AYUSHDHARA
ISSN: 2393-9583 (P)/ 2393-9591 (O)
An International Journal of Research in AYUSH and Allied Systems

Research Article

A COMPARATIVE CLINICAL EVALUATION OF EFFICACY OF *GUDUCHI* (*TINOSPORA CORDIFOLIA* (WILLD.) MIERS) *KANDA* (STEM) AND *GAMBHARI* (*GMELINA ARBOREA* ROXB.) *TWAK* (BARK) IN *VATARAKTA* WITH SPECIAL REFERENCE TO GOUTY ARTHRITIS

Ashwini S Pai[1]*, Dharani[2]

*[1]PG Scholar, [2]Associate Professor, Department of PG Studies in Dravyaguna, Government Ayurvedic Medical College, Bengaluru, Karnataka, India.

Article info

Article History:
Received: 17-01-2023
Revised: 01-02-2023
Accepted: 16-02-2023

KEYWORDS:
Guduchi Kanda, Tinospora Cordifolia Stem, Gambhari Twak, Gmelina Arborea Bark, Vatarakta, Gouty Arthritis, Hyperuricemia.

ABSTRACT

Vatarakta is caused due to *Dushita vata* and *Dushita rakta* which vitiate independently and also interdependently. They further lodge in the different *Dhathu* and manifest as *Utthana* or *Gambhira vatarakta*. Based on symptomology, *Gambhira vatarakta* can be co-related to gouty arthritis, a disorder of purine metabolism. Ayurvedic classics indicate many single herb and compound formulations in management of *Vatarakta.* Among them*, Guduchi* which has been mentioned as the *Agrya dravya* for *Vatarakta*, and *Gambhari*, which has been indicated as *Vataraktahara* by *Bhavaprakasha Nighantu*, have been selected for trial in this study. 40 subjects fulfilling the inclusion criteria were selected and randomly divided into two groups. Group A and Group B were given *Guduchi kanda Kashaya* and *Gambhari twak Kashaya* respectively, 40ml per day in two divided doses, before food, with *Jala* as *Anupana*, for a duration of 48 days. *Sandhi shula, Sandhi daha, Sandhi shotha,* and *Sandhi stabdhata* were considered as subjective parameters, and Serum Uric Acid levels and Erythrocyte Sedimentation Rate were taken as objective parameters. Assessment of these parameters was done before and after the intervention. Appropriate statistical tests were applied to analyse the results. Both groups showed marked improvement in the subjective and objective parameters which was statistically significant ($p<0.01$). Both *Guduchi* and *Gambhari* have shown efficacy in management of *Vatarakta.* On comparison of two groups, *Guduchi* was more effective clinically with respect to all the parameters.

INTRODUCTION

Health is multidimensional and requires physical, physiological, mental, emotional, spiritual, and social wellbeing. Diet and lifestyle are the most important factors influencing this. Throughout the different literatures of Ayurveda, the importance of *Ahara* and *Vihara* in the context of *Swasthya rakshana* and in *Vikara prashamana* has been consistently stressed upon. The significance of this becomes clear, given the fact that there has been a considerable spike in the prevalence of lifestyle-related metabolic disorders in the recent times.

Access this article online	
Quick Response Code	
	https://doi.org/10.47070/ayushdhara.v10i1.1125

Gout is one such disorder caused due to impairment in purine metabolism. The prevalence of gout worldwide ranges up to 10%, the incidence is up to 6 cases per 1,000 person-per year[1], and is increasing steadily. The incidence is more in developed countries, and a recent study suggests that the individuals of Asian descent have a three times higher risk of gout compared to individuals of other descent[1].

Vatarakta is a complex pathogenesis caused by *Dushita vata* and *Dushita rakta*, and its aetiology includes chronic diet and lifestyle related imbalances. There are two stages of the disease, *Utthana vatarakta* involving the *Twak* and *Mamsa dhatu,* and *Gambhira vatarakta* involving the deeper tissues*. Gambhira vatarakta* can be co-related to gout as they both have similar symptomology.

The nature of pain in *Gambhira vatarakta* is said to be *Atyanta duhsaha* (extremely unbearable). The excruciating pain in the joints increases the suffering of an individual, and also hampers the day-to-day activities.

In Ayurveda, many *Eka moolika prayoga* and *Aushadha yoga* have been mentioned for the management of *Vatarakta*. Two such drugs are *Guduchi (Tinospora cordifolia)* and *Gambhari (Gmelina arborea)*. *Guduchi* has been mentioned as an *Agrya dravya* for *Vatarakta* by *Vagbhatacharya*[2], also related scientific studies have shown favourable results. *Gambhari* is a widely used ingredient of multiple formulations indicated for *Vatarakta. Bhavaprakasha Nighantu* mentions one of its indications as *Vataraktahara*[3]. Both these drugs, which are found locally and abundantly in India, were selected for the comparative clinical study.

OBJECTIVES

The objectives of this study were:

1. Pharmacognostic and Phytochemical analysis of *Guduchi kanda* (stem) and *Gambhari twak* (bark).
2. Clinical evaluation of efficacy of *Guduchi kanda kwatha* in *Vatarakta*.
3. Clinical evaluation of efficacy of *Gambhari twak kwatha* in *Vatrakta*.
4. Comparative clinical evaluation of *Guduchi kanda kwatha* and *Gambhari twak kwatha* in *Vatarakta*.

METHODOLOGY

The study was undertaken under three phases.

Phase I – Drug collection

- Authentication, collection, and processing of the drugs *Guduchi* and *Gambhari*.
- Preparation of respective *Kwatha churna*.

