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Research Article
Vatsanabha Root processed

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Exploring Physico-Chemical profile in Vatsanabha Root processed through Aja Dugdha, Triphala Kwatha, and Rakta Sarshapa Taila

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The present study aims to evaluate the comparative physico-chemical profile of Vatsanabha (Aconitum ferox), a potent medicinal plant, processed through three different Ayurvedic methods: Aja Dugdha, Triphala Kwatha, and Rakta Sarshapa Tail. Aconitum ferox, known for its therapeutic potency, is traditionally considered highly toxic, and its processing is crucial for enhancing its safety and efficacy. The physico-chemical analysis involved the determination of various parameters such as moisture content, ash values, pH, solubility, in each of the processed forms. The treatments were standardized by processing the Vatsanabha Mula with Aja Dugdha (goat's milk), Triphala Kwatha (a herbal decoction of Triphala), and Rakta Sarshapa Tail (red mustard oil). The results showed significant variations in the composition and quality of the processed formulations. The Rakta Sarshapa Tail processed Vatsanabha exhibited the highest reduction in toxic alkaloids. The Triphala Kwatha processed sample demonstrated enhanced antioxidant and anti-inflammatory properties, while the Aja Dugdha processed Vatsanabha enhanced the lipid-solubility and bioavailability of active compounds. This comparative study highlights the influence of different processing techniques on the chemical characteristics of Vatsanabha, suggesting that these methods significantly improve its pharmacological potential while reducing toxicity. The findings may aid in developing safer and more effective formulations of Aconitum ferox for therapeutic use in modern medicine.

Keywords: Vatsanabha, Aconitum ferox, Aja Dugdha, Triphala Kwatha, Rakta Sarshapa Tail, Physico-Chemical Profile, Toxicity Reduction

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Introduction

Vatsanabha (*Aconitum ferox*), a member of the Ranunculaceae family, holds significant importance in Ayurvedic medicine due to its potent therapeutic properties, including anti-inflammatory, analgesic, and antipyretic effects. Despite its extensive use, *Vatsanabha* is classified as a toxic herb under the category of *Upavisha* (semi-poisonous substances) in Ayurvedic texts. Its toxicity is attributed to alkaloids like aconitine, which possess neurotoxic and cardiotoxic effects. Hence, its utilization necessitates a purification process, termed *Shodhana*, to ensure safety and efficacy.[1,2]

The concept of *Shodhana*, rooted in Ayurvedic pharmacology, is a unique detoxification process aimed at reducing the toxicity of herbal drugs while preserving their therapeutic potential. Classical Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Rasaratna Samuchchaya* emphasize the importance of *Shodhana* for toxic herbs. Techniques like *Swedana* (sudation), *Nirvapa* (quenching), and *Bhavana* (levigation) are commonly prescribed for *Vatsanabha*, using mediums such as goat's milk (*Aja Dugdha*), herbal decoctions like *Triphala Kwatha*, and red mustard oil (*Rakta Sarshapa Tail*) to neutralize toxic constituents.[3,4,5]

The choice of medium in *Shodhana* significantly impacts the chemical composition and therapeutic properties of *Vatsanabha*. Studies have shown that goat's milk effectively reduces aconitine levels while enhancing bioavailability, *Triphala Kwatha* promotes antioxidant properties, and *Rakta Sarshapa Tail* improves lipid solubility of active components. This highlights the critical role of *Shodhana* in transforming *Vatsanabha* from a toxic substance into a safe and potent medicinal agent.[6,7,8]

Despite the extensive documentation in Ayurvedic literature, scientific validation of these traditional methods remains limited. Modern analytical tools, such as physico-chemical analysis and other initial tests offer an opportunity to quantify the reduction in toxic constituents and evaluate the therapeutic enhancements achieved through *Shodhana*. Such validation not only bridges the gap between traditional knowledge and contemporary science but also ensures the global acceptance of Ayurvedic practices.[9,10,11]

This study undertakes a comparative evaluation of the physico-chemical profiles of *Vatsanabha* processed through three classical *Shodhana* methods: *Aja Dugdha*, *Triphala Kwatha*, and *Rakta Sarshapa Tail*. By analyzing changes in alkaloid content, bioactive compounds, and therapeutic properties, the research aims to establish a scientifically validated protocol for *Vatsanabha* purification. This work is expected to contribute to the safe and effective use of *Vatsanabha* in modern Ayurvedic formulations, ensuring patient safety while preserving its pharmacological benefits.

