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PHYSICOCHEMICAL, PHYTOCHEMICAL, AND HPTLC EVALUATION OF SHATAVHADI TAILA, SHASTHIKA SHAALI, BALAMOOLA KWATHA CHURNA, AND TRAYODASHANG GUGGULU

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ABSTRACT

Sandhigatavata is a condition in which vitiated *vayu* gets localized in *sandhi* and causes *shoola*, *shotha,* and *stambha* leading to reduced movements. *Shashtika Shali Pinda Swedana* is the main types of *Pinda Swedana* indicated in *Sandhigatavata*. This acts as a combination of both *Bahya Snehana* and *Swedana*. Acharya Charaka has mentioned Shatahvadi Taila in the management of Vata diseases. Trayodashanga Guggulu has been mentioned in Bhaisajaya Ratnavali in the context of Vataraktadhikara. To highlight their mode of action accurately the Pharmacological analysis and HPTLC Study on the same helps in proper understanding and interpretation of drug action. This article enlightens about the Pharmacological analysis and HPTLC Study of *Shatavhadi Taila, Shasthika shaali, Balamoola Kwatha Churna,* and *Trayodashang Guggulu.*

As per the Analysis reports the presence of Carbohydrates, Steroids, Alkaloids, Flavonoids Glycosides, etc are positive. The pharmacologically active elements like carbohydrates, alkaloids, and flavanoids are both Alcohol and water-soluble whereas the others like steroids and glycosides are alcohol soluble extracts.
Phytochemical Analysis of *Shatavhadi taila* is both Water and alcohol soluble. Proteins, Tannins, triterpenoids, and flavanoids are water-soluble. Steroids alone are only alcohol soluble. The presence of these elements in the final product is directly proportional to the biological activity expressed by the product. With this in mind, the Qualitative analysis of the final product holds good. Understanding of different active principles present in the different formulations helps in explaining their mode of action scientifically.

Keywords: Physicochemical Analysis, Phytochemical Analysis, HPTLC, Shasthikashaali, Balamoola Kwatha Churna, Shatvhadi Taila, Trayodashang Guggulu

INTRODUCTION

Sandhigatavata is a type of Vatavyadhi characterized by *vata poorna druti sparsha, Shotha, Vedana* during *Prasarana*, and *Akunchana*[1]. Acharya Bhavamishra while explaining *Vatavyadhi* explained about *Sandhigatavata*[2]. Acharya Sushruta[3] and Madhavakara[4] have added *Sandhi Shoola, Atopa, Sandhi Hanti.* The number of patients is increasing and are approaching Ayurvedic doctors with a lot of positive hopes. *Shashtika Shali Pinda Swedana*[5] is the main types of *Pinda Swedana* indicated in *Sandhigatavata*. This acts as a combination of both *Bahya Snehana* and *Swedana*. In *Shashtikashali panda swedana,* a bolus of payasam made up of new coarse rice cooked in cow's milk and bala kwatha is used for fomentation/massage on the body. A successfully employed *Shashtikashali Pinda Swedana* is believed to help to a great extent, the patients suffering from different neuromuscular disorders and also several systemic diseases. Acharya Charaka has mentioned Shatahvadi Taila in the management of Vata diseases[6]. Trayodashanga Guggulu has been mentioned in Bhaisajaya Ratnavali in the context of Vataraktadhikara[7].

Hence, the present study has been framed to highlight its mode of action accurately the Pharmacological analysis and HPTLC Study on the same help in proper understanding and interpretation of the drug action. This article enlightens about the Pharmacological analysis and HPTLC Study of Shatvahadi Taila, Shasthika shaali, Bala Moola KwathaChurna, and Trayodashang Guggulu.

METHODOLOGY

Refractive Index

Placed a drop of water on the prism and adjusted the drive knob in such a way that the boundary line intersects the separatrix exactly at the center. Noted the reading. Distilled water has a refractive index of 1.3315 at 29˚C. The difference between the reading and 1.33206 gives the error of the instrument. If the reading is less than 1.3325, the error is minus (-) then the correction is plus (+) if the reading is more, the error is plus (+), and the correction is minus (-). The Refractive index of oil is determined using 1 drop of the sample. The correction if any should be applied to the measured reading to get an accurate refractive index. The Refractive index of the test samples was measured at 28˚C.