Phase II – Analytical study

- Macroscopic evaluation
- Powder microscopic study
- Physico-chemical analysis for determination of foreign matter, moisture content, total ash content, acid insoluble ash, alcohol soluble extractive, water soluble extractive, and pH value.
- Phyto-chemical analysis for determination of organic and inorganic chemical constituents.
- HPLC analysis

Phase III – Clinical study

1. **Nature of study:** Randomized open labelled comparative clinical study with pre and post-test design.
2. **Ethical clearance:** was obtained from the Institutional Ethical Committee.
3. **Screening:** selection of subjects based on the following criteria:

Diagnostic Criteria

- On the basis of signs and symptoms of *Gambhira Vatarakta* mentioned in classical literature, namely[4] - *Sandhi shula, Sandhi daha, Sandhi shotha, Sandhi stabdhata*
- Based on guidelines for diagnosis of Gouty arthritis mentioned in API Textbook of Medicine[5] Presence of 6 of the 12 clinical, laboratory, and radiographic phenomenon would help in classifying gouty arthritis.

More than one attack of acute arthritis	Unilateral attack involving tarsal joint
Maximal inflammation developed within a day	Suspected tophus
Attack of monoarticular arthritis	Hyperuricemia
Joint redness	Asymptomatic swelling within the joint
Painful or swollen first Metatarsophalangeal joint	Radiograph- subcortical cyst without erosion
Unilateral attacks involving the same	Negative culture of joint fluid

- American College of Rheumatology– 2015 Gout Classification Criteria[6]. According to this, the maximum possible score is 23, and a threshold score of > 8 classifies an individual as having gout.

Inclusion Criteria

- Subjects between the age group of 30 to 65 years, irrespective of gender, socio-economic status, and religion, fulfilling the diagnostic criteria, were included for the study.
- Subjects having serum uric acid concentration more than 7.0mg/dL in males and more than 6.0mg/dL in females.
- Patients exhibiting *Lakshana* of *Gambhira Vatarakta- Sandhi shula, Sandhi shotha, Sandhi daha* and *Sandhi stabdhata.*
- Patients having chronicity less than 5 years, without the manifestation of tophi and not associated with complete joint destruction.

Exclusion Criteria

- Pre-diagnosed cases suffering from:
  - Koch's arthritis
  - Septic arthritis
  - Rheumatoid arthritis
  - Hemarthrosis
  - Renal calculi
  - Chronic renal failure
  - Severe Systemic multi organ syndromes
- Subjects on oral medication for gout or any other medical condition for more than 6 months

4. **Consent and Registration**: After detailed informed consent, 28 subjects were registered from SJIIM OPD, and 19 subjects were registered from a medical camp conducted in SJIIM, Bangalore from 1/3/2021 to 31/3/2021. These 47 subjects were randomly grouped into two groups – Group A with 23 subjects and Group B with 24 subjects. Out of this, 7 subjects dropped out of the study because of various reasons and the study was completed with 40 subjects.
5. **Examination and Assessment of Response to Intervention**: The registered volunteers were subjected to detailed preliminary data collection, clinical examination, and laboratory investigations according to the format framed for clinical study.

For assessment of response to intervention, subjective parameters namely *Sandhi shula, Daha, Shotha, Stabdhata,* and objective parameters namely serum uric acid level and erythrocyte sedimentation rate were evaluated before and after intervention.

Grading of Subjective Parameters

Table 1: Grading for Assessment of Subjective Parameters

S.No	*Lakshana*	Grading
1.	*Sandhi shula*	0 – No pain 1 – Mild pain with no difficulty in flexion and extension 2 – Tolerable pain with slight difficulty in flexion and extension 3 – Moderate pain with much difficulty in flexion and extension 4 – Severe pain with restricted movements
2.	*Sandhi daha*	0 – Absent 1 – Transient 2 – Frequent 3 – Regular, seeking medical advice
3.	*Sandhi shotha*	0 – Absent 1 – Present, but not apparent 2 – Swelling obvious on less than 2 joints 3 – Swelling obvious on more than 2 joints
4.	*Sandhi stabdhata*	0 – Absent 1 – Slight difficulty in flexion and extension 2 – Much difficulty in flexion and extension 3 – Restricted movements

Intervention

Table 2: Details of Intervention

Group	Intervention	Dose	Duration	*Anupana*
Group A	*Guduchi kanda kwatha*	40ml, in 2 divided doses, before food	48 days	*Jala*
Group B	*Gambhari twak kwatha*	40ml, in 2 divided doses, before food	48 days	*Jala*

OBSERVATIONS AND RESULTS

Macroscopic Features

Sensory evaluation of *Guduchi kanda* and *Gambhari twak*

Table 3: Sensory evaluation of *Guduchi kanda* and *Gambhari twak*

S.No	Parameter	*Guduchi kanda*	*Gambhari twak*
1.	*Shabdha* (fracture)	Rough	Rough
2.	*Sparsha* (external surface)	Coarse	Coarse
3.	*Roopa* (colour, shape)	Dark brown, stem	Light brown, bark
4.	*Rasa* (taste)	Bitter	Astringent
5.	*Gandha* (odour)	Characteristic	Faint, characteristic

Fig 01: Dried stem of *Tinospora codifolia*

Fig 02: Dried bark of *Gmelina arborea*

Fig 03: Powder of *Tinospora cordifolia* stem

Fig 04: Powder of *Gmelina arborea* bark

ANALYTICAL STUDY

Observations During Preparation of Extracts

Table 4: Observation during Preparation of Extracts of *Tinospora cordifolia*

S.No.	Observation	Alcoholic extract	Aqueous extract
1.	Drug taken	5.04gm	5.04gm
2.	Extract/yield obtained	0.06gm	0.23gm
3.	Colour	Light brown	Dark brown
4.	Consistency	Almost dry, mildly semisolid in certain places	Completely dry
5.	Odour	Characteristic	Characteristic
6.	Colour of prepared solution	Straw yellow	Light brown

