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# A comprehensive pharmacognostical study of *Charakokta Shonitasthapana Varga Dravyas*

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## ABSTRACT

*Shonitasthapana Varga Dravyas* of *Charaka* consists of *Audhbida* (*Madhuka, Lodhra, Mocharasa, Priyangu, Kunkuma), Jangama (Madhu), Parthiva (Gairika, Mritkapala)* and *Ahara Dravya (Laja, Sharkara)*. Potent pharmacological action of the drug depends on proper identification authentication and purity of the drug. Majority of the drugs of *Shonitasthapana Varga* are subjected to extensive adulteration commercially. Detailed pharmacognostic analysis of the group of drugs is indispensable before its utility in therapeutics. Samples of *Shonitasthapana Varga Dravyas* were collected, procured or purchased from authentic sources and analyzed for their organoleptic, macroscopic, microscopic and physicochemical characteristics. The results of *Madhu, Madhuka, Lodhra, Mocharasa, Priyangu, Gairika, Kunkuma* and *Sharkara* were within the limits of Indian Pharmacopieal standards; *Laja* as per the Indian Council for Medical research guidelines. The Pharmacognostic analysis of *Shonitasthapana Varga Dravyas* helps in standardization and safe use of the drugs clinically on human subjects for its maximum therapeutic effects.

**Key words:** *Shonitasthapana, Pharmacognosy, Charaka, Analysis, Pharmacopeia*

## INTRODUCTION

*Dravya* has been given utmost importance to achieve the objective of Ayurveda i.e., *Swasthasya Swastha Rakshanam, Aturasya Vikara Prashamanam.*[1] *Dravyas* are classified elaborately in the *Samhitas* based on different factors and classification of *Dravyas* based on *Karma* are one among them. *Charaka* and *Vridda Vagbhata* have classified the drugs based on *Karma* and *Shonitasthapana Karma* is one such *Karma*. *Shonitasthapana Varga* of Charaka consists of *Madhu, Madhuka, Kunkuma, Mocharasa, Mritkapala, Lodhra, Gairika, Priyangu, Sharkara* and *Laja.*[2,3] *Shonita Sthapana Karma* includes *Karmas* like *Rakta Vardhana, Rakta Prasadhana* and *Rakta Stambhana* and indicated in diseases like *Raktapitta, Raktavikaras, Daha, Visha, Vrana* etc.

*The Shonitasthapana Varga Dravyas* draws ones attention due to its virtue of diversity of the drugs mentioned which includes *Audhbida* (Plant origin), *Jangama* (Animal origin), *Parthiva Dravyas* (mineral origin) and *Ahara Dravya* (food product).

The authenticity and purity of the *Dravyas* play an important role in performing their desired pharmacological actions in different diseases. In this context, it is imperative for a *Vaidya* to select a standard drug for treatment. The drugs of *Shonitasthapana Varga* are also most commonly adulterated either intentionally for profit, e.g.: *Madhu, Madhuka, Kunkuma, Lodhra, Sharkara, Laja* or unintentionally e.g.: *Mocharasa, Gairika* due to improper collection practices. Hence, a comprehensive

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pharmacognostical study of *Shonitasthapana Varga Dravyas* becomes the essential component of drug standardization and same was undertaken in the present study

## Materials and Methods

### Source of samples

The dry drug samples of *Yashtimadhu, Lodhra, Mocharasa, Priyangu, Kunkuma* and *Gairika* were purchased from authentic sources; Organic samples of *Madhu* and *Sharkara* were procured from FSSAI approved company; *Laja* and *Mritkapala* were purchased from local market.