Specific Gravity

Cleaned a specific gravity bottle by shaking it with acetone and then with ether. Dried the bottle and noted the weight. Cooled the sample solution to room temperature. Carefully filled the specific gravity bottle with the test liquid, inserted the stopper, and removed the surplus liquid. Noted the weight. Repeated the procedure using distilled water in place of the sample solution.

Viscosity

The given sample is filled in a U tube viscometer in accordance with the expected viscosity of the liquid so that the fluid level stands within 0.2 mm of the filling mark of the viscometer when the capillary is vertical, and the specified temperature is attained by

the test liquid. The liquid is sucked or blown to the specified height of the viscometer and the time taken for the sample to pass the two marks is measured. Viscosity is measured using the formula

$$\eta 1 = \frac{\rho 1 t1 \times \eta 2}{\rho 2 t2}$$

$\eta 1$ – Viscosity of sample

$\eta 2$ - Viscosity of water

t1 and t 2- time taken for the sample and water to pass the meniscus

$\rho 1$ and $\rho 2$ – Density of sample and water

X= Specific gravity of sample x 0.9961 / specific gravity of water

Π= X x Time for samplex1.004/specific gravity of waterx70sec

Acid Value

Weighed 2- 10g of oil in a conical flask. Added 50 ml of the acid-free alcohol-ether mixture (25 +25ml) previously neutralized with the 0.1M potassium hydroxide solution and shaken well. Added One ml of Phenolphthalein solution and titrated against 0.1M Potassium hydroxide solution. The endpoint is the appearance of pale pink colour. Repeated the experiment twice to get concordant values.

Saponification Value

Weighed 2g of the Oil / Fat into a 250 ml RB flask fitted with a reflux condenser. Added 25ml of 0.5M alcoholic potash. Refluxed in a water bath for 30 minutes. Cooled and added 1 ml of Phenolphthalein solution and titrated immediately with 0.5 M Hydrochloric acid (an ml). Repeated the operation omitting the substance being examined (blank) (b ml). Repeated the experiment twice to get concordant values.

Iodine Value

The sample was accurately weighed in a dry iodine flask. Dissolved with 10ml of CCl_4, 20ml of iodine monochloride solution was added. The stopper was inserted, which was previously moistened with a solution of potassium iodide, and the flask was kept in a dark place at a temperature of about 17^0 C for 30 min. 15ml of potassium iodide and 100ml of water were added and shaken well. This was titrated with 0.1N Sodium thiosulphate, starch was used as an indicator. The number of ml of 0.1N sodium thiosulphate required (a) was noted. The experiment was repeated with the same quantities of reagents, in the same manner, omitting the substance. The number of ml of 0.1N sodium thiosulphate required (b) was noted. The experiment was repeated twice to get concordant values.

Determination of Unsaponifiable matter

Weighed 5g of the substance into the flask. Added 50ml alcoholic KOH into the sample. Boiled gently but steadily under a reflux condenser for one hour. The condenser was washed with 10ml of ethyl alcohol and the mixture was collected and transferred to a separating funnel. The transfer was completed by washing the sample with ethyl alcohol and cold water. Altogether, 50ml of water was added to the separating funnel followed by the addition of 50ml petroleum ether. The stopper was inserted and shaken vigorously for 1 minute and allowed to settle until both the layers were clear. The lower layer containing the soap solution was transferred to another separating funnel and repeated the ether extraction six times more using 50ml of petroleum ether for each extraction. All the extracts were collected in a separating funnel. The combined extracts were washed in the funnel 3 times with 25ml of aqueous alcohol and shook vigorously. And drawing off the alcohol-water layer after each washing. The ether layer was again washed repeatedly with 25ml of water until the water no longer turns pink with the addition of a few drops of Phenolphthalein indicator solution. The ether layer was transferred to a tarred flask containing a few pieces of pumice stone and evaporated to dryness in a water bath. Placed the flask in an air oven at 85°c for about 1 hour to remove the last traces of ether. A few ml of acetone was added and evaporated to dryness on a water bath. Cooled in a desiccator to remove last traces of moisture and then weighed.

Peroxide Value

5g of the taila was weighed accurately into a conical flask, added 30 ml of a mixture of 3volumes of glacial acetic acid and 2 volumes of chloroform, added 0.5ml of potassium iodide, allowed it to stand for 1 minute, add 30ml of water titrate gradually with vigorous shaking with 0.1M sodium thiosulphate until

the yellow color disappears. Add 0.5ml of starch indicator and continued the titration until the blue color disappears.

