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ANALYTICAL STUDY OF VIBHITAKI PHALA (TERMINALIA BELLIRICA (GAERTN.) ROXB.) WITH SPECIAL REFERENCE TO SAPTAVIDHA KASHAYA

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ABSTRACT

Kashaya Kalpana is one of the dosage forms, prepared by using drug and water in specific proportion and reducing it to specific quantity. *Saptavidha kashaya* is mentioned by *Acharya Harita* depending on reductive dosage form. Those are *Pachana Kashaya, Deepana Kashaya, Shodhana Kashaya, Shamana Kashaya, Tarpana Kashaya, Kledana Kashaya* and *Vishoshi Kashaya*. These reductive dosage forms exhibit multiple pharmacological actions. The drug, *Vibhitaki phala twak*, selected for the present study is assessed to have these seven karmas based on its *rasapanchaka* and an attempt has been made to evaluate and compare the *Saptavidha Kashaya* and Aqueous extract analytically. Seven *Kashaya* and aqueous extract were prepared and subjected to analytical evaluation. The *Saptavidha Kashaya* and Aqueous extract were subjected to HPLC Analysis, showed the variation in concentration of phytoconstituents like Gallic acid, Ellagic acid and Tannins.

KEYWORDS: *Ayurveda, Saptavidha Kashaya, Vibhitaki phala*, Aqueous extract.

INTRODUCTION

Aushadha is one among *Trisutra*. The concept of "*Jagatyevam Aushadham*" is explained in *Samhita*. *Aushadha*, alleviates the diseases by bringing back the *tridosha* to normalcy. The *dravya* to act as an effective medicine, the proper processing plays a pivotal role. As *Acharya Charaka* opines, even a proper processed poison or *tikshna dravya* can be an effective medicine. *Kashaya Kalpana* is one among the various *Kalpana's* elucidated by *brihatrayee*

and laghutrayee. There are different references for preparation of *Kashaya* based on proportion of drug, water and its reduction. Currently the *Ayurvedic* formulation are prepared by using the aqueous and hydro-alcoholic extract which are not equivalent to *Kashaya* preparation. The action of the drug depends on method of preparation, dosage form and time of administration, as not all the phytoconstituents are water soluble at the same time and also varies in concentration. *Saptavidha kashaya* is explained by *Acharya Harita* with its Reduction, *Karma* and *Bheshaja kala.* The Seven *Kashaya's* are *Pachana kashaya, Deepana kashaya, Shodhana kashaya, Shamana kashaya, Tarpana kashaya, Kledana kashaya*, and *Vishoshi kashaya.*[1] The concept of *Saptavidha Kashaya* is not in practice widely. *Saptavidha Kashaya Kalpana*, a liquid dosage form, being absorbed well in gut, is more suitable for water soluble principles like Tannins, Flavanoids, Glycosides etc. So, an attempt was made to study the concentration of phytoconstituents in all the Seven *kashaya* and Aqueous extract. *Vibhitaki* is the drug which is abundantly used in many formulations as it is one of the drugs in *Triphala*. It has properties like *Kashaya rasa, Usna veerya, Madhura vipaka, Laghu* and *Ruksha guna* and *Kapha pitta shamaka, Pachana, Rasayana, Shothahara, Bhedana karma*[2] which can be attributed for *karma's* mentioned for *Saptavidha Kashaya.*

Therefore, it becomes an important study to know the particular phytoconstituent and its concentration in each reductive form of *Vibhitaki phala Saptavidha Kashaya* and also comparing the seven *kashaya* and aqueous extract analytically. Hence the study entitled "Analytical Study of *Vibhitaki phala (Terminalia bellirica* (Gaertn.) Roxb.*)* with special reference to *Saptavidha Kashaya."*

METHODOLOGY

The study was designed under following phases:

1. **Pharmacognostical evaluation of the trial drug**

- ❑ Macroscopic Evaluation
- ❑ Microscopic Evaluation

2. **Physi-cochemical evaluation**

- ❑ Foreign Matter
- ❑ Moisture Content
- ❑ Total Ash
- ❑ Acid Insoluble Ash
- ❑ Alcohol Soluble Extractive Value

- ❑ Water-Soluble Extractive Value
- ❑ pH Values
- ❑ Specific Gravity

3. Phytochemical evaluation

- ❑ Organic Constituents
- ❑ Inorganic Constituents
- ❑ HPLC analysis

Preparation of *saptavidha kashayas*

Principle

1 Part of the drug and 16 parts water, boiled on 25^0C thereafter reduced as following:

Table no. 1: Showing the proportion of drug, Water and Reduction.

