules were prepared.
- *Gojihwaadi* syrup has viscosity of 34.62, total sugar content of 85.07, reducing sugar content of 1.42, non-reducing sugar content of 83.65.

Goji wadi granules has total sugar of 78.44, an average particle size of 34.70, lead content of 0.26, mercury content of 0.15, total bacterial count of 5000, Total fungal count of 100, and all 4 pathogens (E. coli,

Salmonella spp, S.aureus, and Ps.aeroginosa) were absent.

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