### Pharmacognostic analysis

Organoleptic, morphological, microscopic and physicochemical analysis of the drugs *Madhuka, Lodhra, Mocharasa, Priyangu, Kunkuma, Gairka* were done as per the procedures mentioned in Ayurvedic Pharmacopiea of India.[4] Analysis of *Madhu, Sharkara* and *Laja* was conducted as per National Institute of Nutrition Guidelines.[5] Physicochemical analysis of *Gairika, Mritkapala* and *Laja* was done using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES)

## Results

**Table 1: Organoleptic characteristics *Shonitasthapana Varga Dravyas***

| Name of the drug | Part | Colour | Odour | Taste | Texture |
|---|---|---|---|---|---|
| *Madhu* (Honey) *Apis cerena* | Honey | Yellowish Brown | Characteristic, Pleasant | Sweet, faintly acidic | Thick, Slimy, sticky fluid |
| *Madhuka* (*Glycyrrhiza glabra* Linn) | Root Powder | Yellowish brown | Characteristic | Sweet, slightly bitter | Slightly coarse |
| *Rudhira/Kunkuma* (*Crocus sativus* Linn) | Stigma | Dark Red | Aromatic | Slightly bitter | Fimbriate margin |
| *Mocharasa* (*Bombax malabaricum* DC) | Gum resin | Blackish brown | Odourless | Slightly bitter | Granulated, rough |
| *Mritkapala* (Pieces of Broken Earthern pot) | Powder | Blackish brown | Muddy | Slightly sweet | Fine, slightly rough |
| *Lodhra* (*Symplocos racemosa* Roxb) | Bark powder | Greyish brown | Slightly pungent | Astringent, feebly bitter | Rough |
| *Gairika* (*Haematite* / Ferric oxide) | Powder/ Bhasma | Reddish Brown | Characteristic | Feebly sweet | Clayey, smooth |
| *Priyangu* (*Callicarpa macrophylla* Vahl) | Inflorescence powder | Brown | Characteristic | Bitter, slightly astringent | Slightly coarse, slightly oily |
| *Sharkara* (Sugar) | Sugar | Brown to yellowish brown | Pleasant | Sweet | Granulated |
| *Laja* (Puffed rice of Oryza sativa Linn) | Puffed rice | White to Whitish brown | Characteristic/ Slightly fragrant | Feebly sweet | Puffy, soft |

### Macroscopic analysis of *Shonitasthapana Varga Dravyas*

***Madhu*:** Yellowish brown fluid, thick, syrupy with pleasant odour, soluble in water and insoluble in alcohol, sinks when put in water. (Fig. 1)

***Madhuka* (Root/stolon):** External surface dark brown; longitudinally wrinkled; cut surface shows a cambium ring about one third of radius from outer surface; coarsely fibrous in bark. (Fig. 2)

***Lodhra* (Stem Bark):** Curved and channelled; outer surface uneven, greyish brown in colour; Internal surface whitish brown, granular and fibrous. (Fig. 3)

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***Gairika:*** Reddish brown, earthy, smooth powder. (Fig. 4)

***Kunkuma:*** Stigma - trifid, dark red in colour, cornucopia shape, with fimbriate margin, about 25 mm long. (Fig. 5)

***Mocharasa* (Gum Resin):** Dry resin, blackish brown in colour with impurities like bark of tree, insects' infestation, soil particles etc; irregular in shape, rough. (Fig. 6)