Peroxide value= 10(a-b)/W

Where W= weight in g of the substance

Loss on drying at 105ºC

10 g of sample was placed in a tared evaporating dish. It was dried at 105˚C for 5 hours in a hot air oven and weighed. The drying was continued until the difference between two successive weights was not more than 0.01 after cooling in a desiccator. The percentage of moisture was calculated with reference to the weight of the sample.

Total Ash

2g of the content of the capsule sample was incinerated in a tared platinum crucible at a temperature not exceeding 450˚C until carbon-free ash is obtained. The percentage of ash was calculated with reference to the weight of the sample.

Acid insoluble Ash

To the crucible containing total ash, add 25ml of dilute HCl and boil. Collect the insoluble matter on ashless filter paper (Whatmann 41) and wash with hot water until the filtrate is neutral. Transfer the filter paper containing the insoluble matter to the original crucible, dry on a hot plate, and ignite to constant weight. Allow the residue to cool in a suitable desiccator for 30 mins and weigh without delay. Calculate the content of acid-insoluble ash with reference to the air-dried drug.

Water-soluble ash

Boil the ash for 5 min with 25 ml of water; collect insoluble matter on an ashless filter paper, wash with hot water, and ignite for 15 min at a temperature not exceeding 450˚C. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash with reference to the air-dried sample.

Alcohol soluble extractive

Weigh accurately 4 g of the content of the capsule sample in a glass stoppered flask. Add 100 ml of distilled Alcohol (approximately 95%). Shake occasionally for 6 hours. Allow standing for 18 hours. Filter rapidly taking care not to lose any solvent. Pipette out 25ml of the filtrate in a pre-weighed 100 ml beaker. Evaporate to dryness in a water bath. Keep it in an air oven at 105°C for 6 hours, cool in a desiccator for 30 minutes, and weigh. Calculate the percentage of Alcohol extractable matter in the sample. Repeat the experiment twice and take the average value.

Water-soluble extractive

Weigh accurately 4 g of the content of the capsule sample in a glass stoppered flask. Add 100 ml of distilled water, and shake occasionally for 6 hours. Allow to stand for 18 hours. Filter rapidly taking care not to lose any solvent. Pipette out 25ml of the filtrate in a pre-weighed 100 ml beaker. Evaporate to dryness in a water bath. Keep it in an air oven at 105°C for 6 hours. Cool in a desiccator and weigh. Repeat the experiment twice. Take the average value.

Preliminary phytochemical tests

Tests for alkaloids

- ***Dragendroff's test:*** To a few mg of extract dissolved in alcohol, a few drops of acetic acid and Dragendroff's reagent were added and shaken well. An orange-red precipitate formed indicates the presence of alkaloids.
- ***Wagners's test:*** To a few mg of extract dissolved in acetic acid, a few drops of Wagner's reagent were added. A reddish-brown precipitate formed indicates the presence of alkaloids.
- ***Mayer's test:*** To a few mg of extract dissolved in acetic acid, a few drops of Mayer's reagent was added. A dull white precipitate formed indicates the presence of alkaloids.
- ***Hager's test:*** To a few mg of extract dissolved in acetic acid, 3 ml of Hager's reagent was added, and the formation of a yellow precipitate indicates the presence of alkaloids.

Tests for carbohydrates

- ***Molisch's test:*** To the extract, 1 ml of α-naphthol solution and conc. Sulphuric acids were added along the sides of the test tube. The Violet colour formed at the junction of the two liquids indicates the presence of carbohydrates.
- ***Fehling's test:*** A few mg of extract was mixed with equal quantities of Fehling's solution A and B. The mixture was warmed in a water bath.

The formation of a brick-red precipitate indicates the presence of carbohydrates.

- ***Benedict's test:*** To 5 ml of Benedict's reagent, a few mg of extract was added, boiled for two minutes, and cooled. The formation of a red precipitate indicates the presence of carbohydrates.

Test for steroids

- ***Libermann-Burchard test:*** To the extract was dissolved in chloroform, 1 ml of acetic acid and 1 ml of acetic anhydride were added, then heated in a water bath and cooled. Few drops of conc. Sulphuric acid were added along the sides of the test tube. The appearance of bluish green colour indicates the presence of steroids.
- ***Salkowski test:*** The extract was dissolved in chloroform and an equal volume of conc. Sulphuric acid was added. The formation of bluish red to cherry red colour in the chloroform layer and green fluorescence in the acid layer indicates the presence of steroids.

