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# PHARMACOGNOSTICAL AND PHARMACEUTICAL ANALYSIS OF KATUKI VATI – AN AYURVEDIC FORMULATION FOR NAFLD

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## ABSTRACT

**Background:** *Katuki (Pichrorhiza kurro* Royle) is a commonly used herbal medicine for liver disease management, yet no studies have been conducted specifically on *Katuki Vati* for the treatment of non-alcoholic fatty liver disease (NAFLD) associated with obesity. Therefore, to ensure the quality of this herbal formulation, pharmacognostical and pharmaceutical analyses were performed. **Methods:** *Katuki Vati* was subjected to microscopic evaluation for pharmacognostical identification and various physiochemical tests, including loss on drying, water and acid-insoluble extracts, hardness of the Vati, pH value, and thin layer chromatography (TLC). **Results:** The pharmacognostical study revealed characteristic features of the ingredients used in *Katuki Vati*. The physiochemical analysis showed the following results: loss on drying 94.90% w/w, acid value 35.6, water-insoluble extract 21.6%, acid-insoluble extract 19.2%, *Vati* hardness 2.5, and pH value 6.5. TLC analysis identified four spots at 254 nm and two spots at 366 nm. Conclusions: The pharmacognostical and physicochemical studies of *Katuki Vati* conform to standard parameters, providing a foundation for further research on the therapeutic efficacy of this *Vati* formulation.

## INTRODUCTION

*Katuki* is a widely available and commonly used herbal medicine, recognized for its efficacy in treating liver diseases. Non-alcoholic fatty liver disease (NAFLD) is characterized by the accumulation of fat in liver cells (Hepatocytes) in the absence of other identifiable causes, such as significant alcohol consumption, viral hepatitis, or medications known to induce fatty liver. [1] Pharmacological studies indicate that *Katuki* possesses antioxidant, hepatoprotective properties and promotes the regeneration of damaged cells, making it a key player in the management of non-alcoholic fatty liver disease (NAFLD).[2] Additionally, *Katuki* exhibits *Bhedana guna*, which helps eliminate waste products from the body.[3]

When using herbal drugs for internal administration, it is crucial that they are safe, effective, free from adulteration, and contain the correct quantity and quality of ingredients. Identifying herbal drugs in dry or powdered form can be challenging, highlighting the need for standardized parameters for herbal drug quality control. Pharmacognostical studies aid in plant identification and the establishment of these standards, which are essential for the standardization of traditional herbal medicines. Physiochemical analyses, including methods like High Performance Liquid Chromatography (HPLC) and Thin Layer Chromatography (TLC), provide valuable insights into the pharmacokinetics and pharmacodynamics of these drugs, ensuring the identification of active compounds and the detection of adulterants.

In the field of Ayurveda, it is increasingly important to implement quality control measures for both raw materials and finished products, using modern scientific techniques. This not only enhances the credibility of Ayurvedic medicines but also supports their global acceptance. Therefore, the present study was conducted to evaluate the authenticity of *Katuki Vati* through various pharmacognostical procedures and to develop its pharmacognostical and phytochemical profile**.**

## METHOD

### Collection, Identification and Authentication of raw drugs

The raw materials were procured from the pharmacy of Gujarat Ayurved university, Jamnagar and the raw drugs were identified and authenticated in the pharmacognosy laboratory of Institute for Teaching and Research in Ayurveda, Gujarat Ayurved university, Jamnagar. The ingredients and part used of the *Katuki Vati* are given in Table 1.

**Table no. 1: Details of drug.**

| Drug name | Latin name | Part used | *Bhavana Dravya* | Form of drugs |
|---|---|---|---|---|
| *Katuki* | *Picrorhiza Kurrora* Royle | Rhizome | *Katuki Kwath* | *Vati* |

**Preparation of drug**

- The drug was prepared in the pharmacy, I.T.R.A., Jamnagar, following the standard method of preparation of *Vati*. The prepared drug was stored under aseptic and good hygienic conditions.
- The Rhizome of *Katuki* was collected and fine powder was made from the raw material of *Katuki*. While making fine powder, the coarse powder that was left was made into *Kwatha* and, was used as a *Bhavana Dravya. Babul gum (Aacia gum)* as binding agent was added, as per requirement and from this 500mg *Vati* was prepared.

