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# PHARMACEUTICAL AND ANALYTICAL STANDARDISATION OF SWALP KHADIR VATIKA: AN AYURVEDIC PERSPECTIVE

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## ABSTRACT

*Swalp Khadir Vatika*, a classical formulation described in *Bhaishajya Ratnavali* under *Mukhroga Chikitsa*, is widely indicated in disorders of the oral cavity including *Mukhagata Vrana.* The present conceptual study aims to elaborate the pharmaceutical principles involved in the preparation of *Swalp Khadir Vatika* along with the need for Analytical standardisation to ensure quality control. The article highlights classical references, pharmaceutical procedures such as *Kwatha, Ghana* and *Vati Kalpana*, and the relevance of analytical parameters in standardising this traditional formulation in the present era.

**KEYWORDS:** *Swalp Khadir Vatika, Bhaishajya Kalpana, Ghana Kalpana, Vati Kalpana,* Pharmaceutical Standardisation, Ayurveda.

## INTRODUCTION

*Bhaishajya Kalpana* forms the backbone of Ayurvedic therapeutics, as the efficacy of a drug depends not only on its ingredients but also on its method of preparation. *Acharya Charaka* and *Sushruta* have repeatedly emphasized that improper preparation of medicines leads to diminished therapeutic effects. In the present era, standardisation of Ayurvedic formulations has become essential to ensure batch-to-batch consistency, safety, and global acceptability. *Swalp Khadir Vatika* is a classical herbo-mineral formulation described in *Bhaishajya Ratnavali* (*Mukhrogachikitsa)*, primarily indicated in diseases of the oral cavity such as *Mukharoga*, *Dantroga, Jihva and Talugata Vikara*. The formulation is prepared through the principles of *Kwatha Kalpana* followed by *Ghana* and *Vati Kalpana*. The present article attempts to critically analyse the pharmaceutical steps involved in its preparation and discusses the importance of analytical standardisation from an Ayurvedic perspective. *Swalp Khadir Vatika* is described in *Bhaishajya Ratnavali* under *Mukhroga Chikitsa Adhyaya* 61/101-103. The formulation is praised for its *Mukhasaukhya-vardhaka* property and efficacy in *Dant, Oshtha, Jihva and Talugata Rogas*.

## MATERIAL AND METHODS

This section covers the materials and methods used to standardize *Swalpa khadir Vatika* as a finished product and its raw materials in compliance with A.P.I.
This section can be studied under the two headings

- ✓ Pharmaceutical Study.
- ✓ Analytical Study

### Ingredients

**खदिरस्य तुलां सम्यग्जलद्रोणे विपाचयेत् ।**
**शेषाष्टभागे तत्रैव प्रतिवापं प्रदापयेत् ॥**
**जातीकर्पूरपूगानि कङ्कोलस्य फलानि च**
**इत्येषा गुटिका कार्या मुखसौभाग्यवर्धिनी ।**
**दन्तोष्ठमुखरोगेषु जिह्वातालवामयेषु । (भै. र६१/१०१-१०३)**

The formulation consists of the following drugs
These drugs collectively exhibit *Kashaya, Tikta* and *Katu Rasa*, *Laghu* and *Ruksha Guna*, and *Kapha-Pitta Shamaka* action, making them suitable for oral inflammatory conditions.

**INGREDIENTS OF *SWALPA KHADIR VATIKA* {TABLE -1}.**

| S.N. | Name (Common) | Botanical Name | Family | Part Used | Guna (Qualities) |
|---|---|---|---|---|---|
| 1 | *Khadir Twak* | *Acacia catechu* | Leguminosae | *Twak* | *Laghu, Ruksha* |
| 2 | *Javitri* | *Myristica fragrans* | Myristicaceae | *Phal Kosh* | *Laghu, Teekshna* |
| 3 | *Karpoor* | *Cinnamomum camphora* | Lauraceae | *Niryaas (Satva)* | *Laghu, Teekshna* |
| 4 | *Poogphala* | *Areca catechu* | Arecaceae | *Phal* | *Guru, Ruksha* |
| 5 | *Kankol* | *Piper cubeba* | Piperaceae | *Phal* | *Laghu, Ruksha, Teekshna* |

It is done in three steps
a) Collection of raw drugs for the preparation of *Swalpa khadir Vatika*
b) Processing of raw drugs.
*c)* Preparation of ***Swalpa Khadir Vatika***. (3 batches were made)

**RAW INGREDIENTS OF SWALPA KHADIR VATIKA**

**Method of preparation of *Swalpa Khadir Vatika***
*Swalpa Khadir Vatika* was prepared following classical references of *Bhaishajya Ratnavali* using a standardized pharmaceutical procedure. Authenticated raw materials—*Khadira* (Acacia catechu), Javitri (Myristica fragrans), Karpoora (Cinnamomum camphora), Pooga Phala (Areca catechu), and Kankola (Piper cubeba)—were procured and cleaned to remove foreign matter. Khadira {2400gm} was coarsely powdered, soaked overnight in the prescribed quantity of water {6100ml}, and subjected to controlled heating under *Mandagni* for approximately four hours with continuous stirring. The decoction was reduced to one-eighth of its initial volume and filtered to obtain *Khadir Kwatha*.