Table 5: Observation during preparation of extracts of *Gmelina arborea*

S.No.	Observation	Alcoholic extract	Aqueous extract
1.	Drug taken	5.29gm	5.29gm
2.	Extract/yield obtained	0.08gm	0.20gm
3.	Colour	Light brown	Reddish brown
4.	Consistency	Completely dry	Semi solid
5.	Odour	Characteristic	Characteristic
6.	Colour of prepared solution	Light brown	Dark brown

Fig 05: Alcoholic extract of *Tinospora cordifolia*

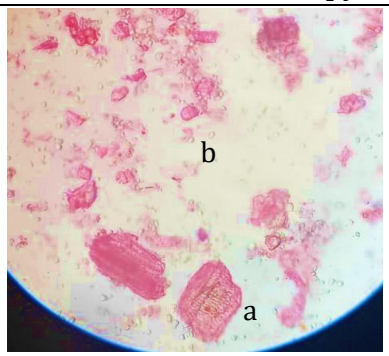
Fig 06: Aqueous extract of *Tinospora cordifolia*

Fig 07: Alcoholic extract of *Gmelina arborea*

Fig 08: Aqueous extract of *Gmelina arborea*

Powder microscopic study

Powder Microscopy of *Tinospora cordifolia* stem



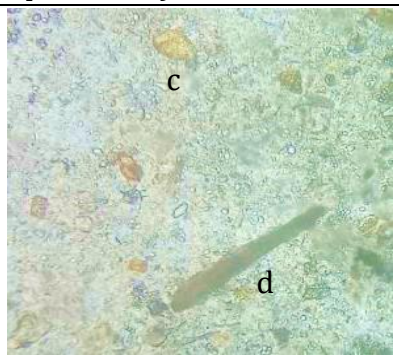


Figure 09 and 10: Powder Microscopy of *Tinospora cordifolia*
a – Vessel with reticulate secondary wall thickening
b – Stone cells
c – Starch grains
d – Tracheids

Powder Microscopy of *Gmelina arborea* Bark

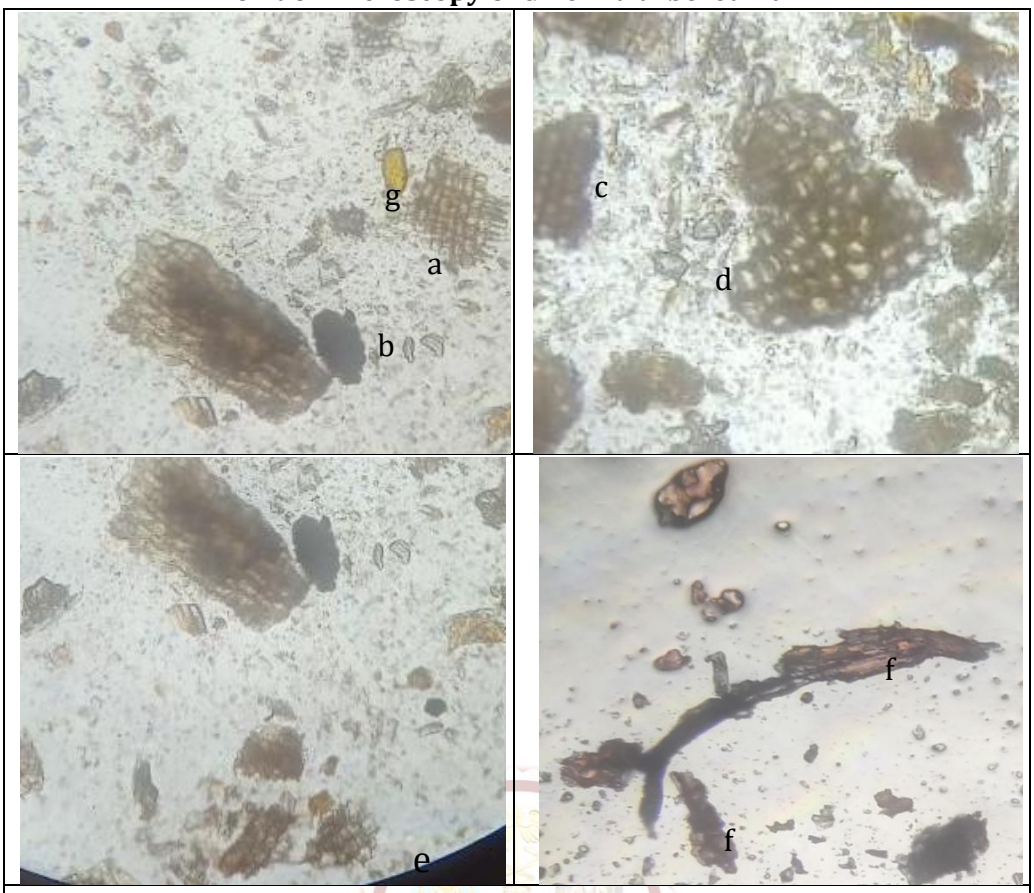


Figure 11 to 14: Powder microscopy of *Gmelina arborea*

a – Transversely cut fragments of lignified cork cells
b – Mesophyll tissue
c – Epidermal tissue
d – Tangentially cut medullary rays
e – Cork cells in surface view
f – Acicular and prismatic crystals of calcium oxalate
g – Oil globule

Physico-chemical Analysis

Table 6: Results of physico-chemical Evaluation of *Guduchi kanda* and *Gambhari twak*

Parameters	***Guduchi kanda***	**API standards**[20]	***Gambhari twak***	**API standards**[47]
Foreign Matter	Nil	Not more than 2% (for dried drug)	Nil	Not more than 2%
Loss on drying	4.06%	-	8.72%	-
Total Ash	6.39%	Not more than 16%	2.89%	Not more than 3%
Acid Insoluble Ash	2.42%	Not more than 3%	0.28%	Not more than 0.3%
Water Soluble Extractive Value	14.74%	Not less than 11%	6.87%	Not less than 4%
Alcohol Soluble Extractive Value	6.30%	Not less than 3%	3.62%	Not less than 1%
pH value (1% solution)	6.70	-	5.73	-

Loss on drying and pH estimation were done in triplicates as standards were not available.