**Pharmacognistical study**

The pharmacognostical study was divided in to organoleptic study and microscopic study of the finished product.

**Organoleptic study**

The genuinity of the herbal formulation can be fined with organoleptic characters of the given. Organoleptic parameters comprise colour, odor, taste & texture of *Katuki* which sample was scientifically studied as per the standard references.[4]

**Microscopic study**

*Katuki* was dissolved with water and microscopy of the sample was done without stain and after staining with phloroglucinol and HCl. Microphotographs of finished product were also taken under Corl-zeisstrinocular microscope.

**Physio chemical analysis**

With the help of various standard physico-chemical parameters, *Katuki Vati* was analysed. The common parameters mentioned for *Vati Kalpana* in Ayurvedic Pharmacopeia of India, and CCRAS, guidelines are loss on drying, water-soluble extract, alcohol soluble extract, Ash value, pH and hardening of the *Vati*.[5]

**High Performance Thin Layer Chromatography (HPTLC)**

High Performance Thin Layer Chromatography (HPTLC) is an advanced analytical technique used for the separation, identification, and quantitative determination of a wide variety of compounds, even from complex mixtures. It is particularly useful for identifying active constituents, detecting impurities, and performing quantitative analysis of active ingredients. The principle of HPTLC is based on adsorption, similar to traditional Thin Layer Chromatography (TLC). In this method, compounds are applied as spots on a thin layer of adsorbent material coated on a chromatographic plate. The mobile phase solvent moves through the stationary phase by capillary action, defying gravitational force. Components that have a higher affinity for the stationary phase will move more slowly, while those with a lower affinity will travel faster, resulting in the separation of the components based on their varying affinities for the stationary phase.[6]

**RESULT**

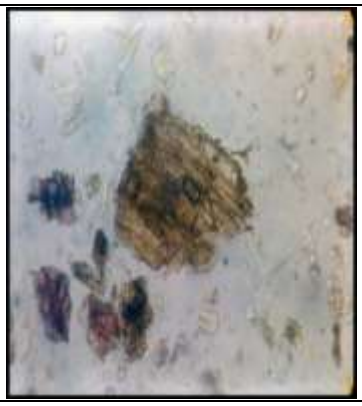
The primary objective of the study was to verify the authenticity of the drugs used in the preparation of *Katuki Vati*. To achieve this, the coarse powder of the ingredients was subjected to organoleptic and microscopic evaluations to confirm the authenticity of the raw materials. Subsequently, after the formulation was prepared, pharmacognostical evaluation was conducted. The organoleptic evaluation involved recording the colour, odour, and taste of *Katuki*, the details of which are presented in Table 2.

**Table no. 2: Organoleptic characters of *Katuki Vati.***

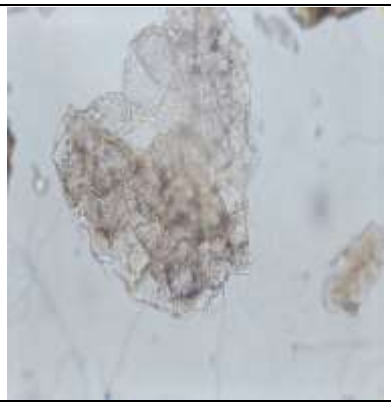
| | Parameter | Results |
|---|---|---|
| 1 | Color | Brown |
| 2 | Odor | Characteristic |
| 3 | Taste | Bitter |
| 4 | Touch | Hard |

**Microscopic evaluation**

Microscopic evaluation of *Katuki* was performed by dissolving its powdered form in distilled water. The diagnostic features observed included: A) Fibers of *Katuki*, B) Thick-walled parenchyma, C) Trichomes with spiral-pitted vessels, D) Cork cells, E) Brown oleoresins, and F) Pitted scleroids.