This *Kwatha* was further concentrated by gentle heating until a semisolid consistency was attained, avoiding charring by maintaining the temperature below 95°C. The concentrated mass (Ghana) was dried to a pliable consistency, after which finely powdered Prakshepa dravyas {quantity mentioned in *shloka*} were added and mixed uniformly. Small spherical Vatis were prepared manually using Ghrita-smeared hands, dried in shade, and finally packed in non-reactive containers. The entire process was repeated in **three batches**, demonstrating consistent yield, organoleptic characters, and reproducibility, thereby validating the standard manufacturing procedure of *Swalpa Khadir Vatika*.

**Result obtained after *Kwatha* preparation{Table -2}.**

| Final results obtained | Batch-I | Batch-II | Batch-III | Average |
|---|---|---|---|---|
| Coarse powder of raw drugs (in gm) | 2400 | 2400 | 2400 | 2400 |
| Water (in ml) | 6100 | 6100 | 6100 | 6100 |
| Final quantity of *Kwatha* obtained (in ml) | 765 | 770 | 750 | 762 |
| Percentage of *Kwatha* obtained (%) | 12.54 % | 12.62% | 12.29% | 12.49% |

**Results obtained during the pharmaceutical process of *Swalpa Khadir Vatika{Table -3 }.***

| Batch number | Quantity of *Kwatha* | Temp. | Final quantity of *Ghana* obtained | Percentage of *Ghana* obtained | Number of *Ghana Vatis* made | Total weight of *Ghana Vati* obtained after drying |
|---|---|---|---|---|---|---|
| **I** | 765 ml | 22-92$^0$C | 710 gm | 92.8% | 1380 | 688.5 gm |
| **II** | 770 ml | 22-92$^0$C | 700 gm | 90.9 % | 1350 | 672.5 gm |
| **III** | 750 ml | 22-92$^0$C | 695 gm | 92.6 % | 1360 | 654.0 gm |
| **Average** | **762** ml | 22-92$^0$C | 702 gm | 92.1% | 1370 | 672 .0gm |

**Observations noted during *Kwatha* preparation{Table -4}.**

| Duration (min.) | Temp. ($^0$C) | | | Observations |
|---|---|---|---|---|
| | Batch-I | Batch-II | Batch-III | |
| 0 | 22 | 22 | 22 | The decoction appeared brown in color with a distinct bitter taste, and frothing was visible on the surface.. |
| 30 | 63 | 63 | 63 | Persistent froth remained throughout the process.. |
| 60 | 80 | 80 | 80 | Gradual sedimentation of drug particles was noted at the bottom while froth continued to stay on top |
| 90 | 82 | 82 | 82 | Colorless vapors were released continuously along with ongoing frothing. |
| 120 | 85 | 85 | 85 | Progressive evaporation of water content was observed during the preparation. |
| 150 | 88 | 88 | 88 | The liquid gradually turned dark brown in color. Colorless vapors were visibly emitted, accompanied by a noticeable reduction in volume due to evaporation. |
| 180 | 90 | 90 | 90 | The liquid attained a reddish-brown hue, with intense evaporation and a continuous release of vapors. |
| 210 | 90 | 90 | 90 | The color of the liquid darkens to reddish brown, and evaporation increased intensely |
| 240 | 92 | 92 | 92 | Boiling process was observed to be steady and controlled. |

## RESULT AND DISCUSSION

The results of the pharmaceutical process batches demonstrate consistent and reproducible outcomes across all parameters evaluated. The quantity of *Kwatha* obtained ranged narrowly between batches, with an average yield of 762 ml, reflecting uniform extraction efficiency. The final quantity of Ghana obtained showed minimal variation, with an average of 702 gm and a high percentage yield averaging 92.1%, indicating efficient concentration and recovery during the pharmaceutical process. The number of *Ghana Vatis* produced and their total weight after drying also remained consistent, further supporting the reliability of the process. The small variations observed between batches fall within acceptable tolerances, underscoring the robustness of the manufacturing protocol under the controlled temperature range of 22-92°C. The average values highlight an optimized procedure with good batch-to-batch reproducibility, ensuring product quality and efficacy. These results affirm that the pharmaceutical process for *Swalpa Khadir Vatika* preparation is well-standardized and controlled, producing consistent quantities and quality attributes. This batch consistency is critical for ensuring therapeutic efficacy and safety in clinical applications. The study supports the practical application of rigorous batch monitoring and quality control in traditional *Ayurvedic* pharmaceutical preparations.