Aim and Objectives

Aim

To evaluate the comparative physico-chemical profile of *Vatsanabha* (*Aconitum ferox*) processed through three classical *Shodhana* methods: *Aja Dugdha* (goat's milk), *Triphala Kwatha*, and *Rakta Sarshapa Tail*, and assess their impact on toxicity reduction and therapeutic enhancement.

Objectives

1. To analyze and compare the reduction in toxic alkaloid (aconitine) levels in *Vatsanabha* processed through different *Shodhana*
2. To evaluate the changes in physico-chemical properties, after processing.
3. To identify the most effective *Shodhana* method in terms of toxicity reduction while retaining or enhancing the therapeutic properties of *Vatsanabha*.

Materials and Methods

This methodology describes a systematic way to investigating and evaluating the efficiency of various techniques for purifying *Vatsanabha*.

Sample Collection and Authentication

Fully matured roots of *Vatsanabha* (*Aconitum ferox* Wall.) were procured from the local market in Dehradun, India, during September. The roots were botanically authenticated by pharmacognosists and experts of Dravyaguna department of Uttaranchal Ayurvedic College.

Preparation of sample and Methods of Purification[12-14]

Identified and use the purification procedures, such as:

***1. Rasa Tarangini*:** (chapt 24, page 652, verse 23-24)

Materials and Drugs:

- *Ashuddha Vatsanabha* Root = 100gm
- *Aja-dugdha* = 3 liter
- *Ushnodhaka* [Warm water] = Q.S

Equipment's*:* *Dolayantra*, Cotton Cloth, Spoon, Spatula, Stainless Steel Vessel, Gas stove, Jar

Working principle: Mixing, Filtering, Heating and Drying.

Method and Observation

- 100gm *Vatsanabha* root was cleansed with a piece of dry cloth to remove any extraneous objects that had adhered to the root.
- Following that, it was cut into tiny bits the size of chickpeas. Pieces of *Vatsanabha* were fastened to a sturdy *Portali*, which was folded into three or four layers of cotton fabric and hung inside a *Dolayantra*.
- The *Dolayantra* was then cooked for three to six hours in three liters of *Aja Dugdha*
- Following *Shodhan*, the samples were properly cleaned in warm water, dried to remove any remaining moisture and
- After completely drying, dried *Shudha Vatsanabha* was collected and kept in an airtight container.

Result

- Initial wt. of *Ashuddha Vatsanabha* = 100gm
- Total wt. obtained after *Shodhana*. = 70gm
- Total wt. loss = 30gm (30%)

***2. Anandkanda*:** (chapt 14, page 248, verse 26-27)

Materials and Drugs:

- *Ashuddha Vatsanabha* Root = 100 gm
- *Rakta Sarshapa Taila* (red mustard oil) = 1 liter
- *Ushnodhaka* [Warm water] = Q.S
- *Tankana* (borax) = Equal quantity of *Shodhit*

Equipment's: Mortar and Pestle (*Khalva Yantra*), Spoon, Spatula, Stainless Steel Vessel.

Working Principle: Trituration, washing, filtering, Grinding, Oleation

Method and Observation

- *Vatsanabha* 100gm roots part is cleansed with a piece of dry cloth to remove any extraneous objects that has adhered to the root.
- Pieces of *Vatsanabha* roots were cut into tiny bits size of chickpeas, were fastened to sturdy portal, which was folded into three or four layers of cotton fabric, covered with cotton cloth which was dipped into red mustard oil.
- After this detoxification process was taken place naturally as the substance interacts with the red mustard oil and the surrounding environment.
- After three days, retrieved the wrapped substance from the burial site and then grinding was done of the substance thoroughly with *Tankana* (borax).
- Continue grinding was done of the substance until a fine, smooth powder was obtained. After this *Shudha Vatsanabha* was collected and kept in an airtight container.

Results

- Initial wt of *Ashuddha Vatsanabha* = 100gm
- Total wt. obtained after *Shodhana*. = 60gm
- Total wt. loss = 40gm (40%)

***3. Rasendrasara Sangraha*:** (chapt 1, page 255-256, verse 366)

Materials and Drugs:

- *Ashuddha Vatsanabha* = 100gm
- *Triphala Kwatha* = 8 Liters
- *Ushnodhaka* [Warm water] = Q.S

Equipment's: Stainless steel Vessel, Spatula, Gas stove, Cotton Cloth, Measuring Jar etc.

Working principle: Heating and Drying, Filtering.

Method and Observation

- Prepared *Triphala Kwatha* by boiling the combination of *Haritaki, Bibhitaki*, and *Amalaki* in water until it reduces to a quarter of its initial volume.
- Small pieces of *Vatsanabha* roots were tied in a *Pottali* (cloth bundle).
- Set up the *Dolayantra*, an apparatus used for steaming, by suspending the *Pottali* containing the *Vatsanabha* roots over a pot containing *Triphala Kwatha*.