Sl. No.	Name	Reducing to	Drug (gms)	Water (ml)	Reduced yield (ml)
1	*Tarpana kashaya*	Just boiling	25	400	400
2	*Pachana kashaya*	½	25	400	200
3	*Kledana kashaya*	1/4th	25	400	100
4	*Shamana kashaya*	1/8th	25	400	50
5	*Deepana kashaya*	1/10th	25	400	40
6	*Shodhana kashaya*	1/12th	25	400	33.3
7	*Vishoshi kashaya*	1/16th	25	400	25

Figure no. 1: **Tarpana kashaya.** ***Figure no. 2:*** **Pachana kashaya.**

Figure no. 3: **Kledana kashaya.**

Figure no. 4: **Shamana kashaya.**

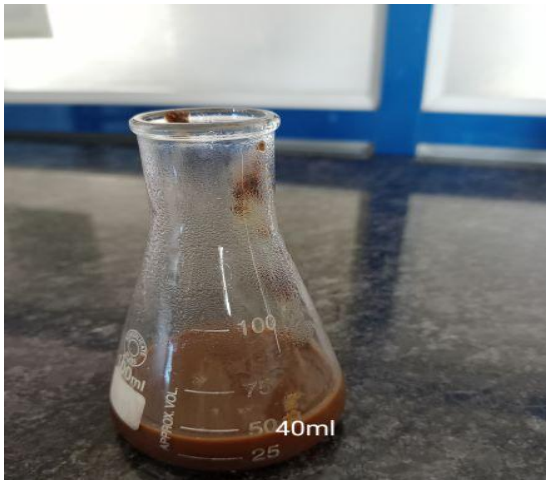


Figure no 5: **Deepana kashaya.**

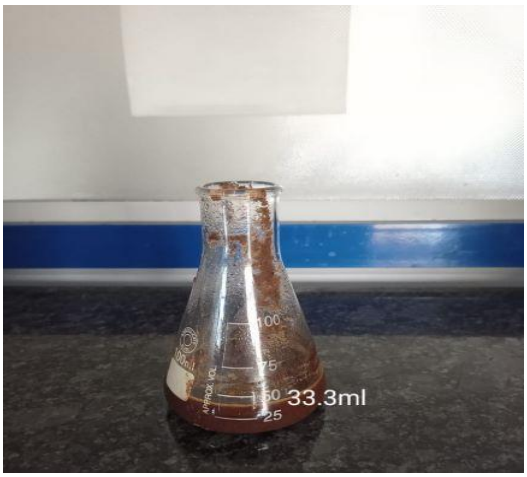


Figure no. 6: **Shodhana kashaya.**

Figure no. 7: **Vishoshi kashaya.**

Figure no. 8: Aqueous extract.

RESULTS

The analytical study carried out for *Vibhitaki phala twak churna, Saptavidha kashaya* and Aqueous extract of *Vibhitaki phala twak churna*, the following observations are documented:

Macroscopic features

Table no. 2: Showing sensory evaluation of *vibhitaki phala*.

Features	Wet	Dry
Sparsha (External surface)	Velvet, smooth	Hard, rough
Rupa (Shape)	Ovoid	Ovoid
Varna (Color)	Yellow	Light brown
Rasa (Taste)	Astringent	Astringent
Gandha (Odour)	Aromatic	Odourless
Fracture	Powdery	Powdery

Table no. 3: Showing organoleptic study of raw material, *Kashaya* and Extracts.

Samples	Colour	Odour	Taste	Form
Churna	Yellow	Characteristic	*Kashaya*	Churna
Tarpana kashaya	Dark brown	Agreeable	*Kashaya*	Liquid
Pachana kashaya	Light brown	Agreeable	*Kashaya*	Liquid
Kledana kashaya	Brown	Agreeable	*Kashaya*	Liquid
Shamana kashaya	Dark brown	Agreeable	*Kashaya*	Liquid
Deepana kashaya	Dark brown	Agreeable	*Kashaya*	Liquid
Shodhana kashaya	Dark brown	Agreeable	*Kashaya*	Liquid
Vishoshi kashaya	Dark brown	Strong	*Kashaya*	Liquid
Aqueous extract	Reddish brown	Agreeable	*Kashaya*	Extract

Microscopic characters

Microscopy of fruit pericarp

Revealed the presence of following structures,

1. Starch grain
2. Stone cell
3. Hair like projection

Showing the microscopic features of *Vibhitaki phala* pericarp.