Test for saponins

To a few mg of extract, distilled water was added and shaken. Stable froth formation indicates the presence of saponin.

Test for tannins

To the extract, a few drops of a dilute solution of ferric chloride was added, formation of dark blue colour shows the presence of tannins.

Test for flavonoids

Shinoda's test: To the extract in alcohol, a few magnesium turnings and a few drops of conc. hydrochloric acid was added and heated in a water bath. The formation of red to pink colour indicates the presence of flavonoids.

Test for phenol

To the extract in alcohol, added two drops of alcoholic ferric chloride. The formation of blue-to-blue black indicates the presence of phenol.

Test for coumarins

To the extract in alcohol, a few drops of 2 N sodium hydroxide solution was added. The dark yellow colour formation indicates the presence of coumarins.

Test for triterpenoids

The extract was warmed with tiny bits and a few drops of thionyl chloride. The formation of pink colour indicates the presence of triterpenoids.

Test for carboxylic acid

Extract dissolved in water is treated with sodium bicarbonate. Brisk effervescence indicates the presence of carboxylic acid.

Test for resin

A few mg of the sample was mixed with water and acetone. Turbidity indicates the presence of turbidity.

Test for quinone

A few mg of alcohol extract was treated with 0.5% of sodium hydroxide. Deep coloration like pink, purple or red indicates the presence of quinone.

Sample preparation for HPTLC

The sample obtained in the procedure for the determination of the unsaponifiable matter is dissolved in 10 ml of chloroform this was followed for the sample of Shatavadi taila, and the chloroform soluble portion was used for HPTLC.

HPTLC:

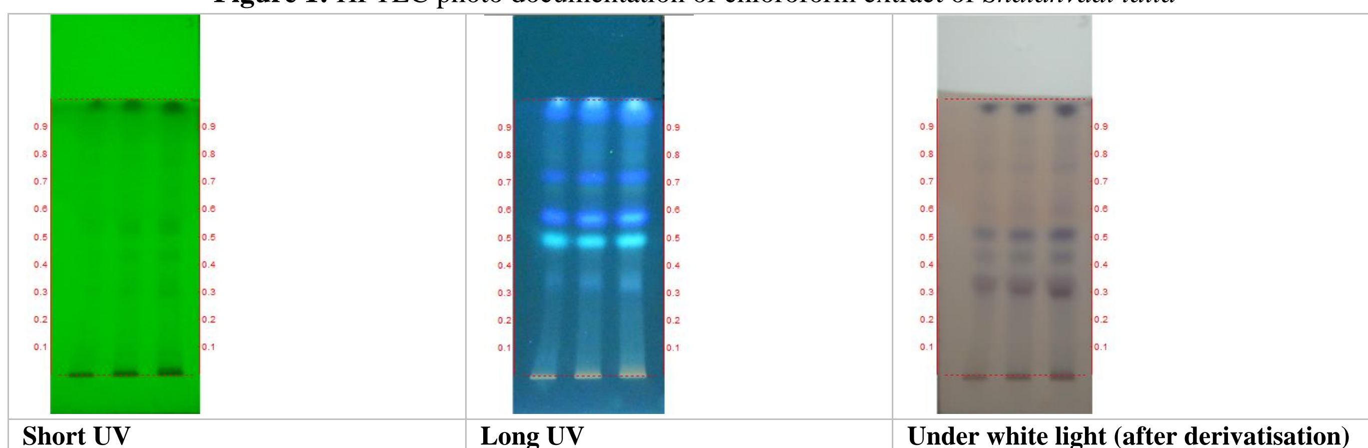
3, 6, 9µl of the chloroform fraction of samples of Shatahvadi taila was applied on a precoated silica gel F254 on aluminum plates to a bandwidth of 8 mm using a Linomat 5 TLC applicator. The plate was developed in Toluene – Ethyl acetate (9:1) and the developed plates were visualized under short UV, long UV, and after derivatization in vanillin-sulphuric acid spray reagent and scanned under UV 254nm, 366nm, and 620nm (Post derivatisation). Rf, color of the spots, and densitometric scan were recorded.