Phytochemical Analysis

Organic constituents

Table 7: Phytochemical analysis of organic constituents of *Kashaya* of *Guduchi kanda* and *Gambhari Twak*

Sl. No.	Constituents	*Guduchi kanda*	*Gambhari twak*
1.	Alkaloids	+	+
2.	Flavonoids	+	+
3.	Saponins	+	+
4.	Glycosides	+	+
5.	Triterpenoids	+	-
6.	Tannins	+	+
7.	Phenolic compounds	+	+
8.	Steroids	+	-
9.	Resins	-	-
10.	Carbohydrates	+	+
11.	Reducing sugars	+	+
12.	Protein	+	+
13.	Starch	+	-

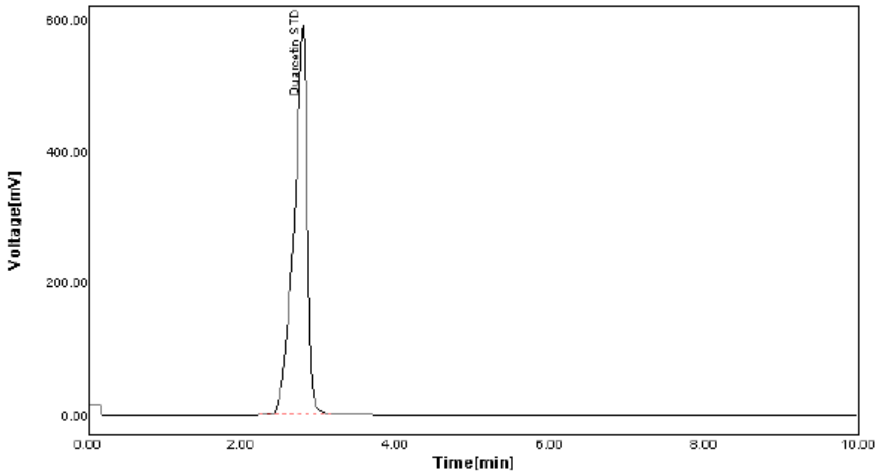
Inorganic constituents

Table 8: Phytochemical analysis of inorganic constituents of *Kashaya* of *Guduchi kanda* and *Gambhari twak*

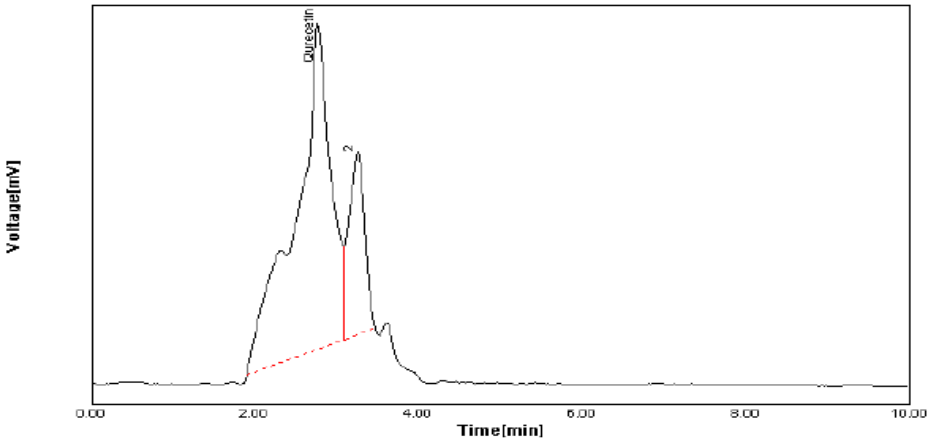
Sl. No.	Constituents	*Guduchi kanda*	*Gambhari twak*
1.	Calcium	+	-
2.	Magnesium	-	-
3.	Sodium	+	-
4.	Potassium	-	-
5.	Iron	-	+
6.	Sulphate	-	+
7.	Phosphate	+	-
8.	Chloride	+	+
9.	Carbonate	-	-
10.	Nitrates	-	-

HPLC study

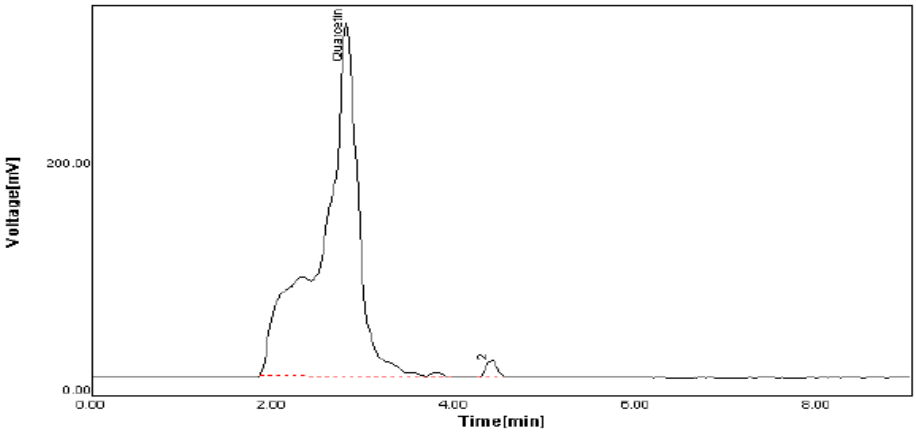
Graph 1: Chromatogram of HPLC of standard 'Quercetin'