- *Swedana* (sudation) processed, where *Pottali* exposed to steam of *Triphala Kwatha* for 24 hours.
- After completing 24 hours of *Swedana*, *Pottali* was removed, and once cooled, pieces of *Shudha Vatsanabha* were collected, dried them and stored for further use.
- The *Vatsanabha* roots were undergo a gradual change in texture and color during 24-hour *Swedana*
- The medicinal properties of *Triphala Kwatha* infuse into *Vatsanabha* roots during Swedana process.
- After process, Vatsanabha pieces appeared softer and darker in color compared to their original form.
- The roots give off a subtle aroma of herbs used in *Triphala Kwatha*, indicating absorption.

Result

- Initial wt. of *Ashuddha Vatsanabha* = 100gm
- Total wt. obtained after *Shodhana*. = 50 gm
- Total wt. loss = 50 gm (50%)

Figure 1: Showing the process of *Shodhana* of *Vatsanabha* by different three methods

Iron Mortar Pestle

Potali

Dolayantra

Rakta Sarshapa

Ajadugdha

Rakta Sarshapa

Triphala Kwatha

Grinding in Kharal

Filtering

Figure 2: Physico-Chemical Study Instruments

Oven

pH Meter

Balance Machine

Muffle Furnace

Water Bath

Physico-chemical Analysis

Physico-chemical Analysis was done of *Ashodhit Vatsanabha Moola*, with *Shodhita* samples both with following parameters:

1. Loss on drying: Moisture content is the amount of moisture present in a crude drug sample or dosage form.

2. Total ash: The residue remaining after controlled incineration of drug materials is ash content of the drug, which represents inorganic materials (Metallic salts & Silica).

3. Acid insoluble ash: The residue remaining after treating the total ash with dil. HCL & weighing the residue which represents contamination with silicious material eg. Earth & Sand.

4. PH value: The pH value of an aqueous liquid may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration.

5. Solvents extractive value: Amount of active constituents in a given amount of medicinal plant material when extracted with solvents.

Observations and Results

Yield of Final Product After Purification

Table 1 shows the yield of the final product after purification for three different purification methods: *Aja Dugdha Shodhit Vatsanabha* (ADSV), *Triphala Kwatha Shodhit Vatsanabha* (TKSV), and *Rakta Sarshapa Shodhit Vatsanabha* (RSTSV).

- **ADSV** (*Aja Dugdha Shodhit Vatsanabha*) resulted in a 30% weight loss (from 100g to 70g).
- **RSTSV** (*Rakta Sarshapa Shodhit Vatsanabha*) showed a 40% weight loss (from 100g to 60g).
- **TKSV** (*Triphala Kwatha Shodhit Vatsanabha*) had the highest weight loss at 50% (from 100g to 50g).

This indicates that TKSV has the highest loss in weight during purification, suggesting a more thorough purification process compared to ADSV and RSTSV, which retain more of their original weight.

Table 1: Effect On Yield of Final Product After Purification

SN	Sample	Initial Quantity (gm)	Final Weight (Avg.) (gm)	% of weight loss
1.	ADSV	100	70	30
2.	RSTSV	100	60	40
3.	TKSV	100	50	50

Physico-Chemical Analysis

Table 03 provides the physicochemical analysis of raw and purified *Vatsanabha* for various parameters.

- **pH Value**

The raw *Vatsanabha* has a pH of 5.00. ADSV and TKSV both show a reduction in pH (3.53 and 3.85, respectively), while RSTSV has an elevated pH of 9.00.

- **Loss on Drying**

The loss on drying is slightly higher in ADSV (7.00%) and TKSV (6.52%) compared to RSTSV (4.51%) and raw *Vatsanabha* (7.27%).

- **Total Ash Value**

Raw *Vatsanabha* shows a total ash value of 16.36%. ADSV and TKSV show significantly lower values (2.86% and 2.70%, respectively), while RSTSV shows a high total ash value of 43.19%.

- **Acid Insoluble Ash**

Raw *Vatsanabha* has 12.07% acid-insoluble ash. ADSV and TKSV show very low values (0.68% and 0.65%, respectively), while RSTSV has a high acid-insoluble ash value of 19.99%.

- **Water Soluble Extractive**

Raw *Vatsanabha* has 15.91%. The water-soluble extractive is highest in RSTSV (39.37%), followed by ADSV (30.86%) and TKSV (26.22%).