RESULTS:

Table 1: Results of standardization parameters for *Shatavhadi taila*

Parameter	***Results n = 3 %w/w***
Refractive index	1.470
Specific gravity	0.9223
Viscosity	64.51
Acid value	5.44
Saponification value	280.5
Iodine value	123.80
Unsaponifiable matter (%)	2.18
Peroxide value	0.0

Figure 1: HPTLC photo documentation of chloroform extract of *Shatahvadi taila*



Short UV	**Long UV**	**Under white light (after derivatisation)**

Track 1- ***Shatahvadi taila***– 3µl

Track 2- ***Shatahvadi taila***– 6µl

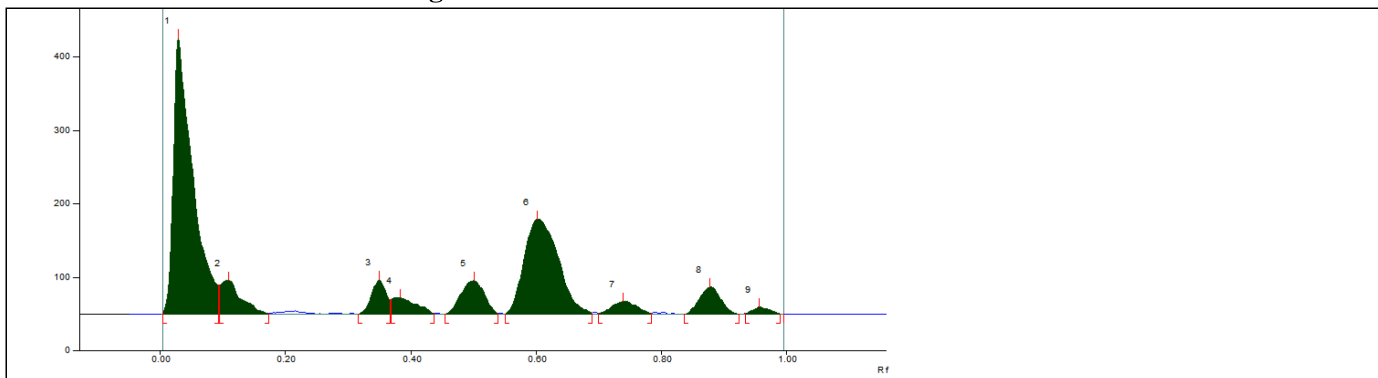
Track 3- ***Shatahvadi taila***– 9µl

Solvent system – Toluene: Ethyl Acetate (9:1)

Table 2: Rf value of Shatahvadi taila

Short UV	**Long UV**	**Under white light (after derivatisation)**
0.08 (Green)	-	-
0.30 (Green)	-	0.30 (Pink)
-	0.34 (F. blue)	-
0.44 (Green)	-	0.44 (Purple)
-	0.49 (F aqua. blue)	-
-	-	0.52 (Purple)
0.54 (Green)	--	-
-	0.57 (F. blue)	-
-	-	0.59 (Purple)
0.65 (Green)	-	-
-	0.68 (F. blue)	-
-	0.72 (F. blue)	-
-	-	0.76 (Purple)
0.80 (Green)	0.80 (F. blue)	-
-	0.85 (F. blue)	0.86 (Purple)

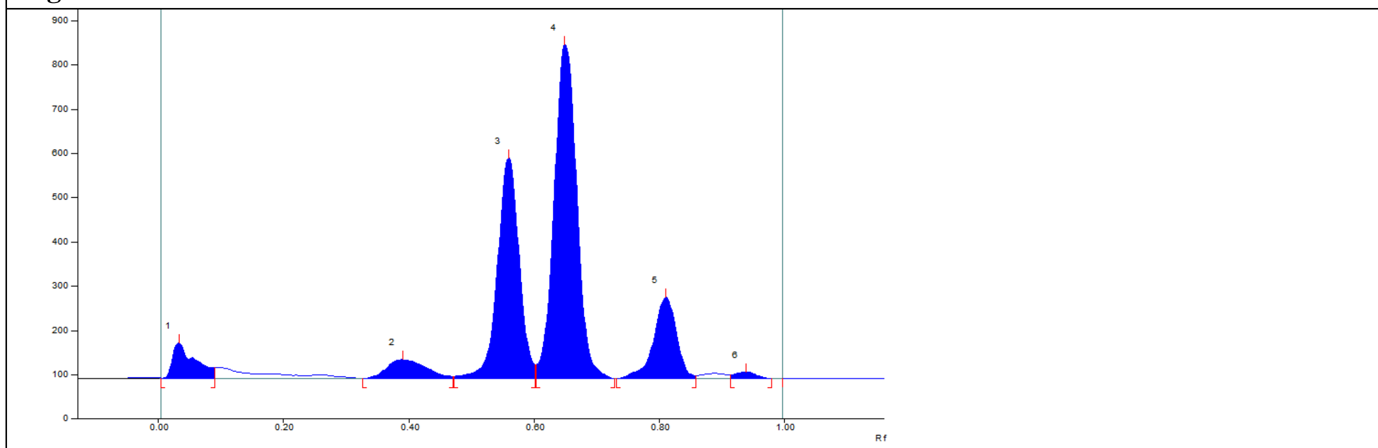
Figure 2: Densitometric scan of *Shatahvadi taila*