Graph 2: Chromatogram of HPLC of *Tinospora cordifolia*



Graph 3: Chromatogram of HPLC of *Gmelina arborea*



Interpretation

Table 9: Interpretation of HPLC of Quercetin, *Tinospora cordifolia*, and *Gmelina arborea*

Sample	RT	Area	Amount (mg/ml)
Quercetin	2.78	7056	---
Tinospora cordifolia	2.78	1750	0.09
Gmelina arborea	2.8	8790	0.49

Demographic Data

In this study, 47 subjects were registered. These 47 subjects were randomly grouped into two groups – Group A with 23 subjects and Group B with 24 subjects. There 7 dropouts altogether, at various stages of the intervention, and the study was completed with 40 subjects, 20 in each group. The demographic data was assessed and recorded.

Age: Among 40 subjects, a maximum of 16 (40%) belonged to the age-group of 40-49 years, 13 (32.5%) belonged to 50-59 years, 7 (17.5%) belonged to 60-65 years, and 4 (10%) belonged to 30-39 years. This pattern of distribution of subjects was found to be similar for both the groups.

Gender: Among 40 subjects, 29 (72.5%) were males and 11 (27.5%) were females.

Socio-economic status: Out of 40 subjects, 35 (62.5%) subjects were above poverty line, and 5 (12.5%) were below poverty line.

Chronicity: Out of 40 subjects, 15 (37.5%) subjects had chronicity less than 1 year, 14 (35%) subjects had chronicity of 1-2 years, 5 (12.5%) subjects had chronicity 2-3 years, 4 (10%) subjects had chronicity of 3-4 years, and 2 (5%) subjects had chronicity of 4-5 years.

Family history: Out of 40 subjects, 31 (77.5%) subjects had no family history of *Vatarakta,* and 9 (22.5%) subjects had family history of *Vatarakta.*

Diet: Out of 40 subjects, 33 (82.5%) subjects had a mixed diet, and 7 (17.5%) subjects had a vegetarian diet.

Built: Out of 40 subjects, 6 (15%) were of *Krusha akruthi,* 19 (47.5%) were of *Madhyama akruthi,* and 15 (37.5%) were of *Sthula akruthi.*

Prakruthi: Out of 40 subjects, 16 (40%) were of *Vata-pittaja prakruthi*, 13 (32.5%) were of *Pitta-kaphaja prakruthi*, and 11 (27.5%) of *Kapha-vataja prakruthi*.

Clinical Study Results

Group A

Table 10: Grading of Subjective Parameters Before and After Intervention in Group A

Symptoms	Assessment		Grading				
			0	1	2	3	4
Sandhi shula	Before intervention	Frequency	0	3	10	6	1
		Percent	0%	15%	50%	30%	5%
	After intervention	Frequency	9	10	1	0	0
		Percent	45%	50%	5%	0%	0%
Sandhi daha	Before intervention	Frequency	2	7	10	1	-
		Percent	10%	35%	50%	5%	-
	After intervention	Frequency	11	9	0	0	-
		Percent	55%	45%	0%	0%	-
Sandhi shotha	Before intervention	Frequency	1	7	10	2	-
		Percent	5%	35%	50%	10%	-
	After intervention	Frequency	11	9	0	0	-
		Percent	55%	45%	0%	0%	-
Sandhi stabdhata	Before intervention	Frequency	2	6	9	3	-
		Percent	10%	30%	45%	15%	-
	After intervention	Frequency	10	9	1	0	-
		Percent	50%	45%	5%	0%	-

Table 11: Values of objective parameters before and after intervention in group A

Parameter	Before intervention (Mean)	After intervention (Mean)	Change
Serum Uric Acid	7.30	5.44	1.86
Erythrocyte Sedimentation Rate	39.5	10.4	29.1

Group B

Table 12: Grading of Subjective Parameters Before and After Intervention in gRoup B

Symptoms	Assessment		Grading				
			0	1	2	3	4
Sandhi shula	Before intervention	Frequency	0	1	11	7	1
		Percent	0%	5%	55%	35%	5%
	After intervention	Frequency	8	10	2	0	0
		Percent	40%	50%	10%	0%	0%
Sandhi daha	Before intervention	Frequency	2	6	10	2	-
		Percent	10%	30%	50%	10%	-
	After intervention	Frequency	11	8	1	0	-
		Percent	55%	40%	5%	0%	-
Sandhi shotha	Before intervention	Frequency	2	5	12	1	-
		Percent	10%	25%	60%	5%	-
	After intervention	Frequency	10	10	0	0	-
		Percent	50%	50%	0%	0%	-
Sandhi stabdhata	Before intervention	Frequency	3	8	7	2	-
		Percent	15%	40%	35%	10%	-
	After intervention	Frequency	7	10	3	0	-
		Percent	35%	50%	15%	0%	-

Table 13: Values of objective parameters before and after intervention in group B

Parameter	Before intervention (Mean)	After intervention (Mean)	Change
Serum Uric Acid	7.5	5.83	1.67
Erythrocyte Sedimentation Rate	37.7	10.3	27.4

To assess the efficacy of the intervention on subjective parameters in the groups, Wilcoxon signed-rank test and Mann Whitney U test were adopted. To assess the efficacy of the intervention on objective parameters, paired 't' test and unpaired 't' test were adopted.

