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Research Article

ANALYTICAL STUDY OF GUDUCHYADI YOG (GHANVATI): AYURVEDIC FORMULATION FOR STHAULYA

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ABSTRACT

Introduction - Sthaulya (Obesity) is a common problem today. Guduchyadi Yog (Ghanvati) was mentioned in the classic Yogratnakar for managing Sthaulya. Churna is effective, but it is unpleasant for some patients. Therefore, the Ghanvati was transformed into a more preferable dosage form to meet the needs of the present era. This herbal preparation combines three highly regarded ingredients: Guduchi (*Tinospora cordifolia*), Triphala (a mixture of *Terminalia chebula*, *Terminalia bellerica*, and *Emblica officinalis*), and Musta (*Cyperus rotundus*). Together, these herbs work synergistically to support detoxification, strengthen the body's resistance to infections, and restore balance in the digestive system. Aims & Objects - To explore the physicochemical properties and TLC to demonstrate the safety and efficacy of Guduchyadi Yog, emphasizing its importance in modern wellness practices rooted in Ayurvedic medicine. Material & Methods - This formulation was prepared at the Nagarjun Pharmacy and evaluated for physicochemical parameters according to API at Cultivator Phyto Lab Pvt. Ltd., Sonamukhi Nagar, Sangaria Fanta, Jodhpur. Result and Discussion - The prepared drug Guduchyadi Yog (Ghanvati) was a rounded, shiny blackish tablet with a pungent taste. Its pH value was 3.37, total ash content was 7.40, friability was noted at 0.02, moisture content was 8.56%, and total hardness was 17.21 kg/cm². Thin Layer Chromatography showed Rf values of 0.76 and 0.79. Conclusion - It was concluded that Guduchyadi Yog (Ghanvati) was found to be safe and effective for managing Sthaulya.

Keywords: Ayurveda, Ghanvati, Guduchyadi Yog, Obesity, Sthaulya

INTRODUCTION

An analytical study involves applying a series of processes to identify, authenticate, or quantify a substance, and its components in a solution or mixture, or to determine the structures of chemical compounds.[1] With the increasing popularity of traditional medicine, such as Ayurveda, in the global market, it is crucial to ensure the quality of these products. Achieving the highest quality in any medicine is essential for ensuring safety and efficacy. To build consumer confidence, it is the manufacturer's responsibility to provide information on the safety and quality of their products, supported by scientific evidence.[2] Standardization and quality control of Ayurvedic formulations are significantly more complex than those of allopathic products, primarily because Ayurvedic products are not simply a collection of chemical entities like allopathic products. Standardization refers to the assurance of the quality of drugs and formulations in terms of their composition, efficacy, and genuineness, based on measurable parameters. For the standardization of a finished product, it is necessary to establish specific standards for the formulation and compare the results against these standards to confirm the product's genuineness. The compositional evaluation of the finished product will depend on the manufacturing methods applied.[3] The manufacturing processes, which include various unit operations such as crushing, grinding, boiling, heating, and filtering must be standardized to ensure reproducible analytical parameters.[4] An analytical study of Guduchyadi Yog was carried out under the clinical trial title “Clinical study to evaluate the efficacy of Guduchyadi Yog and Suryanamaskar in the management of Sthaulya (Childhood Obesity)” registered on CTRI with registration no: CTRI/2023/07/055513. In this study, Guduchyadi Yog (Ghana Vati) was prepared, and several analytical parameters were utilized for its standardization. These parameters will serve as guidelines for standardization, and the data obtained from Guduchyadi Yog (Ghana Vati)[5] were compared with established standards. The analysis included organoleptic tests and physio-chemical tests.

Aims and Objectives

- Identification and authentication of raw drugs used for Guduchyadi Ghanavati.
- Preparation of Guduchyadi Ghanavati at GMP-certified pharmacy.
- Organoleptic characters, Physicochemical and TLC analysis of Guduchyadi Ghanavati.