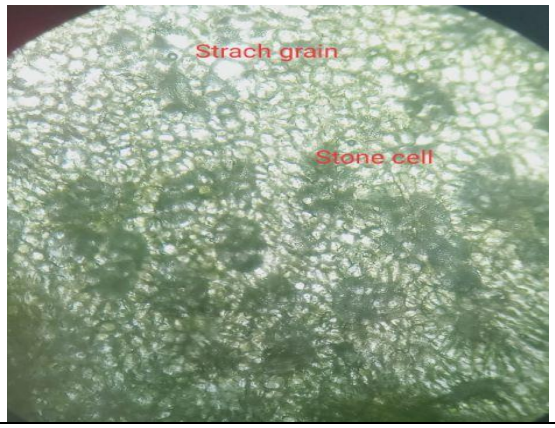


Figure no. 9: Starch Grain and Stone cell.

Figure no. 10: Hair like projection.

Powder microscopy of *vibhitaki phala*

Revealed the presence of following structures,

- Stone cells
- Calcium oxalate crystals
- Hair like projections
- Sclerides
- Fibre
- Spiral vessels
- Pitted vessels
- Oil globules
- Pitted trachieds
- Starch grain
- Tannin
- Border pitted vessel

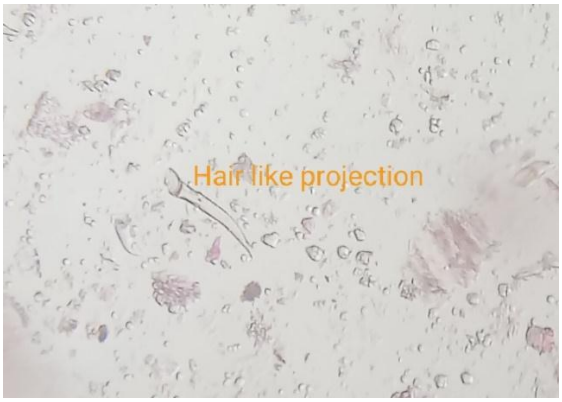


Figure no. 11: Hair like projectins.

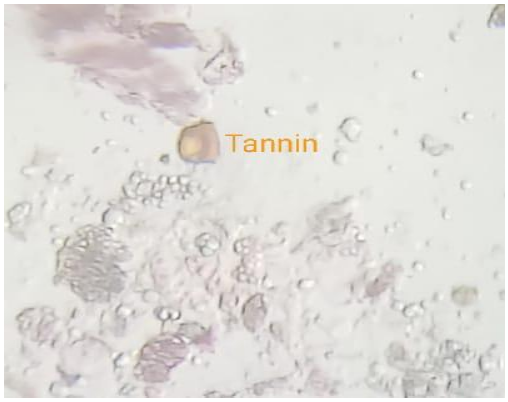


Figure no. 12: Tannin.

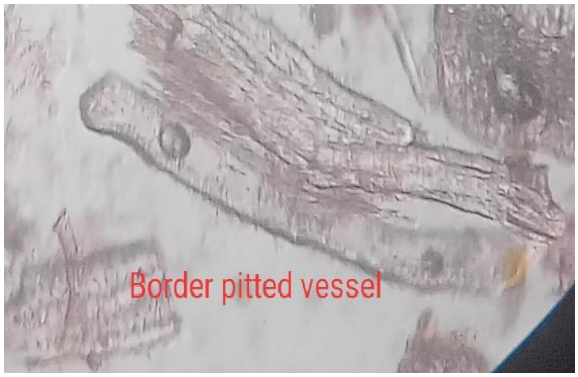


***Figure* no. 13: Border pitted vessel.**

Figure no. 14: Fibre.

Figure no. 15: Stone cell.