***Priyangu* (inflorescence):** Cymose, densely clothed with wooly hairs; peduncle cylindrical, densely haired. (Fig. 7)

***Sharkara*:** Yellowish brown in colour; Granulated free from dirt and foreign matter. (Fig. 8)

***Laja*:** Soft, light, whitish to whitish brown in colour prepared by roasting paddy. (Fig. 9)

***Mritkapala*:** Blackish brown powder of earthern pot, rough in nature. (Fig. 10)

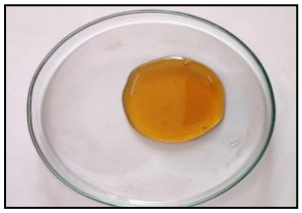


**Fig. 1: *Madhu***

**Fig. 2: *Madhuka***

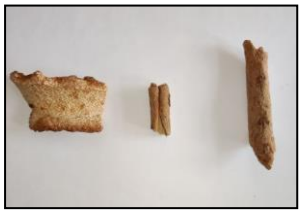


**Fig. 3: *Lodhra***

**Fig. 4: *Gairika***

**Fig. 5: *Kunkuma***

**Fig. 6: *Mocharasa***

**Fig. 7: *Priyangu***

**Fig. 8: *Sharkara***

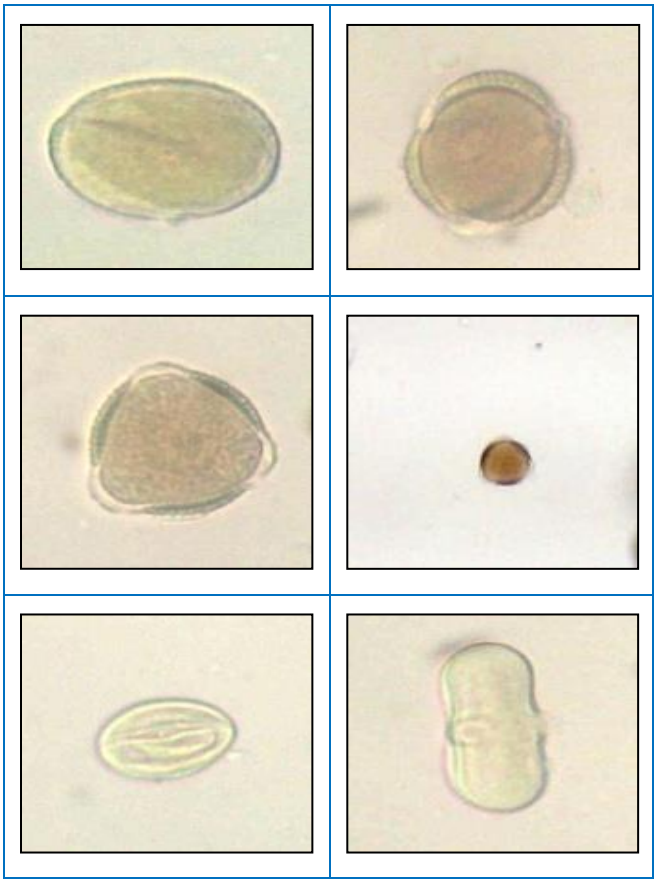
**Fig. 9: *Laja***

**Fig. 10: *Mritkapala***

**Microscopic analysis of *Shonitasthapana Varga Dravyas***

***Madhu*:** Microscopic examination of *Madhu* shows pollens of different sizes and shapes (Fig. 11)

**Fig 11: Microscopy of Honey showing different types of Pollens**



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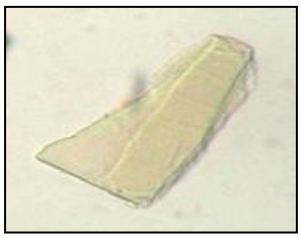
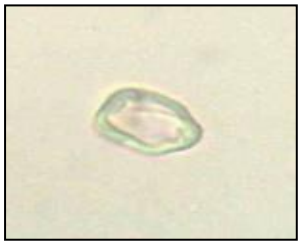


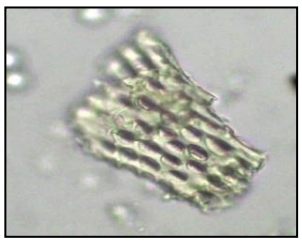




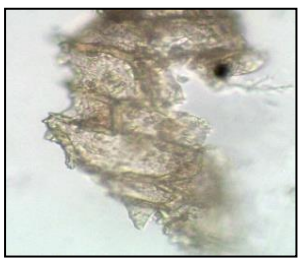

***Madhuka* (Root/stolon):** Powder microscopy of *Madhuka* showed presence of cluster of oval starch cells, pitted vessels, parenchyma cells, bundle of fibres, cork cells and calcium oxalate crystals. (Fig: 12)