MATERIALS AND METHODS

Parameters studied in Guduchyadi Yog were taken from the Ayurveda Pharmacopoeia of India, published by the Government of India, Department of Ayurveda, Yoga, Naturopathy, Unani, Siddha & Homeopathy (AYUSH), New Delhi. They served as the basis for the parameters used in numerous investigations.

Collection of plant material

Musta (*Cyperus rotundus*), Guduchi (*Tinospora cordifolia*), Amalaki (*Emblica officinalis*), Haritaki (*Terminalia chebula*), and Bibhitaki (*Terminalia bellerica*) were sourced from authenticated suppliers in Jodhpur.

Identification and authentication of raw drugs
The Department of Dravyaguna, Postgraduate Institute of Ayurveda, Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Karwad Jodhpur, carried out raw drug identification and validation.

Method of preparation guduchyadi ghanavati [6]
The ingredients of Guduchyadi Ghanavati (Table 1) were taken in equal quantities and converted into coarse powder. First, the coarse powder (Yavakut) is prepared using a grinder. This Yavakut powder is then soaked in water eight times to create a decoction. After soaking, it is boiled on a gas burner to make Kwatha until the volume is reduced to one-fourth. The mixture is then filtered using a cotton cloth. Next, the filtered Kwatha is placed back on the gas burner to boil. During this boiling process, continuous stirring is required until it thickens and all the water evaporates, leaving only the concentrate. Once thickened, turn off the stove and remove the mixture from the heat. After the mixture has cooled, add the powder of Triphala Churna. This will form a dough-like mass (Ghana). Take the dough mass in your hands and make its Vati. The dose of Guduchyadi Yog was decided as per Young Formula (Adult dose of Vati was considered during the calculation of dose as per Acharya Sharngadhara) and then labeled with the date of manufacturing, batch number, and drug license no.

Table 1: Ingredients of Guduchyadi Yog [7]

Ingredient	Latin name	Part used	Ratio
Haritaki	*Terminalia chebula*	Dried Fruit	1 Part
Bibhitaki	*Terminalia bellirica*	Dried Fruit	1 Part
Amalaki	*Emblica officinalis*	Dried Fruit	1 Part
Musta	*Cyperus rotundus*	Dried Rhizome	1 Part
Guduchi	*Tinospora cordifolia*	Dried Stem	1 Part

Methods of evaluation of Guduchyadi Ghanavati

Place of work
Cultivator Phyto Lab Pvt. Ltd. Sonamukhi Nagar, Sangaria Fanta, Jodhpur.
Sample Registration No. – CPL/O/24/09/01481
Sample Code – CPL/ 2024/07746-N
Date of Sample sent to Lab & Sample Registration -12/09/2023
Date of start of analysis- 13/09/2024
Date of completion of Analysis-18/09/2024

Organoleptic Characters
Using sense organs, one can observe traits known as organoleptic qualities. These metrics are useful for assessing and contrasting sample quality. Guduchyadi Yog exhibited organoleptic features, including factors like color, appearance, odor, touch, taste, etc.

Table 2: Organoleptic Properties of Guduchyadi Yog (Ghanvati)

Macroscopic Study	Guduchyadi Yog (Ghanvati)
Appearance	Round Vati
Color	Shiny blackish
Odor	Characteristic
Taste	Pungent, Bitter
Touch	Hard

Physiochemical parameters [8]
The following parameters were required for the safety, potency, and efficacy of the prepared formulations pH value (10 % aqueous extract), Total Ash, Friability, Disintegration test, Moisture, Tablet Hardness, Thin Layer Chromatography (TLC).

pH value determination [9]
pH value reflects the acidity or alkalinity of a substance in the form of an aqueous solution. It is generally measured with a pH meter, which is a potentiometric meter with two electrodes a glass electrode and a calomel electrode. 10 % Aqueous solutions of formulation samples were prepared. A digital pH meter was calibrated before measuring pH. The sample was then immersed in the solutions, and the pH value was 3.37 recorded.