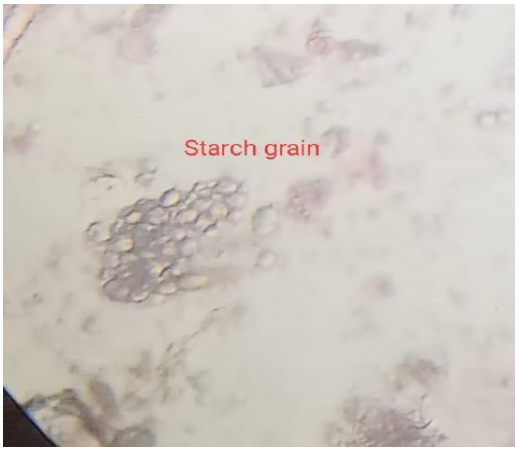


Figure no. 16: Starch grain.

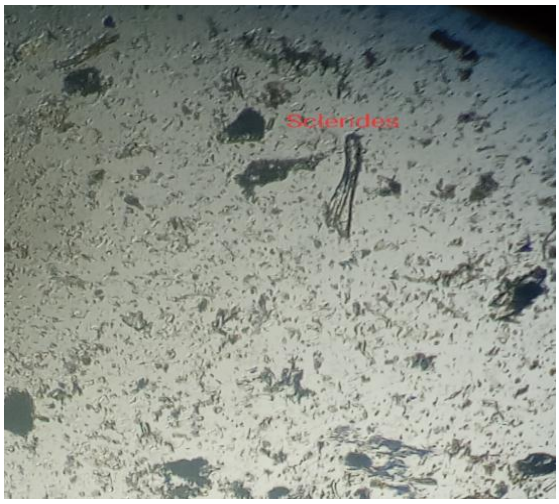


Figure no. 17: Sclerides.

Figure no. 18: Pitted vessel.

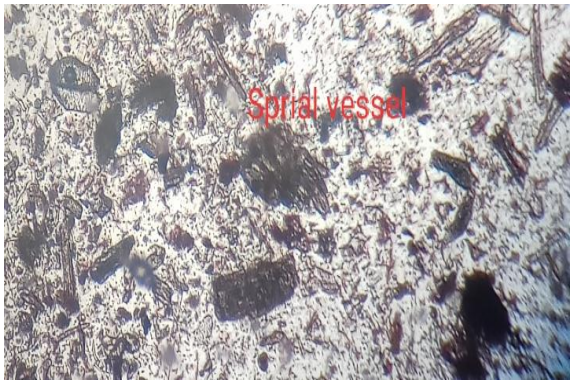


Figure no. 19: Spiral vessels.

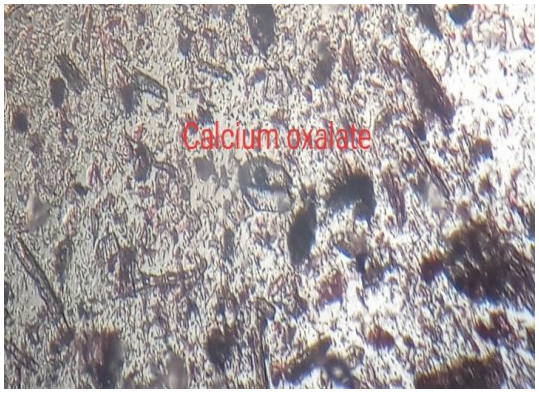


Figure no. 20: Calcium oxalate crystal.

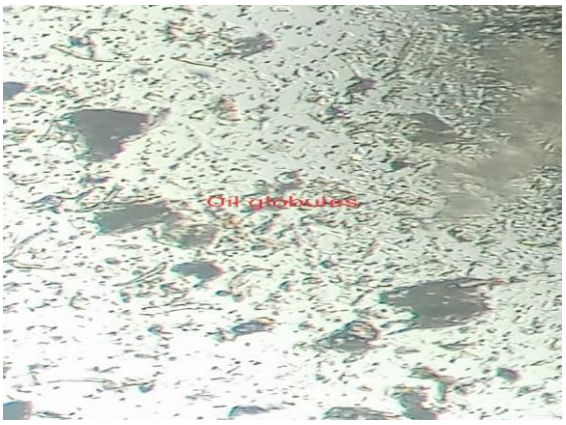


Figure no. 21: Oil globules.

Figure no. 22: Pitted tracheids.

Table no. 4: Time taken for the preparation of *saptavidha Kashaya* and Aqueous extract.