**Fig: 12: Microscopy of *Madhuka***

**a. oval starch**



**b. Pitted vessels**

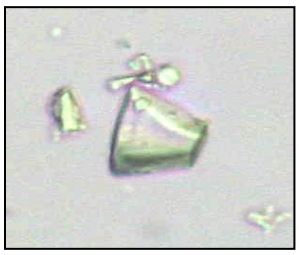


**c. Parenchyma cells**

**d. Fragment of parenchyma**

**e. Fibres**

**f. Cork cell**



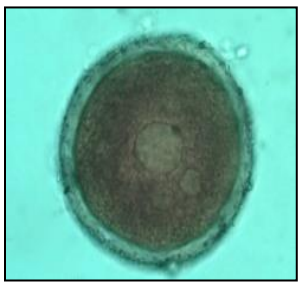
**g. Calcium oxalate**

**h. Bundle of fibres**

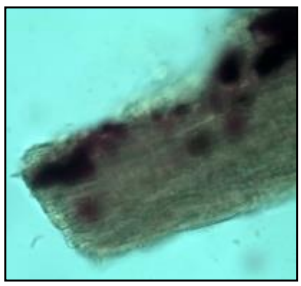
**i. Clusters of starch**

***Kunkuma*:** Powder microscopy of stigma of *Kumkuma* showed presence of Pollen grains, anther sac, oil globules, parenchyma cells. Calcium crystals, stone cells, spiral vessels, group of vessels, fragment of trachea, fibres, epithelial cells, companion cells and epidermal cells were observed. (Fig: 13)

**Figure 13: Microscopy of *Kumkuma***



**a. Pollen grain**



**b. Anther Sac**

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| | |
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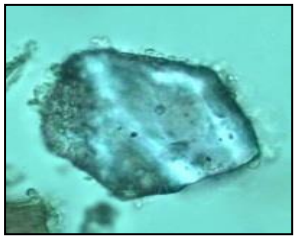
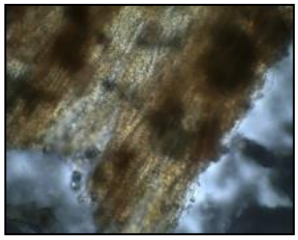
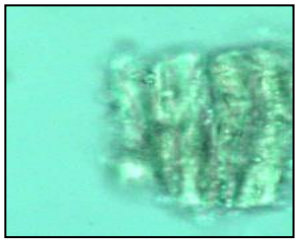
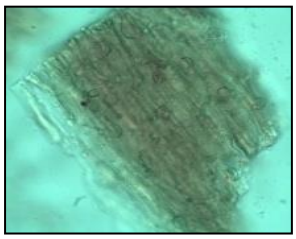
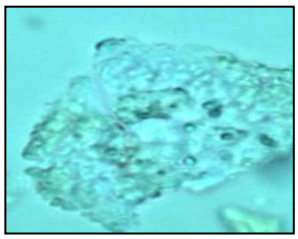
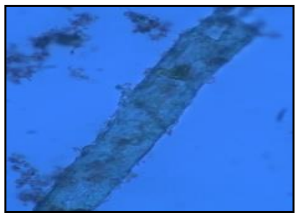
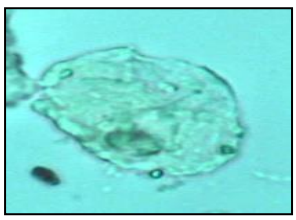
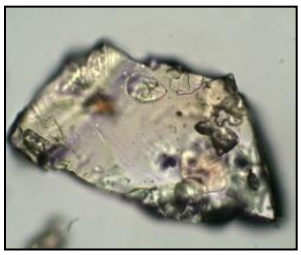
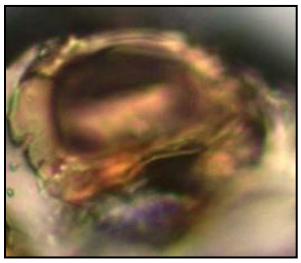
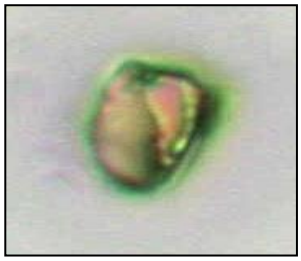
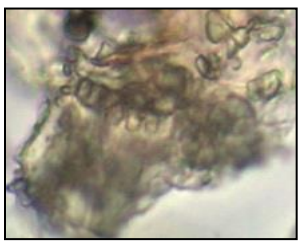
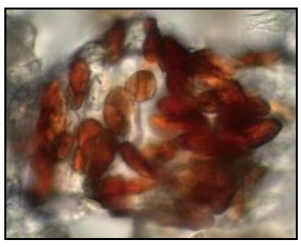
|  |  |
| **c. Calcium oxalate crystals** | **d. Spiral vessels** |
|  |  |
| **e. Companion cell** | **f. Epidermal cell** |
|  |  |
| **g. epithelial cell** | **h. Fibre** |
|  |  |
| **i. fragment of trachea** | **j. oil globules** |
|  |  |
| **k. Parenchyma cells** | **l. Stone cell** |