To summarize the observations of the intervention:

1. ***Sandhi shula***- In group A, the mean grading of *Shula* before intervention was 2.25, and after intervention was 0.6. In group B, the mean grading of *Shula* before intervention was 2.4, and after intervention was 0.75. The reduction in *Shula* in group A was 73.33% and in group B was 70.83%.
2. ***Sandhi daha***- In group A, the mean grading of *Daha* before intervention was 1.5, and after intervention was 0.45. In group B, the mean grading of *Daha* before intervention was 1.6, and after intervention was 0.5. The reduction in *Daha* in group A was 70% and in group B was 68.75%.
3. ***Sandhi shotha***- In group A, the mean grading of *Shotha* before intervention was 1.65, and after intervention was 0.45. In group B, the mean grading of *Shotha* before intervention was 1.6, and after intervention was 0.5. The reduction in *Shotha* in group A was 72.72% and in group B was 68.75%.
4. ***Sandhi stabdhata***- In group A, the mean grading of *Stabdhata* before intervention was 1.65, and after intervention was 0.55. In group B, the mean grading of *Stabdahta* before intervention was 1.4, and after intervention was 0.8. The reduction in *Stabdhata* in group A was 66.66% and in group B was 42.88%.
5. **Serum Uric Acid**- In group A, the mean reading of serum uric acid was 7.30 before intervention, and 5.44 after intervention. In group B, it was 7.5 before intervention, and 5.83 after intervention.
6. **Erythrocyte Sedimentation Rate**- In group A, the mean reading of ESR was 39.5 before intervention, and 10.4 after intervention. In group B, it was 37.7 before intervention, and 10.3 after intervention.

- **Within group**

  In both the groups, marked reduction of *Sandhi shula, Sandhi daha, Sandhi shotha, Sandhi stabdhata,* serum uric acid levels, and ESR was observed post intervention, with statistically highly significant value $p<0.01$.

- **In between groups**

  On comparison of both groups, the intervention in group A appeared to have a better effect on all parameters. However, since $p>0.05$, this difference was not statistically significant.

DISCUSSION

- **Age**- Most subjects were from the age group 30 to 60 years. This is in accordance with the data that this disease is more prevalent in the above mentioned age group[7].
- **Gender**- Most of the subjects (72.5%) were male. This is in accordance with the epidemiology of gout, according to which it is 3-4 times more prevalent in men compared to women [7].
- **Socio-economic status**- Most of the subjects (62.5%) were economically above poverty line. *Vatarakta* is also called as *Aadhyavata* because it is more commonly seen in *Aadhya* (rich) population [8]. However, the sample size of this study is very small to make definite statements based on it.
- **Diet**- 82.5% of the subjects followed a mixed diet, and 17.5% followed a vegetarian diet. Meat rich diet is high in purine content [9], and hence might be one of the reasons for higher prevalence of the disease among subjects that follow a mixed diet.

A few of the subjects also reported frequent consumption of *Lavana amla katu ushna pradhana Bhojana*, which is one of the *Raktadushtikara nidana* mentioned in *Vatarakta.*

- ***Akruthi*** – 47.5% of the subjects were of *Madhyama akruthi,* 37.5% were of *Sthula akruthi*, and 15% were of *Krusha akruthi*. It is likely that higher BMI increases the risk of gout by increasing the serum uric acid levels. Hyperuricemia has been associated with obesity via both increased production and decreased renal excretion of urate [10].
- ***Deha Prakruthi*** – 40% of the subjects were of *Vata-pittaja prakruthi.* 32.5% were of *Pitta-kaphaja prakruthi.* 27.5% were of *Kapha-vataja prakruthi.* It appears from this data that people of *Vata-pittaja prakruthi* are more susceptible to the disease. This might be the case, considering the pathology involves *Vata,* and *Rakta* which is a *Sthana* and also the *Mala* of *Pitta*. Further evaluation can be carried out on a larger sample, with a standardised method of assessment of *Prakruthi* to verify this.
- **Dosage form, *Matra* and *Anupana*** – The dosage form *Kwatha* was selected as both *Guduchi kwatha* and *Gambhari kwatha* have been indicated in *Vatarakta*[11,12].

40ml of the *Kwatha* was given per day in two divided doses. This dose was fixed based on the reference in API, which mentions the dose of *Kwatha* of both these drugs as 40-50ml[13,14]. *Jala* was given as *Anupana.*

- ***Aushadha sevana kala*** – The *Kwatha* was given on empty stomach. Specific reference for *Aushadha sevana kala* in *Vatarakta* is not available, but according to a cross reference, *Kwatha kalpana* is comparatively *Guru* in nature, and requires a strong *Agni* to digest properly, and therefore should be administered in *Abhakta avastha*. Hence this *Aushadha sevana kala* was adopted[15].
- **Duration** – The duration of intervention was 48 days, which equals to one *Mandal*[16].

Assessment of Response to Intervention

- In the present study, fairly good effect of intervention is seen in both group A and group B.
- Both the groups have shown marked improvement in both subjective and objective parameters post intervention.
- Even though a non-significant p value is observed, on comparison in between groups for all the parameters, the intervention *Guduchi kashaya* (of group A), appears to be more effective clinically than the intervention *Gambhari kashaya* (of group B).
- Even in the classical literature, *Guduchi* is mentioned as an *Agrya dravya* for *Vatarakta.* Considering these observations and literary references, it can be inferred that *Guduchi* possibly acts as both *Dosha pratyanika* and *Vyadhi pratyanika* in *Vatarakta.*

Probable Mode of Action of Drugs

Dravya karmukata can be due to *Dravya prabhava, Guna prabhava,* or both. Because of *Guna prabhava* i.e., by the virtue of its properties like *Rasa, Gurvadi guna, Virya, Vipaka,* the drug possibly acts as *Dosha pratyanika.* Because of *Dravya prabhava* i.e., the inherent, specific property of the drug, it possibly acts as *Vyadhi pratyanika.* The probable mode of action of drugs as per their *Guna* is as follows.