Samples	Time
Tarpana kashaya	30mins
Pachana kashaya	2hours 30mins
Kledana kashaya	3hours 30mins
Shamana kashaya	4hours
Deepana kashaya	4hours 10mins
Shodhana kashaya	4hours 15mins
Vishoshi kashaya	4hours 20mins
Aqueous extract	8hours

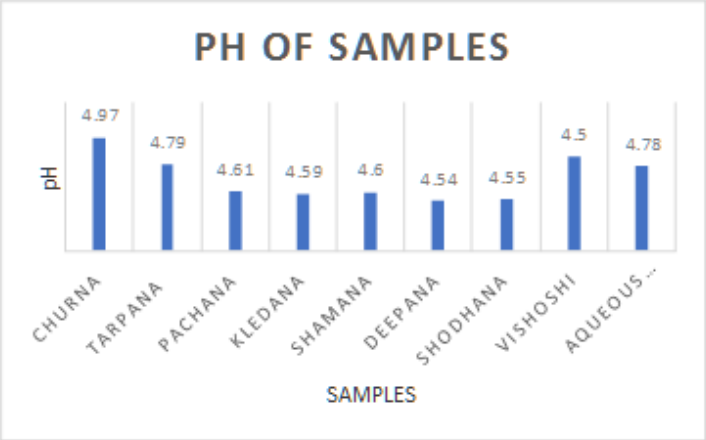
Physicochemical analysis

Table no. 5: Physical constituents of *vibhitaka phala twak.*

Parametrers	*Vibhitaki phala*	Standard values of api limits
Foreign matter	Nil	Not more than 2.0%
Loss on drying	6.72%	Not more than 12.0 %
Total ash	6.26%	Not more than 7.0%
Acid insoluble ash	0.88%	Not more than 1.0%
Water soluble extractive value	45.93%	Not less than 35.0%
Alcohol soluble extractive value	13.97%	Not less than 8.0%

pH Value

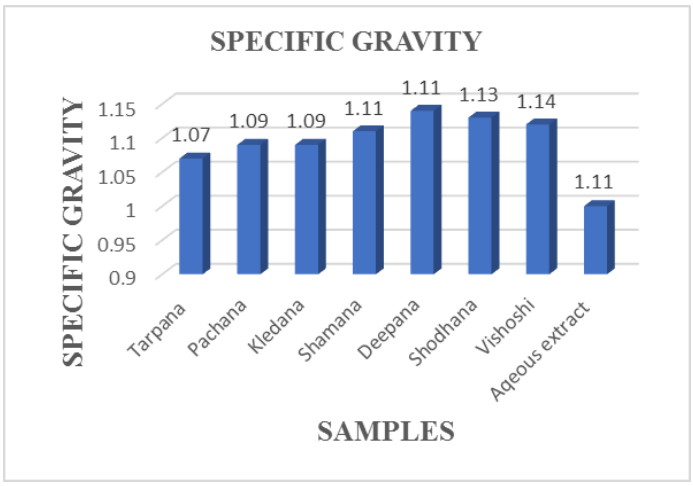
The pH of *Vibhitaki phala twak churna*, seven *kashaya* and aqueous extract is acidic



Graph no. 1: Showing the pH of the samples.

Specific gravity

Least specific gravity is of *Tarpana kashaya* (1.07) and high specific gravity of *Vishoshi kashaya* (1.14)



Graph no. 2: Showing the specific gravity of the samples.

Phytochemical analysis

A. Oraganic analysis

The presence of secondary metabolites like Alkaloids, Glycosides, Flavanoids, Triterpenoids, Saponins, Tannins, Phenolic Compunds, Steroids and Primary metabolites like Carbohydrates, Reducing sugar, Proteins, Coumarin.

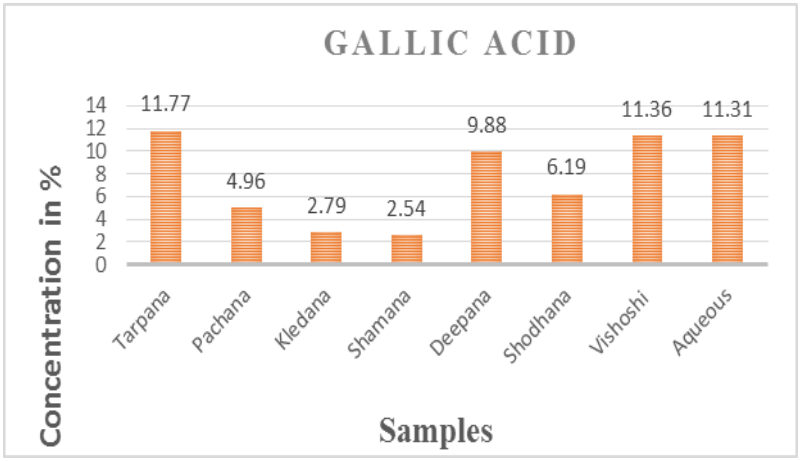
B. Inorganic analysis

The presence of inorganic compounds like Calcium, Potassium, Sulphate, Phosphate, Chloride**.**