***Mocharasa* (Gum Resin):** Powder microscopy of *Mocharasa* showed the presence of different shapes of calcium oxalate crystals, Starch cells, Stone cells, Pigment cells and calcium oxalate embedded in pigmented cells. (Fig.14)

**Figure 14: Microscopy of *Mocharasa***

| | |
|---|---|
|  |  |
| **a. Calcium oxalate** | **b. Pigment cell** |
|  |  |
| **c. Stone cell** | **d. Starch cells** |
|  |  |
| **e. Starch cells** | **f. Starch cells** |
|  |  |
| **g. Starch cells** | **h. Pigmented cells embedded in calcium oxalate** |

***Lodhra* (Stem Bark):** Microscopy of *Lodhra* stem bark powder showed the presence of Cork cells; Fragment

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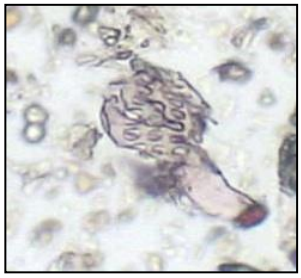
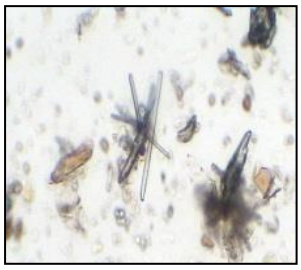
of trachea; accicular crystals; bundles of fibres; fragment of fibres ; Clusters of starch granules; Scleroids (Stone cells); Pigment cells; fragment of trachea (vessels). (Fig:15)

**Figure 15: Microscopy of *Lodhra***

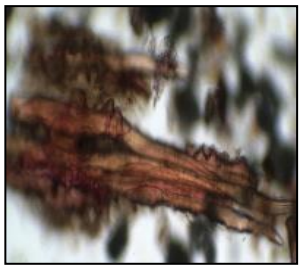
**a. Cork cells**



**b.Fragment of trachea**

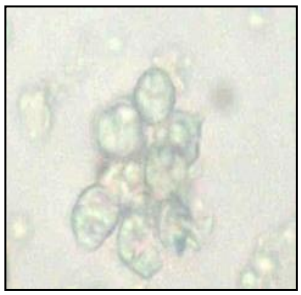


**c. accicular crystals**



**d. bundles of fibres**

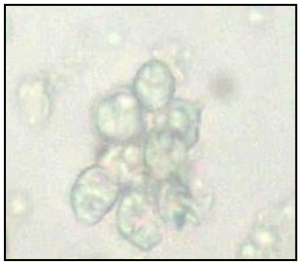
**e. fragment of fibres**



**f. Clusters of starch granules**

**g. Scleroids (Stone cells)**

**h. Pigment cells**

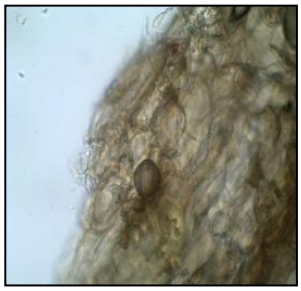


**i. fragment of trachea (vessels)**

***Priyangu* (Inflorescence):** Powder microscopy of *Priyangu* inflorescence showed the presence of pollen grains, stellate hairs, trichomes, starch, vessels, fibers, anther sac, glandular trichomes, parenchyma cells, epidermal cells and pigmented cells. (Fig:16)