### Analytical Study

The minimum standard for the raw pharmaceutical used to create any formulation is also suggested by the analytical study. Testing or analysis of finished items shows the drug's little or insignificant negative effect. So, confirmation of these properties in pharmaceuticals is required for countries and health-conscious individuals. On *Swalpa Khadir Vatika*, the following analytical investigation was conducted.

- Organoleptic parameters (Raw materials-mentioned in table no.5 and final product-mentioned in table no.7)
- Physico-chemical parameters (Raw materials-mentioned in table no.6 and final product - mentioned in table no.8 to 18)

**ORGANOLEPTIC PARAMETERS FOR RAW MATERIALS {Table -5}**

| DRUG | COLOUR | ODOUR | TASTE | TEXTURE/APPERANCE |
|---|---|---|---|---|
| *Khadir* | Dark red/brown | Characteristic faint | Astringent | Hard brittle extract |
| *Kankol* | Grey brown to black | Aromatic | Pungent, slightly bitter | Wrinkled berries with stalk |
| *Poogphala* | Brown | Characteristic | Astringent slightly bitter | Hard nut |
| *Javitri* | Yellowish orange to reddish | Aromatic | Warm ,slightly bitter | Lacy aril |
| *Karpoor* | White translucent crystals | Strong penetrating | Pungent cooling | Crystalline volatile |

**Physico-chemical parameters of Raw ingredients {table -6}**

| Physico-chemical parameters (in% w/w) | *Khadir* | *Kankol* | *Javitri* | *Poogphala* | *Karpoor* |
|---|---|---|---|---|---|
| **Foreign matter** | *0.8%* | *1.1%* | *0.9%* | *0.89%* | - |
| **Total Ash value** | *1.46%* | *3.6%* | *2.11%* | *2.30%* | - |
| **Acid insoluble ash** | *0.41%* | *0.18%* | *0.48%* | *0.34%* | - |
| **Water-soluble extractive** | *9.44%* | *12.97%* | *13.56%* | *14.21%* | - |
| **Alcohol-soluble extractive** | *7.24%* | *18.89%* | *9.64%* | *9.65 %* | - |
| **Melting point** | | | | | *177* |
| **Non volatile Matter** | | | | | *0.0001%* |

All values came within a limit that means all raw drugs are validated with a limit mentioned in API and were safe to use for pharmaceutical and analytical process also, safe to use for further clinical trials.

**Organoleptic- Characters of final product i.e, *Swalpa Khadir Vatika {Table -7}***

| Organoleptic characters- | BATCH-I | BATCH-II | BATCH-III |
|---|---|---|---|
| **COLOR** | Black coloured | Black coloured | Black coloured |
| **ODOUR** | Characteristic like camphor | Characteristic like camphor | Characteristic like camphor |
| **TASTE** | Astringent | Astringent | Astringent |
| **TEXTURE** | Solid | Solid | Solid |

**Physico-chemical parameters**

**Showing the Percentage of Loss on drying for *Swalpa Khadir Vatika {*Table no.8}.**

| Samples | Percentage of Loss on drying |
|---|---|
| Batch 1 | 7.9642 % w/w |
| Batch 2 | 8.0125 % w/w |
| Batch 3 | 8.1673% w/w |
| Average | 8.0484%w/w |

**Showing the Percentage of Total Ash Value *Swalpa Khadir Vatika {Table -9}.***

| SAMPLES | Percentage Total Ash Value |
|---|---|
| BATCH I | 5.96% |
| BATCH II | 6.01% |
| BATCH III | 5.99% |
| AVERAGE | 5.98% |

**Showing the Percentage of Water-Soluble Extractive for *Swalpa Khadir Vatika {Table -10}.***

| Samples | Percentage water-soluble extractive % w/w |
|---|---|
| BATCH I | 25.69% |
| BATCH II | 26.55% |
| BATCH III | 26.15% |
| AVERAGE | 26.13% |

**Showing the percentage of Alcohol-Soluble extractive for *Swalpa Khadir Vatika {Table- 11}.***

| Samples | Percentage water-soluble extractive % w/w |
|---|---|
| BATCH I | 34.3544% |
| BATCH II | 35.7854% |
| BATCH III | 36.1066% |
| AVERAGE | 35.4154% |

**Showing the percentage of hardness{kg/cm} for *Swalpa Khadir Vatika {Table -12}.***

| Samples | Hardness{kg/cm} |
|---|---|
| BATCH I | 4.61 |
| BATCH II | 4.64 |
| BATCH III | 4.61 |
| AVERAGE | 4.63 |