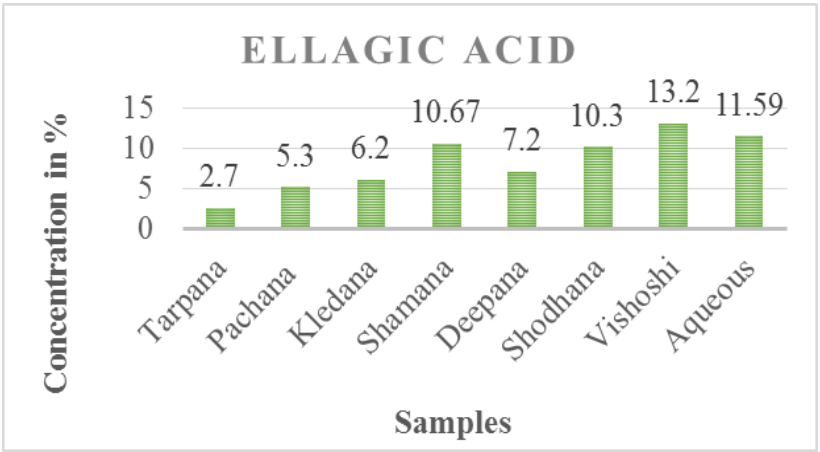
Hplc analysis

Table no. 6: Showing HPLC analysis of *saptavidha Kashaya* and Aqueous extract of *Vibhitaki phala.*

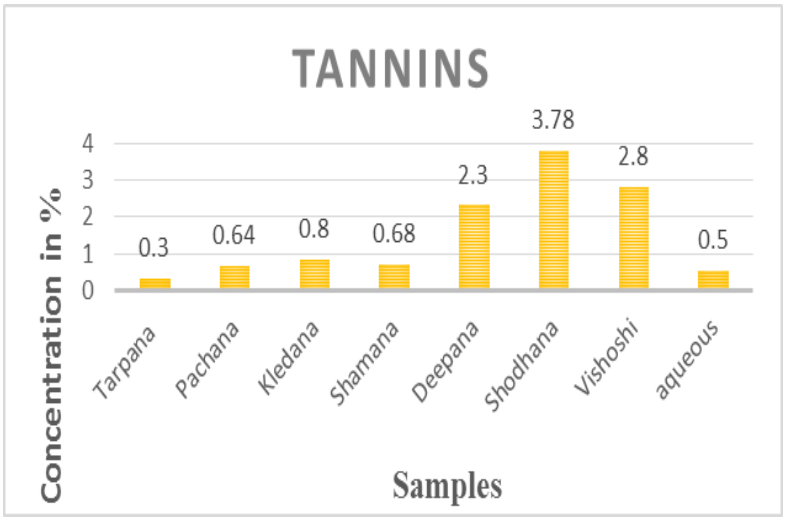
Sl. No.	Samples	Gallic acid %	Ellagic acid%	Tannins%
1	Tarpana *kashaya*	11.77	2.7	0.3
2	Pachana *kashaya*	4.96	5.3	0.64
3	Kledana *kashaya*	2.79	6.2	0.8
4	Shamana *kashaya*	2.54	10.67	0.68
5	Deepana *kashaya*	9.88	7.2	2.3
6	Shodhana *kashaya*	6.19	10.3	3.78
7	Vishoshi *kashaya*	11.36	13.2	2.8
8	Aqueous extract	11.31	11.59	0.5



Graph no. 3: Showing the gallic acid concentration of the samples.



Graph no. 4: Showing the ellagic acid of the samples.



Graph no. 5: Showing the tannins concentration of the samples.