**Figure 16: Microscopy of *Priyangu***

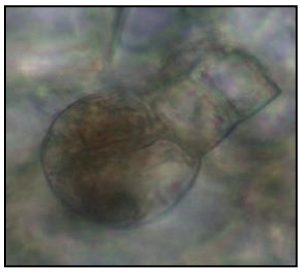
**a. Pollen grain**



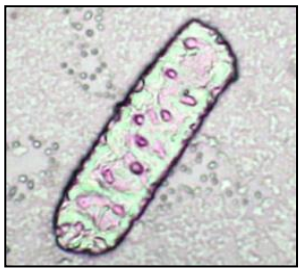
**b. Anther sac**

**c. Starch**

**d. Stellate hairs**



**e. Glandular trichome**



**f. Vessels**

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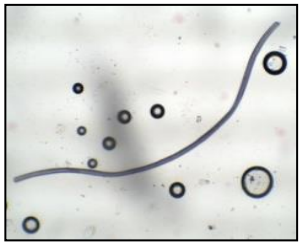
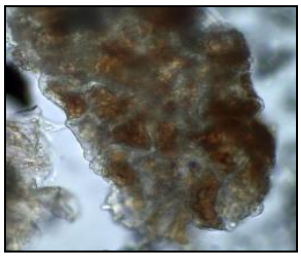
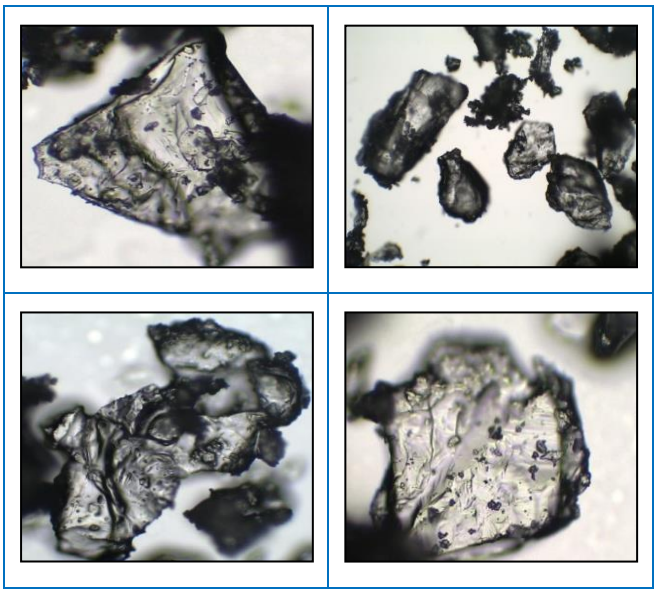
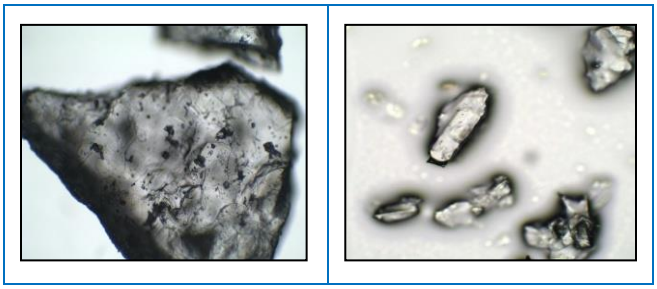
|  |  |
| **g. Parenchyma cells** | **h. Fibres** |
|  |  |
| **i. Pigmented cells** | **j. fragment of trichome** |
|  |  |
| **k. Epidermal cells** | **l. trichome** |

***Sharkara***: Microscopy of powdered *Sharkara* revealed various types and shapes of sugar crystals. (Fig: 17)

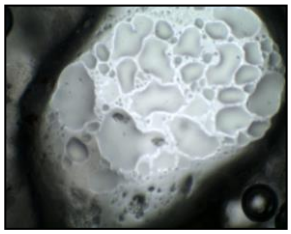
**Fig 17: Microscopy of *Sharkara* – Sugar crystals**





***Laja***: Microscopy of powder of puffed rice showed gelatinized starch cells with void spaces and air vacuoles imparting porous and expanded structure. (Fig: 18)

**Fig 18: Microscopy of *Laja***

| | |
|---|---|
|  |  |
| **a. Starch cells** | **b. Starch cell with vacuoles** |