Determination of total ash [10]
The total ash content of a drug or formulation is the inorganic materials remaining after its controlled incineration. Total ash usually contains silica, carbonates, silicates, and phosphates.

2 gm of powdered material was placed in a tared silica crucible. It was burned at 450°C until it was carbon-free. After that, it was allowed to cool before being weighed. Using the air-dried sample as a reference, the total ash percent was calculated at 7.40.

Tablet friability test [11]
It is an analysis technique to determine the durability of the tablets and their capacity to resist breaking in transportation. This is achieved by repeatedly dropping the tablets from a specific height over a fixed time. The friability apparatus' drums were filled with 20 tablets of samples that were correctly weighed. It was rotated 100 times with a speed of 25 rotations per minute for 4 minutes. Tablets were removed, and the dust was removed. The weight of all 20 tablets was taken again and compared with the initial weight. The percentage of difference was 0.02 calculated.

Tablet disintegration test [12]
The disintegration test determines how rapidly a tablet breaks down into smaller particles, resulting in a larger surface area and increased medication availability when consumed by a patient. 750 ml of distilled water was poured into each beaker of the disintegration apparatus. The temperature of water in the beaker was set to 37°C, and the timer was set for 30 min. 1 pill of the sample was introduced into each tube of the apparatus and was covered with a disc. The apparatus was turned on, and the duration of the disintegration of pills was 60 noted.

Loss on drying [13]
The proportion of volatile content (mostly water) is determined by this test. It is also known as the 'estimation of moisture content'. 10 g of accurately weighted sample was taken in a tared Petri dish. It was dried in a hot air oven for 5 hours at 105°C. After that, it was weighed and again dried for 1 hour, and the weight was recorded. The final weight was considered when the difference between two successive readings was not more than 0.25%. loss on drying was 8.56% noted.

Tablet hardness test [14]
It is a physical property of tablets/pills, vati, and gutika. The instrument measures the force required to break the tablet when the force generated by a coil spring is applied diametrically to the tablet. Tablet hardness has been associated with tablet properties such as density & porosity.

Equipment and Glassware: Hardness tester (Monsanto or Pfizer type)

Procedure
1. First, set the hardness tester at zero value.
2. Take one piece of the sample.

3. Put the sample tablet between two jaws or die set of the hardness tester vertically.
4. Revolving the screw on the back side of the tester.
5. Revolving screw (in case of the upward moving model- Monsanto hardness tester).
6. Press the handle of the tester (in the case of the hand press model- Pfizer hardness tester).
7. Read the scale carefully on the surface of the tester when the sample is broken down.
Tablet hardness was 17.21 noted.

Table 3: Physiochemical Parameters of Guduchyadi Yog

Test Parameters	Unit	Result	Test Method
pH value (10 % aqueous extract)	-	3.37	API Part II Vol IV: 2017
Total Ash	%	7.40	API Part II Vol II: 2008
Friability	%	0.02	API Part II Vol IV: 2017
Disintegration test	Minute	60	API Part II Vol IV: 2017
Moisture	%	8.56	API Part II Vol II: 2008
Tablet Hardness	Kg/cm^2	17.21	CPL/STP/C/77

Fingerprinting of Guduchyadi Yog by Thin Layer Chromatography (TLC)

Preparation of the Sample

- Crush the Ghanvati: Crush it into a fine powder or dissolve it in a small amount of solvent (e.g., methanol or ethanol). This is necessary because thin-layer chromatography requires liquid samples to be applied onto the plate.
- Make a Solution: Dissolve a small quantity of the crushed Ghanvati in a suitable solvent like ethanol, methanol, or chloroform. The concentration should be low enough to allow proper separation of components.

Preparation of the TLC Plate

- Prepare or use pre-coated TLC plates (typically with silica gel as the stationary phase).
- If using a pre-coated plate, simply proceed to the next step. If preparing the plate, you would need to spread a silica gel layer on a glass plate and allow it to dry before use.