Track 3, ID: Shatahvadi taila

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	2.9 AU	0.03 Rf	375.2 AU	51.45 %	0.09 Rf	39.4 AU	8384.4 AU	44.72 %
2	0.10 Rf	39.5 AU	0.11 Rf	46.2 AU	6.34 %	0.17 Rf	0.7 AU	1088.6 AU	5.81 %
3	0.32 Rf	0.1 AU	0.35 Rf	46.6 AU	6.39 %	0.37 Rf	19.8 AU	783.2 AU	4.18 %
4	0.37 Rf	20.1 AU	0.38 Rf	22.4 AU	3.07 %	0.44 Rf	1.3 AU	624.0 AU	3.33 %
5	0.45 Rf	0.2 AU	0.50 Rf	45.4 AU	6.23 %	0.54 Rf	0.8 AU	1225.6 AU	6.54 %
6	0.55 Rf	0.3 AU	0.60 Rf	129.3 AU	17.73 %	0.69 Rf	1.8 AU	5060.4 AU	26.99 %
7	0.70 Rf	1.5 AU	0.74 Rf	17.1 AU	2.34 %	0.79 Rf	1.2 AU	502.2 AU	2.68 %
8	0.84 Rf	0.0 AU	0.88 Rf	36.8 AU	5.04 %	0.93 Rf	0.0 AU	893.2 AU	4.76 %
9	0.94 Rf	1.1 AU	0.96 Rf	10.3 AU	1.41 %	0.99 Rf	0.2 AU	185.1 AU	0.99 %