**Physicochemical analysis of *Shonitasthapana Varga Dravyas*.**

**Table 1: Physicochemical analysis of *Madhuka, Kunkuma, Mocharasa, Lodhra, Priyangu*[9-14]**

| Drug | Foreign matter (%) | Total Ash (%) | Acid-insoluble ash (%) | Alcohol soluble extractive (%) | Water soluble extractive (%) |
|---|---|---|---|---|---|
| ***Madhuka*** | 0.65 | 4.97 | 0.49 | 48.4 | 38.7 |
| ***Kunkuma*** | 0.4 | 1.5 | 0.2 | - | - |
| ***Mocharas*** | 2 | 10.0 | 5.5 | 24.68 | 66.85 |
| ***Lodhra*** | Nil | 5.97 | 0.99 | 13.5 | 17.2 |
| ***Priyangu*** | 0.95 | 7.0 | 0.5 | 16.5 | 22.3 |

**Table 2: Physicochemical analysis of *Sharkara*[15]**

| Parameter | Result | Limit |
|---|---|---|
| **Foreign matter** | NIL | NIL |
| **Total Ash** | 0.36 % | NA |

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| | | |
|---|---|---|
| **Moisture content** | 0.05 % | NMT 1.5% by wt. |
| **Acid-insoluble ash** | 0.33 % | NMT 0.7 % by wt. |
| **Sucrose** | 67. 5 % | NMT 93% by wt. |
| **Sulphur dioxide** | Absent | Absent |

*NMT - Not More Than; NLT - Not Less Than; wt. - Weight*

**Table 3: Physicochemical analysis of *Madhu*[8]**

| Parameter | Result | Limit |
|---|---|---|
| **Wt. per ml at 250°** | 13.75 | NLT 1.35 % |
| **Moisture content (LOD)** | 17.5 % | NMT 25 % by wt. |
| **Reducing sugars** | 15.85 | NMT 65 % by wt. |
| **Sucrose** | 1.46 | NMT 5 % by wt. |
| **Fructose – Glucose ratio** | 2.15 | NLT 1 % by wt. |
| **Ash** | 0.03 | NMT 0.50 % by wt. |
| **Acidity (expressed as Formic acid)** | 0.1 | NMT 0.2 % by wt. |
| **Fiehe's Test** | Negative | Negative |
| **Aniline chloride test** | Negative | Negative |
| **Specific gravity @ 27°C** | 1.0403 | NLT 1.35 |

**Table 4: Physicochemical analysis of *Mritkapala*.**

| Test Parameter | Unit | Test Result | Limits | Test Method |
|---|---|---|---|---|
| Iron as Fe | % | 5.2 | NA | ICP – OES |
| Calcium as Ca | % | 0.59 | NA | ICP – OES |
| Phosphorous as P | % | 0.05 | NA | ICP – OES |
| Sulphur as S | ppm | 44 | NA | ICP – OES |
| Magnesium as Mg | % | 0.35 | NA | ICP – OES |
| Potassium as K | % | 0.42 | NA | ICP – OES |
| Aluminum as Al | % | 6.6 | NA | ICP – OES |
| Silicon as Si | % | 0.07 | NA | ICP – OES |

*NA - Not available*

**Table 5: Physicochemical analysis of *Gairika*[7]**

| Test Parameter | Unit | Test result | Limits | Test Method |
|---|---|---|---|---|
| Iron as Fe | % | 18.0 | NLT 16 % | ICP - OES |
| Hematite as $Fe_2O_3$ | % | 24.2 | NLT 21 % | ICP - OES |

**Table 6: Physicochemical analysis of *Laja*[6]**

| Test Parameter | Unit | Test Result | Test Method |
|---|---|---|---|
| Sodium as Na | ppm | 30 | ICP – OES |
| Iron as Fe | ppm | 43 | ICP – OES |
| Calcium as Ca | ppm | 83 | ICP – OES |
| Zinc as Zn | ppm | 86 | ICP – OES |
| Magnesium as Mg | ppm | 408 | ICP – OES |
| Potassium as K | ppm | 1260 | ICP – OES |
| Selenium as Se | ppm | 0.6 | ICP – OES |
| Moisture | % | 13.0 | IS: 7874 (P-1):1975 |
| Ash | % | 1.4 | IS: 7874 (P-1):1975 |
| Protein | % | 8.4 | IS: 7874 (P-1):1975 |