Spotting the Sample

- Using a capillary tube, carefully apply a small drop of the Ghanvati solution onto the TLC plate about 1-2 cm from the bottom. If needed, let the spot dry and then apply another drop (repeating the process) to concentrate the sample. The idea is to create a visible spot that will separate during development.

Preparing the Solvent (Mobile Phase)

- Prepare the solvent mixture (mobile phase) according to the polarity of the compounds you wish to separate. Typical solvents for herbal samples include ethanol, chloroform, or a mixture of solvents, depending on the chemical nature of the compounds.
- Fill a developing chamber (e.g., a small jar) with the mobile phase, ensuring the solvent level is below the level of the spot on the TLC plate.

Developing the TLC Plate

- Place the TLC plate into the developing chamber, making sure the solvent does not touch the sample spots initially.
- Allow the solvent to move up the plate via capillary action. This process may take several minutes. The solvent will carry the components of the sample with it, causing them to separate based on their different affinities for the stationary phase (silica gel) and the mobile phase.
- Once the solvent front is near the top of the plate (but before it reaches the top edge), remove the plate.

Visualizing the Results

- If the components in the Ghanvati formulation are UV-active, you can visualize the spots under UV light.
- If the sample is not UV-active, may need to use a visualizing agent or a spray reagent (e.g., anisaldehyde, vanillin-sulfuric acid) to visualize the spots. After spraying, heat the plate if necessary to develop colored spots.
- Observe separate spots on the plate, each corresponding to different compounds in the sample. The Rf (Retention Factor) value of each spot can be calculated as follows:

$$Rf = \text{Distance travelled by the compound} / \text{Distance travelled by the solvent}$$

The Rf value helps in identifying compounds by comparing them to known standards.

Analysis

- Compare the pattern of spots and their Rf values with a standard (if available) or with the expected profile of compounds in the Ghanvati formulation.
- Multiple spots may represent different active principles, additives, or contaminants in the formulation.

Interpretation

- Multiple spots: Indicate a mixture of compounds present in the Ghanvati formulation.
- Single spot: If only one spot is observed, it suggests a pure compound or that the formulation contains a dominant compound.
- No spots: Indicates that no detectable compounds were present, which could be due to a poorly prepared sample or ineffective solvent choice.

TLC profile
Sample Name: Guduchyadi Yog
sample Id: CPL_2024_07746
Sample Preparation: 1ml in 10ml methanol.
Mobile Phase: Toluene: Ethyl acetate: chloroform: methanol (8:0.5:0.5:0.2)
Derivatization: Anisaldehyde +Sulphuric Acid +Acetic Acid
Sample Injection volume: 10ul
Solvent distance traveled: 8 cm.
Visualization after derivatization Rf Value: 0.76, 0.79
Result: 0.76,0.79
Test Method: API Part II Vol IV: 2017

Table 4: Rf value of Guduchyadi Yog (Ghanvati)

Test Parameters	Unit	Result	Test Method
Thin Layer Chromatography	-	0.76,0.79	API Part II Vol IV: 2017

RESULT AND DISCUSSION

Organoleptic evaluation
The organoleptic parameters are essential criteria for selecting raw ingredients and verifying the quality of the finished