**Showing the results of friability test for *Swalpa Khadir Vatika {Table -13}*.**

| Samples | Friability test |
|---|---|
| Batch 1 | 0.85 |
| Batch 2 | 0.72 |
| Batch 3 | 0.91 |
| Average | 0.83 |

**Showing Disintegration time for *Swalpa Khadir Vatika {Table-14}*.**

| Samples | Disintegration time |
|---|---|
| Batch 1 | 18 min |
| Batch 2 | 21 min |
| Batch 3 | 19 min |
| Average | 19.3 min |

**Showing the Percentage of Acid Insoluble Ash for *Swalpa Khadir Vatika {Table -15}*.**

| Samples | Percentage Acid Insoluble Ash |
|---|---|
| Batch 1 | 0.66% |
| Batch 2 | 0.56% |
| Batch -3 | 0.61% |

**Showing the Percentage of pH (10 % in aq. Solution) for *Swalpa Khadir Vatika* -Table no.16.**

| Samples | Percentage of pH |
|---|---|
| Batch 1 | 6.720 |
| Batch 2 | 6.810 |
| Batch 3 | 6.750 |
| Average | 6.766 |

**Showing the Percentage of Heavy Metals (in ppm) for *Swalpa Khadir Vatika* - Table no.17.**

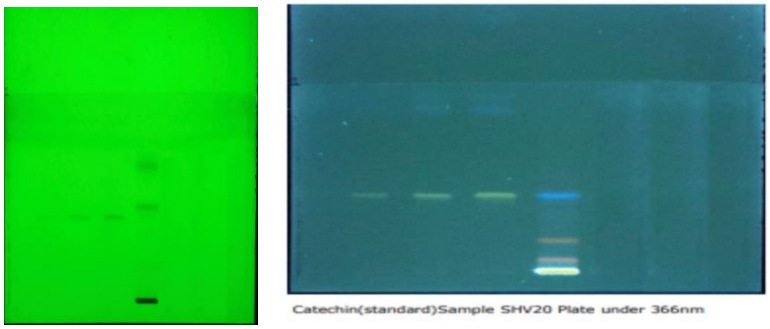
| Heavy metals (in ppm) | Limit (in ppm) | *Swalpa Khadir Vatika* | | |
|---|---|---|---|---|
| | | Batch I | Batch II | Batch III |
| **Mercury** | **Up to 1** | 0.16 | 0.16 | 0.16 |
| **Arsenic** | **Up to 3** | 0.45 | 0.45 | 0.45 |
| **Cadmium** | **Up to 0.3** | 0.09 | 0.09 | 0.09 |
| **Lead** | **Up to 10** | 0.47 | 0.47 | 0.47 |

**Showing the Total Microbial Load (Cfu/gm) for *Swalpa Khadir Vatika*-Table no.18.**

| Samples | Total Plate Load (Microbial) (Cfu/gm) for *Swalpa Khadir Vatika* |
|---|---|
| **Batch 1** | **20** |
| **Batch 2** | **22** |
| **Batch 3** | **21** |
| **Average** | **21** |

**Results of HPTLC study of (All the samples of *Swalpa Khadir Vatika*)**

- Presence of CATECHIN content in mobile phase - (Toulene: Ethylacetate: Formic acid 5:4:0.2)
- Methanolic extract of all samples with Quercetin marker were run in solvent system of Toulene:Ethylacetate:Formic acid (5:4:0.2).
- The plate was observed under UV wavelength of 254 nm and 366 nm and the presence of the marker compound CATECHIN was detected in all the sample.
- The presence of marker compound catechin in the sample *Swalpa Khadir Vatika* is 64.3004 ng/ml.




The HPTLC analysis of SKV20 confirmed the presence of Catechin, validated through comparison with the reference standard. The obtained Rf value and peak pattern matched closely with the standard Catechin profile. The quantitative estimation revealed Catechin content of 51.63 ng/mL, indicating that the formulation maintains its phytochemical integrity. Thus, HPTLC proves to be an effective tool for standardizing SKV20, ensuring quality, authenticity, and therapeutic consistency of the formulation.

## CONCLUSION

Pharmaceutical and analytical standardisation of *Swalpa Khadir Vatika* establishes a scientific framework for ensuring the quality, safety, and reproducibility of this classical Ayurvedic formulation. The systematic evaluation of raw materials, adherence to classical pharmaceutical procedures, and assessment through organoleptic, physicochemical, and analytical parameters confirm the authenticity and consistency of the prepared formulation. The findings highlight that proper standardisation not only preserves the therapeutic integrity described in classical texts but also enhances acceptability in contemporary clinical practice and research. This study provides baseline reference standards that can be utilised for quality control, large-scale production, and further pharmacological and clinical investigations, thereby contributing to the evidence-based integration of Ayurvedic formulations into modern healthcare systems.

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## Conflicts of Interest

No academic or financial Conflict of Interest.

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