Guduchi – Tinospora cordifolia

- On *Dosha* and *Samprapti* – The *Samprapti* of *Vatarakta* starts with *Prakopa* of *Vata* and *Rakta*. *Chakrapani,* in his commentary, says that the nature of this disease is *"Agni maruta tulya."* Any drug administered in this condition should be able to pacify *Vata* without increasing *Rakta* and vice versa. *Guduchi*, due to its *Ushna veerya* and *Madhura vipaka*, acts as *Vata hara*. Due to *Tikta rasa*, it acts as *Pitta shamana*, and it in-turn as *Rakta prashamana* because of *Ashraya-ashrayi-bhava* of *Rakta* and *Pitta*.
- The *Vata hara* property further helps decrease the *Shula, Shotha,* and *Stabdhata.* The *Rakta prashamana* property further helps decrease the *Shula* and *Daha.*
- The phytoconstituents of *Guduchi* like alkaloids, beta sitosterol, quercetin, glycosides like tinocordioside, cordioside etc, and diterpenoid lactones like tinosporin, tinosporide etc exhibit anti-inflammatory activity. It thus reduces pain, edema and stiffness which are all secondary to inflammation [17,18].
- The polysaccharides present in *Guduchi* is possibly responsible for the uricosuric activity, and quercetin is responsible for xanthine oxidase inhibition activity, which in turn reduces the burning pain/sensation by reducing the elevated serum uric acid levels [19,20].

Gambhari – Gmelina arborea

- On *Dosha* and *Samprapti* – Due to its *Madhura rasa, Ushna veerya,* and *Guru guna, Gambhari* acts as *Vata hara.* Due to *Madhura tikta kashaya rasa,* and *Madhura vipaka,* it acts as *Pitta shamaka,* and in-turn, *Raktaprashamana.* It also has *Rakta dosha hara karma.*
- The *Vata hara* property further helps decrease the *Shula, Shotha,* and *Stabdhata.*

  The *Rakta prahsmana* property further helps decrease the *Shula* and *Daha.*
- The active components like alkaloids, quercetin, lignans like arboreal, isoarboreal etc, and saponins present in the bark of *Gambhari* exhibit anti-inflammatory activity, and are also responsible for the anti-nociceptive activity. It thus reduces pain, edema, and stiffness [21].
- The components tannins, and lignanas (arboreal, isoarboreal and related lignans) are possibly responsible for its uricosuric activity, and quercetin is responsible for xanthine oxidase inhibition activity, which in turn reduces the burning pain/sensation by reducing the elevated serum uric acid levels [20,22,23,24].

Even though both *Guduchi* and *Gambhari* possess different properties and active constituents, both the drugs, through different modes of action, possess similar *Dosha hara karma* and pharmacological activities required for the management of *Vatarakta.*

CONCLUSION

- The results of the analytical study of *Tinospora cordifolia* and *Gmelina arborea* are in accordance with the standards mentioned in the Ayurvedic

Pharmacopeia of India. Thus, confirms the genuineness of the drugs.

- HPLC study has confirmed the presence of Quercetin in both the drugs qualitatively and quantitatively.
- In the present clinical study, *Guduchi kanda* and *Gambhari twak* are found to be effective in the management of *Vatarakta.*
- The interventions, *Guduchi kanda* and *Gambhari twak,* have shown statistically significant results ($p<0.01$) with regard to various parameters in the management of *Vatarakta.*
- Quercetin aids in the anti-inflammatory activity. It also possesses xanthine oxidase inhibition activity because of which it reduces the production of uric acid in the body.
- Apart from Quercetin, the active components of *Guduchi* like beta-sitosterol, tinocordioside, etc and the active components of *Gambhari* like alkaloids, lignans, etc are responsible for their anti-inflammatory activity.
- The uricosuric activity of *Guduchi* can be possibly attributed to its polysaccharide content, and of *Gambhari* to its lignans and tannin content.
- Clinically, *Guduchi kanda* appears to be more effective with regard to all parameters when compared to *Gambhari twak.*

Scope for Further Studies

- Further phytochemical studies can be carried out to isolate the active compounds responsible for these pharmacological activities.
- This study needs to be carried out on a larger sample. Observing the action of drugs, and the difference in response to these two interventions on a larger sample will help make more definite conclusions regarding the efficacy of these interventions.
- Even though statistically significant, the effect of the interventions, especially of *Gambhari kwatha,* was less on *Sandhi stabdhata* compared to other parameters. This can be further evaluated with an increased dose, different dosage form, or an increased duration of intervention.
- A comparative study can be carried out between these drugs and an anti-gout drug.
- Study can be carried out to assess if these interventions have any effect on tophaceous gout.
- In subjects of chronic gout who are on anti-gout medication, these drugs can be prescribed alongside, and the added effect can be studied.
- This study can be carried out with different dosage forms of the drugs.