DISCUSSION

- *Kashaya* is a liquid dosage form, which is administered easily and absorption is faster.
- There are various references available for proportion of drug and water and its reduction. Among them *Acharya Harita* has mentioned *Saptavidha Kashaya* based on *karma* which are *Tarpana, Pachana, Kledana, Shamana, Deepana, Shodhana,* and *Vishoshi*. But there is no reference about the drugs to be used specifically. So, the selection of drug was based on the presence of all the seven *karmas* in the drug.
- Reductive decoction according to *Harita Samhita* having *karmas* like *Tarpana, Pachana, Kledana, Shamana, Deepana, Shodhana, Vishoshi* was selected because the solubility at different proportion and reduction results in specific *karma*.
- *Vibhitaki phala twak* possess all the seven *karma's* of *Saptavidha Kashaya* was selected which can be justified as following:

- ***Tarpana kashaya:*** As *Vibhitaki phala twak is Madhura Vipaka* does *Dhatu Tarpana.*
- ***Pachana kashaya*:** As *Vibhitaki phala twak is usna veerya* and *laghu guna* does *ama pachana.*
- ***Kledana kashaya*:** As *Vibhitaki phala twak* has *Madhura vipaka* it is attributed for *Hridkledana*.
- ***Shamana kashaya:*** Based on the *rasapanchaka* of the *Vibhitaki phala twak* it does *shamana* of *kasa, netrarogas, vaiswarya* etc.,
- ***Deepana kashaya*:** As *Vibhitaki phala* is *ushna veerya* and *laghu guna* does the *agnideepana*.

- ***Shodhana kashaya*:** As *Vibhitaki phala* is *ushna veerya* and *bhedana karma* does the *Shodhana*.
- ***Vishoshi kashaya*:** As *Vibhitaki phala* is *kashaya rasa, laghu, ruksha guna, ushna veerya* does *shoshana karma*.

➢ *Acharya Harita* has not mentioned the proportion of drug and water to be taken so the general method of preparation as mentioned in *Sharanghadhara Samhita* that is 1part of drug and 16parts of water was followed.

➢ According to *Acharya Sharanghdhara Kashaya Kalpana* to be prepared on *mandagni*. By considering this, these seven *kashaya's* were prepared at 25^0C.

➢ The time consumed in preparation of individual *Kashaya* was noted. *Tarpana kashaya* was prepared by no reduction in thirty minutes. *Pachana kashaya* was prepared by reducing to half in two and half hours. *Kledana Kashaya* was prepared by reducing it to one fourth in three and half hours. *Shamana kashaya* was prepared by reducing it to one eight in four hours. *Deepana kashaya* was prepared by reducing it to one tenth in four hours ten minutes. *Shodhana kashaya* was prepared by reducing it to one twelfth in four hours, fifteen minutes. *Vishoshi kashaya* was prepared by reducing it to one sixthteen in four hours twenty minutes. These reductive *kashaya's* have a range of boiling in time, half to four hours twenty minutes. This probably indicates there is variation of pharmacological activities from *Tarpana* to *Vishoshi kashaya* that is from anabolic to catabolic. Here the time taken for boiling, specific reduction and particular phytoconstituents is responsible for distinct pharmacological actions of *Saptavidha Kashaya.*

➢ In *Tarpana* to *Vishoshi Kashaya* the consistency was ranged from thin to thick because of the reduction and concentration.

➢ During the filtration of *Kashaya, Deepana* and *Pachana Kashaya* was filtered fast in comparison to remaining *Kashaya*. This may be because the properties like *laghu, usna, tikshna guna* etc.,

Discussion on physicochemical evaluation

➢ The drug was devoid of foreign matter, which indicates absence of impurity and confirms the genuinity.

➢ The loss on drying was 6.72% which was within the standard value. This reveals that *Vibhitaki phala twak churna* was not contaminated by microbes and pests.