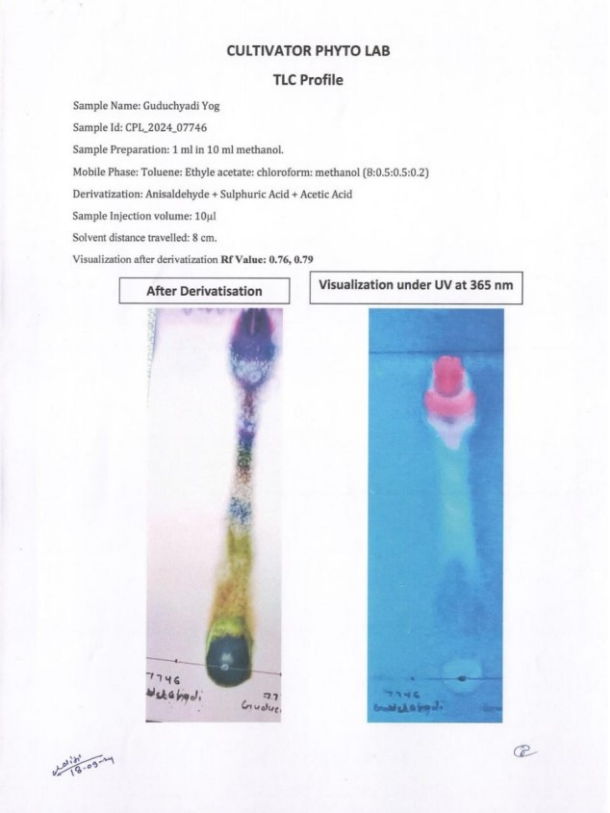
formulation. The texture of the final product was smooth, indicating a uniform surface without any cracks. The color was a shiny blackish hue, while the taste was pungent. Additionally, the smell was slightly aromatic and characteristic, attributed to the unique properties of the ingredients used.

Physiochemical parameters evaluation

pH- The pH level measures the acidity or alkalinity of a drug's aqueous solution, which is important for understanding the pharmacological aspects of drug absorption and metabolism. In this sample, the pH of Guduchyadi Ghana vati was found to be 3.37, indicating that the tested drug is acidic. Total Ash- The text discusses contamination, substitution, and adulteration. Low levels of total ash and acid-insoluble ash indicate minimal amounts of inorganic matter and silica content. In this sample, the ash value of Guduchyadi Ghanvati was measured at 7.40%, which is slightly higher than expected. This increase may be attributed to the presence of fibers and sclereids in the ingredients. Hardness and friability- The hardness of the tablet should be at least 3 kg/cm², while the ideal friability level is 1%. The Guduchyadi Ghanavati sample demonstrated a hardness of 17.21 kg/cm² and a friability of 0.02%. Both values fall within the required range, indicating the durability of the finished formulation. Disintegration time -The disintegration time of this sample was reported to be 60 minutes. The disintegration time of a tablet is a crucial factor in quality assessment, as it offers important insights into the bioavailability of the tablet's contents. In further research on the same trial drug, it has become essential to establish comparative criteria for evaluating the quality of the formulation. Moisture- The loss during drying was measured at 8.56% of Guduchyadi Yog. This indicates that the samples have a good shelf life and will remain stable when stored properly. Drying samples are essential to ensure they are free from excess water, which helps confirm that there is no microbial overgrowth or insect infestation. Uniformity of weight -This process aims to distribute drugs and determine the appropriate dosage. Chromatography -It was carried out at Cultivator Phyto Lab, Jodhpur. TLC fingerprinting report was done to analyze the finished formulation of Guduchyadi Yog. Chromatographic condition: TLC chromatographic condition details have been mentioned in Table no.-5. TLC details at different Rf. After derivatization, the plate was examined for the appearance of other bands at different Rf. and the following were the findings: Details of TLC profile of all tracks @365nm: Under the 365 nm wavelength-Track -T1 of Guduchyadi Ghanvati, 2 spots were detected and started concerning retardation factor 0.76 and 0.79. after the derivatization, revealed the presence of 2 spots at 365 nm wavelength respectively. Thus, the formulation is rich in phytoconstituents.

CONCLUSION

The present study concluded that the prepared drug Guduchyadi Yog (Ghanvati) was a rounded, shiny blackish tablet with a pungent taste. Its pH value was 3.37, total ash content was 7.40, loss on drying was 8.56%, moisture content was 8.56 %, and total hardness was 17.21 kg/cm2. Thin-layer Chromatography showed a 0.76,0.79 Rf Value. Overall, Guduchyadi Yog (Ghanvati) was found safe and efficacious for the management of Sthaulya.



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