REFERENCES

1. Butler, Faven & Alghubayshi, Ali & Roman, Youssef. (2021). The Epidemiology and Genetics of Hyperuricemia and Gout across Major Racial Groups: A Literature Review and Population Genetics Secondary Database Analysis. Journal of Personalized Medicine. 11. 231. 10.3390/ jpm11030231.
2. Vaghbhatacharya, Ashtanga Hridayam with Sarvangasundhara of Arunadutta and Ayurveda Rasayana of Hemadri, collated by Dr.Anna Moreshwar Kunte and Krishna Ramachandra Shastri Navre, Varanasi: Chukhamba surabharathi prakashan, Reprint 2010.pg 944
3. Bhavamishra, Bhavaprakasha Nighantu-Guduchyadi varga, Shloka no 1, Hindi Commentary by K.C.Chunekar, edited by Dr GS Pandey, 1st ed. Varanasi; Chaukhumbha Bharathi Academy; Reprint 2015, Pg 257
4. Agnivesha, Charaka Samhitha (revised by Charaka and Dridabala) with Chakrapanidatta commentary, Sutrasthana, Ashtodariyodhyaya, Shloka no. 3, 4, Edited by Vaidya Acharya Yadavji Trikamji, 5th edition, Chaukambha Sanskrit Sansthan, Varanasi, 2001. Pg 110, 111.
5. Dr. Yash Pal Munjal, API Textbook of Medicine, for and on behalf of The Association for Physicians of India, Tenth Edition, Part 24, Chapter 5, p.2486
6. Neogi T, Jansen TL, Dalbeth N, et al.: 2015 Gout Classification Criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. Arthritis Rheumatol. 2015; 67(10): 2557–68
7. Nat Rev Rheumatol. 2015 Nov; 11(11): 649-62.doi:10.1038/nrrheum.2015.91. Epub 2015 Jul 7
8. Agnivesha, Charaka Samhitha (revised by Charaka and Dridabala) with Chakrapanidatta commentary, Chikitsasthana, Vatashonita chikitsitam, Shloka no. 11, Edited by Vaidya Acharya Yadavji Trikamji, 5th edition, Chaukambha Sanskrit Sansthan, Varanasi, 2001. Pg 628
9. Foods to eat and avoid on a low purine diet [homepage on the Internet]. Available from: https://www.medicalnewstoday.com/articles/322 590
10. Choi HK, Atkinson K, Karlson EW, Curhan G. Obesity, Weight Change, Hypertension, Diuretic Use, and Risk of Gout in Men: The Health Professionals Follow-up Study. Arch Intern Med. 2005; 165(7): 742–748. doi:10.1001/archinte.165.7.742
11. Sri Chakrapanidatta. Chakradatta with Vaidyaprakasha Hindi commentary, Vatarakta chikitsa, Shloka no 9, by Dr.Indradev Tripathi,

edited by Prof. Ramanath Dwivedy, Chaukambha. Pg 156.

12. Anonymous, Yogaratnakara, edited by Vaidya Lakshmipathi Sastri, Varanasi: Chaukambha Sanskrit Sansthan, 1988. Pg 553.
13. Govt. of India Ministry of Health and Family Welfare Department of ISM & H. The Ayurvedic Pharmacopoeia of India. Part I. Vol 1. New Delhi: Chaukhamba Publications; 2001. Pg 41.
14. Govt. of India Ministry of Health and Family Welfare Department of ISM & H. The Ayurvedic Pharmacopoeia of India. Part I. Vol 4. New Delhi: Chaukhamba Publications; 2001. Pg 31.
15. Junjarwad, Ashwini V et al. "Critical review on Bhaishajya Kaala (time of drug administration) in Ayurveda." Ayu vol. 34, 1 (2013): 6-10. doi:10.4103/0974-8520.115436
16. Shastri A. Rasaratnasamuchchya of Vagbghata. Visarpadi chikitsa, Shloka no. 106-112, 9th ed. 1 Ver. 8. Varanasi: Choukhamba Sanskrita Publication; 1995.
17. Joshi G and Kaur R: Tinospora Cordifolia: A Phytopharmacological Review. Int J Pharm Sci Res 2016; 7(3): 890-97.doi: 10.13040/IJPSR.0975-8232.7(3). 890-97.
18. Saha, Soham, and Shyamasree Ghosh. Tinospora cordifolia: One plant, many roles. Ancient science of life vol. 31, 4 (2012): 151-9. doi:10.4103/0257-7941.107344
19. Shah, Palak & Shah, Gaurang. (2015). Uricosuric activity of Tinospora cordifolia. Bangladesh Journal of Pharmacology. 10. 884. 10.3329/ bjp.v10i4.25160.
20. Alberto Bindoli, Marina Valente, Lucia Cavallini, Inhibitory action of quercetin on xanthine oxidase and xanthine dehydrogenase activity, Pharmacological Research Communications, Volume 17, Issue 9, 1985, Pages 831-839.
21. Kulkarni, Yogesh A et al. "Effect of Gmelina arborea Roxb in experimentally induced inflammation and nociception." Journal of Ayurveda and integrative medicine vol. 4, 3 (2013): 152-7. doi:10.4103/0975-9476.118697
22. Arora, Charu & Tamrakar, Vinita. (2017). Gmelina arborea: chemical constituents, pharmacological activities and applications. International Journal of Phytomedicine. 9. 528. 10.5138/09750185.2149
23. Sakthivel .S, Sheik Abdulla.S, Acute Toxicity and In Vivo Hepatoprotective And Nephroprotective Inethanol Extract of gmelina Arborea and Grewia Umbellifera. IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS), Volume 12, Issue 4 Ver. III (Jul – Aug 2017), PP 01-27
24. Ling X, Bochu W. A review of phytotherapy of gout: perspective of new pharmacological treatments. Pharmazie. 2014 Apr; 69(4): 243-56. PMID: 24791587

Cite this article as:
Ashwini S Pai, Dharani. A Comparative Clinical Evaluation of Efficacy of Guduchi (Tinospora Cordifolia (Willd.) Miers) Kanda (Stem) and Gambhari (Gmelina Arborea Roxb.) Twak (Bark) in Vatarakta with special reference to Gouty Arthritis. AYUSHDHARA, 2023;10(1):1-13.
https://doi.org/10.47070/ayushdhara.v10i1.1125
Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**
Dr. Ashwini S Pai
PG Scholar
Department of PG Studies in Dravyaguna
Government Ayurvedic Medical College, Dhanwantari Road
Bengaluru, Karnataka.
Email: s.ashwini.pai@gmail.com