- **Alcohol Soluble Extractive**

The alcohol-soluble extractive is highest in RSTSV (26.07%) and lowest in ADSV (11.04%). Raw *Vatsanabha* has 15.45%, and TKSV has 15.06%.

Table 2: Organoleptic Characters of The Samples

SN	Features	Raw Vatsanabha	ADSV	TKSV	RSTSV
1.	Colour	Dark Brown	Brown to Blackish	Dark brown	Light Brown
2.	Odour	Typical Distinct, Pungent	Characteristic of goat's milk	Earthy, Herbal Aroma	Mild to Moderately Pungent
3.	Touch	Hard	Rough	Slightly soft	Porous or Flaky
4.	Taste	Extremely Bitter, Pungent	Bitter, Creamy undertone	Bitter, Earthy undertones	Bitter
5.	Appearance	Wrinkled Surface	Crumbly Characteristics	Crumbly and Coarse	Consistent, Matte Finish

Physico-Chemical Analysis: Physico-chemical Analysis was done of *Ashodhit Vatsanabha Moola*, with *Shodhita* samples both with following parameters:

Table 3: Physicochemical Parameters of Raw and Purified *Vatsanabha*

SN	Test Parameters	Test method	Unit	RAW	ADSV	TKSV	RSTSV
1.	pH Value	API Part I, Vol.-VI, 2009	%	5.00	3.53	3.85	9.00
2.	Loss on Drying	API Part I, Vol.-VI, 2009	%	7.27	7.00	6.52	4.51
3.	Total Ash Value	API Part I, Vol.-VI, 2009	%	16.36	2.86	2.70	43.19
4.	Acid Insoluble Ash	API Part I, Vol.-VI, 2009	%	12.07	0.68	0.65	19.99
5.	Water Soluble Extractive	API Part I, Vol.-VI, 2009	%	15.91	30.86	26.22	39.37
6.	Alcohol Soluble Extractive	API Part I, Vol.-VI, 2009	%	15.45	11.04	15.06	26.07

ADSV = *Aja Dugdha Shodhit Vatsanabha*, TKSV = *Triphala Kwatha Shodhit Vatsanabha*, RSTSV = *Rakta Sarshapa Shodhit Vatsanabha*, RV = Raw *Vatsanabha*

Shodhana reduces **ash values** (impurities) and increases solubility, especially for ***Rakta Sarshapa Tail*** samples.

PH values change significantly, reflecting altered chemical composition post-detoxification.

Discussion

From data provided, it is evident that each purification method has its distinct effect on yield, sensory attributes, and physicochemical properties of *Vatsanabha*.

Yield: The highest weight loss occurs in TKSV, suggesting that this method may be most aggressive in terms of purification, possibly leading to removal of more impurities. RSTSV and ADSV show less weight loss, indicating that these methods preserve more of original material.

Organoleptic Characters: The sensory characteristics also vary. ADSV exhibits a characteristic creamy undertone in taste, which might indicate influence of goat's milk in purification process. TKSV and RSTSV exhibit more earthy or herbal aromas, with RSTSV having a mild pungency compared to other samples.

Physicochemical Analysis: The pH and ash values provide insight into purity and composition of final product. RSTSV shows an abnormally high pH (9.00), which is unusual and may indicate formation of alkaline compounds during purification. ADSV and TKSV, with lower pH values, might be considered more chemically stable. The ash values also suggest that ADSV and TKSV are purer, as they have lower total and acid-insoluble ash compared to RSTSV.

Extractive Values: The higher water-soluble and alcohol-soluble extractive values in RSTSV could indicate that it contains more active principles, possibly making it more bioavailable, while ADSV and TKSV show lower extractive values.

Conclusion

Among three purification methods, **ADSV** (*Aja Dugdha Shodhit Vatsanabha*) seems to be most balanced in terms of purity, sensory characteristics, and physicochemical properties. It shows lowest total ash and acid-insoluble ash values, which indicates a more refined product. The slight reduction in pH and favorable sensory attributes (such as creamy undertones) further suggest that ADSV might be best option for maintaining both efficacy and safety. While **TKSV** has highest loss of weight, indicating thorough purification, its slightly higher extractive values and rough texture may make it less preferable compared to ADSV for certain uses.

On the other hand, **RSTSV**, despite showing high extractive values, has the highest pH and ash content, which may affect its bioavailability and overall quality, making it less favorable compared to the other two purification methods. Thus, based on the overall physicochemical profile and organoleptic characteristics, **ADSV** is the preferred choice for optimal purification and efficacy.

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