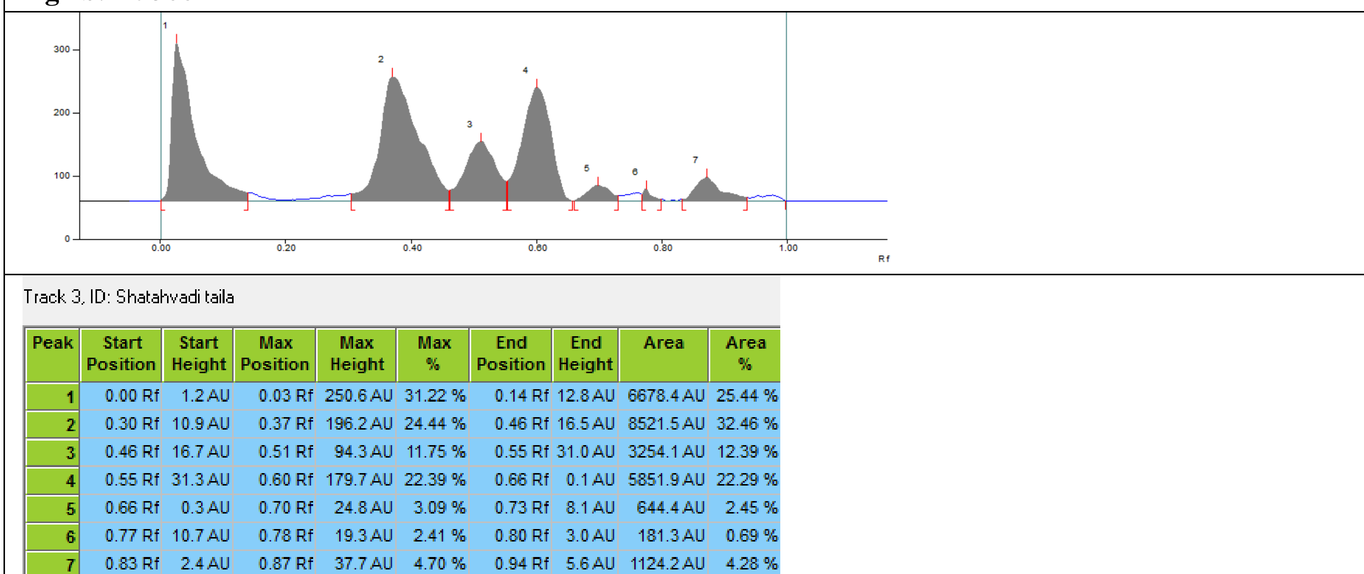
Fig 2a. At 254nm



Track 3, ID: Shatahvadi taila

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	0.2 AU	0.03 Rf	81.0 AU	5.14 %	0.09 Rf	23.8 AU	2078.4 AU	5.06 %
2	0.33 Rf	0.1 AU	0.39 Rf	42.4 AU	2.69 %	0.47 Rf	4.8 AU	1917.6 AU	4.67 %
3	0.47 Rf	4.9 AU	0.56 Rf	498.7 AU	31.67 %	0.60 Rf	31.1 AU	12375.0 AU	30.12 %
4	0.60 Rf	31.3 AU	0.65 Rf	754.0 AU	47.88 %	0.73 Rf	0.0 AU	19529.2 AU	47.53 %
5	0.73 Rf	0.0 AU	0.81 Rf	183.7 AU	11.67 %	0.86 Rf	6.8 AU	4827.2 AU	11.75 %
6	0.91 Rf	8.6 AU	0.94 Rf	14.8 AU	0.94 %	0.98 Rf	0.0 AU	362.9 AU	0.88 %

Fig 2b. At 366nm



Track 3, ID: Shatahvadi taila

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	1.2 AU	0.03 Rf	250.6 AU	31.22 %	0.14 Rf	12.8 AU	6678.4 AU	25.44 %
2	0.30 Rf	10.9 AU	0.37 Rf	196.2 AU	24.44 %	0.46 Rf	16.5 AU	8521.5 AU	32.46 %
3	0.46 Rf	16.7 AU	0.51 Rf	94.3 AU	11.75 %	0.55 Rf	31.0 AU	3254.1 AU	12.39 %
4	0.55 Rf	31.3 AU	0.60 Rf	179.7 AU	22.39 %	0.66 Rf	0.1 AU	5851.9 AU	22.29 %
5	0.66 Rf	0.3 AU	0.70 Rf	24.8 AU	3.09 %	0.73 Rf	8.1 AU	644.4 AU	2.45 %
6	0.77 Rf	10.7 AU	0.78 Rf	19.3 AU	2.41 %	0.80 Rf	3.0 AU	181.3 AU	0.69 %
7	0.83 Rf	2.4 AU	0.87 Rf	37.7 AU	4.70 %	0.94 Rf	5.6 AU	1124.2 AU	4.28 %

Fig 2c. At 620nm (Post derivatisation)

Table 3: Shasthikashali Physico-chemical parameters

Parameters	Results n=3 %w/w Shashtikashali
Loss on drying	12.155±0.00
Total ash	1.19±0.16
Acid insoluble ash	0.00±0.00
Water-soluble ash	0.29±0.00
Alcohol soluble extractive	3.51±0.00
Water-soluble extractive	2.61±0.00

Table 4: Results of preliminary phytochemical screening of Shashtikashali

Test	Inference
Alkaloid	+
Steroid	-
Carbohydrate	+
Tannin	-
Flavanoids	-
Saponins	-
Terpenoid	+
Coumarins	-
Phenols	-
Carboxylic acid	-
Amino acids	-
Resin	-
Quinone	-

(+) - present; (-) – negative

Table 5: Balamoola kwatha churna Physico-chemical parameters

Parameters	Results n=3 %w/w Balamoola kwatha churna
Loss on drying	11.51±0.01
Total ash	4.32±0.19
Acid insoluble ash	0.27±0.00
Water-soluble ash	1.84±0.01
Alcohol soluble extractive	1.59±0.01
Water-soluble extractive	7.21±0.00

Table 6: Results of preliminary phytochemical screening of Balamoola kwatha churna

Test	Inference
Alkaloid	+
Steroid	-
Carbohydrate	+
Tannin	-
Flavanoids	-
Saponins	
Terpenoid	+
Coumarins	+
Phenols	-
Carboxylic acid	-
Amino acids	-
Resin	+
Quinone	-

(+) - present; (-) – negative

Table 7: Results of standardization parameters Trayodashanga guggulu tablet

Parameter	Results n = 3 %w/w
	Trayodashanga guggulu
Loss on drying	9.59±0.01
Total Ash	11.89±0.37
Acid Insoluble Ash	2.41±0.01
Water-soluble Ash	2.96±0.01
Alcohol soluble extractive value	3.49±0.04
Water-soluble extractive value	27.93±0.01
Tablet (average wt ± SEM)	0.5746±0.00
Tablet wt variation	Tablets fall within 0.546 and 0.603mg, since deviation allowed is 5%
Hardness (Kg/cm^2)	0.1
Disintegration test time (min)	31sec
Friability	Passes test