**A. Fibre of *Katuki***

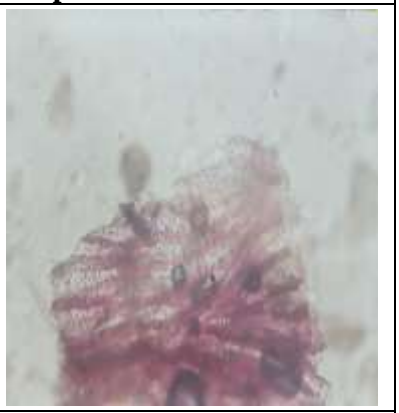


**B. Thick wall parenchyma of *Katuki***

**C. Trichome with spiral pitted vessels of *Katuki***

**D. Corks cells of *Katuki***

**E. Yellowish brown oleoresins of *Katuki***



**F. Pitted scleroids of *Katuki***

**Figure no. 1: Microscopic characters of *katuki vati.***

**Physio-chemical parameters**

Physio-chemical parameters like Loss on drying, Ash value, water soluble extract, methanol soluble extract, pH value and hardness of the Vati are mentioned in table no.3.

**Table no. 3: Physio-Chemical Parameters of *Katuki Vati.***

| S. N. | Parameters | *Katuki Vati* |
|---|---|---|
| 1 | Loss on drying | 94.90%w/w |
| 2 | Acid value | 35.6%w/w |
| 3 | Water soluble extract | 21.6%w/w |
| 4 | Methanol soluble extract | 19.2%w/w |
| 5 | pH value | 6.5 |
| 6 | Hardness of the Vati | 2.5 |

**High performance thin Layer Chromatography (TLC) of *Katuki Vati***

Densitometry scanning of the HPTLC pattern showed 4 spots at corresponding Rf values 0.037, 0.11.0.31, 0.52 in short wave UV 254 nm and 2 spots at corresponding Rf values 0.025, 0.41 obtained in long wave UV 366 nm (Table 4). Though it is not possible to identify

particular chemical constituent from the spot obtained, the pattern may be used as a reference standard for further quality control researches.

**Table no. 4: TLC profile / Rf values of *Katuki Vati.***

| Extract | Solvent system | Wave length | No of Spots | Maximum Rf value |
|---|---|---|---|---|
| Methanol extract | Toluene: ethyl acetate: Acetic acid (14 : 4: 2) | At 254 nm | 4 | 0.037,0.11,0.31,0.52 |
| | | At 366 nm | 2 | 0.025, 0.41 |

## DISCUSSION

The study on *Katuki Vati* represents a significant step toward the pharmacognostical and pharmaceutical standardization of this herbal formulation. The pharmacognostical evaluation revealed the presence of key diagnostic features, including the fibers of *Katuki*, thick-walled parenchyma, trichomes with spiral-pitted vessels, cork cells, brown oleoresins, and pitted scaloroids. These findings confirm the presence of all raw drug ingredients in the final product, with no significant alterations in the microscopic structure of the raw drug during the pharmaceutical preparation of the Vati, thus ensuring the authenticity and integrity of the final product.

The results also indicate that *Katuki Vati* is free from undesirable organic compounds, and the production site maintained a clean environment, free from dust and other contaminants. The physico-chemical parameters of the formulation were found to be within acceptable limits, with a loss on drying of 94.90% w/w, an ash value of 35.6% w/w, water-soluble extract of 21.6% w/w, methanol-soluble extract of 19.2% w/w, a pH value of 6.5, and a Vati hardness of 2.5. These values reflect the quality and consistency of the formulation.

Furthermore, the HPTLC analysis revealed four spots at 254 nm and two spots at 366 nm, suggesting the presence of specific bioactive components that may contribute to the therapeutic effects of *Katuki Vati*. The HPTLC fingerprint supports the standardization process and can serve as a reliable reference for future quality control. [7] Overall, the findings from this study confirm that the quality of *Katuki Vati* is well-standardized, ensuring its safety, efficacy, and reproducibility for clinical use. This standardization process not only strengthens the therapeutic potential of *Katuki Vati* but also contributes to the broader acceptance and credibility of Ayurvedic formulations in modern pharmacological practice.

## CONCLUSION

The pharmacognostical and physico-chemical analysis of *Katuki Vati* has confirmed the purity and authenticity of the formulation. As no established fingerprint for this specific formulation exists, this study represents a pioneering effort to develop comprehensive pharmacognostical and physico-chemical profiles for *Katuki Vati*. The findings provide valuable insights into the composition and quality of the drug, contributing to its standardization. The data obtained from this study can serve as a reference for future quality control and standardization efforts, as well as a foundation for further research on the therapeutic efficacy of *Katuki Vati*. This research is crucial for ensuring the consistency, safety, and reliability of the formulation, facilitating its acceptance in both clinical and regulatory settings.

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