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| | | | |
|---|---|---|---|
| Fat | % | 6.9 | IS: 7874 (P-1):1975 |
| Carbohydrates | % | 67.2 | By difference |
| Energy | Kcal/100g | 364 | By Calculation |

## Discussion

Organoleptic characteristics of the group as a whole revealed predominance of sweet and bitter taste, which is an essential *Rasa* to act on diseases of *Rakta*. The odour was characteristic to the individual drugs of the group. The texture of *Madhuka* root powder and *Lodhra* stem bark powder was slightly rough due the fibrous nature of the drug. *Mochrasa* was granulated in nature as the gum resin was the part used. For *Mritkapala* powder, black pot was taken as *Krishna Mrit* is considered as best among the soil. The colour of blackish brown might be due the *Samskara* (heat) the pot has undergone to get the final product. The slight oiliness of *Priyangu* powder is due to the oil glands present in the drug and coarseness may be as result of pubescent nature of the flowers. Frimbriate margin is the characteristic feature of *Kunkuma* stigma.

The macroscopic characteristics of the plant origin drugs, *Sharkara, Madhu* and *Gairika* of the group were as per the pharmacopeial standards, *Laja* as per the ICMR guidelines.[6] There are no standardized parameters available for *Mritkapala*. *Gairika* was clayey, reddish brown and earthy in lustre.[7]

Microscopic analysis of *Madhu* showed presence of different sizes and shapes of pollen grains indicating that the honey is of multifloral variety, i.e., honey bees collected the nectar from different sources of the plants. Anther sac, pollen grains and parenchyma cells are characteristic microscopic features in flowers and were present in *Priyangu* and *Kunkuma* respectively. Pubescent nature of the inflorescence of *Priyangu* reveals the presence of stellate hairs and trichomes. The presence of cork cells, fragment of fibers is the common microscopic characteristic of stem bark and root, which was found in *Madhuka* and *Lodhra*. Starch cells were present in *Madhuka, Mocharasa, Lodhra* and *Laja.* Calcium oxalate crystals were present in *Madhuka, Mocharasa* and *Lodhra*.

Results of the Physicochemical analysis of *Madhu,*[8] *Madhuka,*[9] *Kunkuma,*[10] *Mocharasa,*[11,12] *Lodhra,*[13] *Priyangu,*[14] and *Sharkara*[15] were within the Ayurvedic pharmacopeial standards. Filter paper press test is a physical test conducted to check the presence of Glycerin or fixed oil, indicating adulteration of *Kunkuma*. Absence of translucent oily spots confirmed the purity of the drug *Kunkuma.* Sulphur di-oxide is used as bleaching agent in sugar industry to remove the colouring matter from sugar and also as a preservative. Sulphur dioxide can cause respiratory issues like bronchitis, cough, wheezing, asthma etc. sulphur dioxide free sugar should be ideally used for consumption. Absence of sulphur dioxide is an important test parameter conducted for purity of sugar, and in the present study the sample of sugar/*Sharkara* was free from the same. Presence of high Reducing sugars and sucrose indicate the adulteration of honey and in the present study they were well within the normal limits, suggestive of pure honey sample. Invert sugar and table sugar (Sucrose) is the most common commercial adulterant added to the honey. Fiehe's test and aniline chloride test are the test used to check the presence of invert sugar and sucrose respectively and in the present study the absence of the same indicate the purity of the honey. The presence of Hematite ($Fe_2O_2$) and iron as Fe is suggestive of purity of *Gairika.* Different minerals like iron, calcium, sulphur, aluminium, magnesium, phosphorus, silicon were present in *Mritkapala*. Macronutrients like carbohydrates, proteins, fat, potassium and micronutrients like sodium, iron, calcium, zinc, magnesium and selenium were present in *Laja*, indicating its utility as a *Pathya* in Ayurveda formulations specially for *Raktapitta*.

## Conclusion

*Shonitasthapana Varga* consists of *Dravyas* of varied origins and these *Dravyas* are widely adulterated commercially due to their extensive utility as food and medicine in ayurveda practice. A comprehensive pharmacognostical study or analysis of this group of

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drugs in the above study will help the physician to use the pure and standard drug for therapeutics which in turn plays a critical role in action and effect of the drug on humans.

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