Table 8: Results of preliminary phytochemical screening of Trayodashanga guggulu tablet

Test	Inference
Alkaloid	+
Steroid	+
Carbohydrate	+
Tannin	+
Flavanoids	+

Saponins	-
Terpenoid	+
Coumarins	-
Phenols	-
Carboxylic acid	-
Amino acids	-
Resin	-
Quinone	+

(+) – present; (-) – negative

Tests	Colour if positive	Alcoholic extract of Trayodashanga guggulu tablet
Alkaloids		
Dragendroff's test	Orange-red precipitate	Orange-red precipitate
Wagners test	Reddish-brown precipitate	Reddish-brown precipitate
Mayers test	Dull white precipitate	Dull white precipitate
Hagers test	Yellow precipitate	Yellow precipitate
Steroids		
Liebermann- buchard test	Bluish-green colour	Bluish-green colour
Salkowski test	Bluish red to cherry red color in chloroform layer and green fluo-rescence in acid layer	Bluish red to cherry red color in chloroform layer and green fluorescence in acid layer
Carbohydrate		
Molish test	Violet ring	Violet ring
Fehlings test	Brick red precipitate	Brick red precipitate
Benedicts test	Red precipitate	Red precipitate
Tannin		
With $FeCl_3$	Dark blue or green or brown	Green color
Flavanoids		
Shinoda's test	Red or pink	Pink color
Saponins		
With $NaHCO_3$	Stable froth	No Stable froth
Triterpenoids		
Tin and thionyl chloride test	Pink	Pink color
Coumarins		
With 2 N NaOH	Yellow	Red color
Phenols		
With alcoholic ferric chloride	Blue to blue-black	Green color
Carboxylic acid		
With water and $NaHCO_3$	Brisk effervescence	No brisk effervescence
Amino acid		
With ninhydrine reagent	Purple colour	Purple colour
Resin		
With aqueous acetone	Turbidity	No turbidity
Quinone		
Conc. sulphuric acid	Pink/purple/red	Red color

DISCUSSION

The isolated secondary metabolite otherwise known as the phytoconstituents are therapeutically significant and hence studied here. Among the lot Carbohydrates, Alkaloids and saponins are both Water and alcohol soluble. Proteins, AA, Tannins, triterpenoids, and flavanoids are water-soluble. Steroids alone are only alcohol soluble.

The Qualitative Phytochemical Analysis of *Shatavhadi taila*

HPTLC results showed the presence of 9 spots at 254nm, 6 spots at 366nm, and 7 spots at 620nm.

The Therapeutically active components present in the final product are Carbohydrates, Steroids, Alkaloids, Saponins, Glycosides, and lipids.

The Preliminary Phytochemical Analysis of *Shasthikashaali*

The Therapeutically active components present in *Shasthikashaali* are Carbohydrates, Alkaloids, and terpenoids.

Preliminary phytochemical screening of Balamoola kwatha churna

The Therapeutically active components present in *Balamoola kwatha churna* are Carbohydrates, Alkaloids, Caumarins, Resins, and terpenoids.

Preliminary phytochemical screening of Trayodashanga guggulu tablet

The Therapeutically active components present in *Trayodashanga guggulu* are Carbohydrates, Alkaloids, Steroids, Quinones, Tannins, Flavonoids, and terpenoids.

Note: In general, there are macro elements, Microelements, and Micronutrients as well. They are both Organic and Inorganic types. Amongst them are carbohydrates, proteins, fat, and other mineral elements. Others are the secondary metabolites which are complex chemical substances metabolized by the plants. Amongst them are the Alkaloids, Glycosides, Flavonoids, and so on. These are of significance due to their therapeutic value in them. They are initially separated from the unwanted components present and are later isolated and studied. The presence of these elements in the final product is directly proportional to the biological activity expressed by the product. With this in mind, the Qualitative analysis of the final product holds good.

CONCLUSION

The presence of these elements in the final product is directly proportional to the biological activity expressed by the product. With this in mind, the Qualitative analysis of the final product holds good. Understanding of different active principles present in the different formulations helps in explaining their mode of action scientifically.

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