- Total ash value was 6.26% which is within the standard value, indicates the presence of inorganic compounds within the standard limit.
- Acid insoluble ash value was 0.88% which was within the standard value, indicating the presence of inorganic content.
- The Water-soluble extractive value was 45.93% and Alcohol soluble extractive value was 13.97%, both the values were within the standard values, which indicates there was more water-soluble extractives than alcohol soluble extractive in *Vibhitaki phala twak*.
- pH value of *Vibhitaki phala twak churna* was 4.97 which indicates that drug was acidic in nature, this may be because of presences of phenols. As the reduction of water increases in seven *kashaya* the pH value decreased which shows the acidic nature of the *kashaya* increases successively. pH value of *Vishoshi Kashaya* was 4.5 which reveals presence of phenols more compared to other seven *kashaya* and aqueous extract. The pH value *Tarpana kashaya* and Aqueous extract was almost same with the values 4.79 and 4.78 respectively.
- The specific gravity value was successively increased from *Tarpana kashaya* to *Vishoshi Kashaya* that is 1.07 to 1.12 respectively. Lesser the specific gravity higher the absorption of the drug. Therefore, this may be the reason for the dhatu *tarpana karma* of *tarpana kashaya*.

Discussion on Phyto-chemical evaluation

- Phyto chemical screening of seven *kashaya* and aqueous extract reveals presences of Secondary metabolites **like Alkaloids, Glycosides, Flavonoids, Tannins, Triterpenoids, Saponins, Phenolic Compounds, Steroids and Primary metabolites like Carbohydrates, Reducing sugars, Proteins, Coumarins and Inorganic chemicals like Calcium, Potassium, Sulphate, Phosphate, Chloride.**
- Presence of **Glycosides** are responsible for pharmacological activities like **Cardiotonic** and **Purgative**[3] this may be responsible for ***Kledana*** *and* ***Shodhana*** *karma* respectively.
- Presence of **Flavonoids**, which are polyphenols, have pharmacological actions like **Anti-oxidant**[4,5] can be corelated to ***Tarpana, Pachana, Deepana, Shodhana*** **karmas and Cardioprotective to** ***Kledana karma*****.**
- **Triterpenoids** have pharmacological activities like

- **Anti-coagulant, Anti-hyperlipidemic**[6] **can be corelated to** ***Vishoshi karma.***
- **Immunomodulatory may be responsible for** ***Tarpana karma***

- **Tannins** have **Anti-oxidant activity**[7] this may be responsible for *karma* of ***Tarpana, Pachana, Deepana, Shodhana,*** **and Anti-coagulant activity for *Vishoshi karma*.**
- **Saponins,** have **Haemolytic activity**[8] this may be responsible for ***Vishoshi karma*** and **Anti-inflammatory activity can be corelated to *Shamana karma*.**

Discussion on HPLC evaluation

- The HPLC analysis was done for three phytoconstituents that is Gallic acid, Ellagic acid and Tannins in Seven *Kashaya's* and aqueous extract because these phyto-constituents are standard marker in API.
- The HPLC analysis was done to identify the variation in concentration of these three phytoconstituents in seven *kashaya's* and aqueous extract.
- Higher concentration of Gallic acid was seen in *Tarpana kashaya* 11.77%, *Vishoshi kashaya* 11.36% and Aqueous extract 11.31%. This confirms the presence of standard almost equal in these three *kashayas*.
- Higher concentration of Ellagic acid was seen in *Vishoshi kashaya* 13.2%. Because of this it exhibits anti-coagulant activity that can be corelated with shoshana karma in turn by lekhana karma.
- Higher concentration of Tannins was seen in *Shodhana kashaya* 3.78%, *Vishoshi kashaya* 2.8% and *Deepana Kashaya* 2.3%. This confirms the presence of standard with the slight variations in these three *kashayas*.

CONCLUSION

Vibhitaki phala twak has *Kashaya rasa, Madhura vipaka, Usna veerya, Laghu* and *ruksha guna, Kapha pitta shamaka,* and *karmas* like *Pachana, Rasayana, Jwarahara, Bhedana.* These karmas are ideal for the preparation of *Saptavidha kashaya*. The Physico-chemical evaluation of *Vibhitaki Phala* revealed the results as per API standard. pH of the *kashaya's* showed acidic as the reduction was increased, suggesting boiling increases the acidic nature of the drug. Phyto chemical screening of saptavidha *kashaya* and aqueous extract reveals presences of like Alkaloids, Glycosides, Flavonoids, Tannins, Triterpenoids, Saponins, Phenolic Compounds etc., which reveals that reduction method doesn't effect the qualitative presence of phytoconstituents. The quantitative analysis of Gallic acid, Ellagic acid and Tannins in saptavidha *kashaya's* and aqueous extract by HPLC showed the variations and confirms the standard. Therefore, the *Saptavidha kashaya* can be utilized in place of aqueous extract according to their pharmacological actions.

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