Research Article

www.ijrap.net

(ISSN Online:2229–3566, ISSN Print:2277–4343)

PHARMACEUTICO-ANALYTICAL STUDY OF SHIGRUPUNARNAVADI YOGA: A POLY-HERBAL PREPARATION

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Received on: 18/6/24 Accepted on: 03/8/24

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DOI: 10.7897/2277-4343.154120

ABSTRACT

Introduction: Shigrupunarnavadi yoga is explained in prayoga samuchayyam, a renowned visha chikitsa grantha (Ayurvedic toxicology book) stating in detail about keraliya visha chikitsa prayogas (traditional Kerala toxicology treatment modalities) authored by Sri Kochunni Thampuran in the context of mandali visha chikitsa (viper bite management) as an external lepa (application). All the ten ingredients in this yoga are economical and readily available. Materials and Methods: This combination of Shigrupunarnavadi yoga has drugs such as Shigru, Punarnava, Haridra, Vacha, Chandana, Patha, Ishwaramooli, Yashtimadhu, Sirisha and Gokshura. Equal drug quantities were combined and processed into kwatha choorna (coarse powder). An analytical study was then conducted following the guidelines outlined in the Ayurvedic Pharmacopoeia of India. Various physicochemical parameters of the kwatha choorna were analysed, including organoleptic characteristics, moisture content, total ash, acid-insoluble ash, water-soluble ash, alcohol-soluble extractive value, and water-soluble extractive value. Additionally, the pH, refractive index, total solids, specific gravity, and viscosity of the freshly prepared Shigrupunarnavadi kwatha (decoction) were assessed. Observation and Results: The phytochemical analytical study proved its efficacy for internal consumption. Conclusion: This study helped standardise Shigrupunarnavadi yoga in kwatha choorna (coarse powder) and kwatha (decoction). It also helped to analyse this particular yoga's probable mode of action when given internally.

Keywords: Visha, Shigrupunarnavadi, Kwatha, Choorna, Pharmaceutico-analytical.

INTRODUCTION

Standardisation of a formulation helps to ensure the quality, efficacy and uniformity of the phytoconstituents or the biological activity of a particular compound across the globe. Pharmacognostic studies ensure plant identity and lay down standardisation parameters, which will help authenticate the plants and provide the reproducible quality of herbal drugs. However, the complexity of the herbal formulations is a significant challenge in the Ayurveda drug industry, making standardisation of Ayurvedic formulation a difficult task[1]. Shigrupunarnavadi yoga is a majestic combination of ten economically feasible and easily available drugs explained in the same combination of drugs and indication in two Keraleeya visha chikitsa granthas such as Visha jyotsnika[2] and Prayoga samuchayya in Mandali visha adhikarana[3]. This yoga indicates that it can be used as an external application in vishaja shopha (oedema). After analysing the pharmacological action of each drug and considering its authenticity, we have moved forward to standardise and document the safety parameters needed for internal use as per API guidelines. In the present communication, the pharmaceutico-analytical study of Shigrupunarnavadi kwatha choorna (coarse powder) and standardisation of fresh kwatha (decoction) aiming for safe internal administration was done.

MATERIALS AND METHODS

Plant Materials and Preparation

All ten drugs were collected in equal quantities, authenticated and kwatha choorna (coarse powder) was prepared as per the general method from G.M.P. certified S.D.M. Ayurveda Pharmacy, Kuthpady, Udupi, Karnataka, India. Ingredients of Shigrupunarnavadi Yoga are tabulated in Table 1, and pictures are depicted in Figures 1-12.

Table 1: Ingredients of Shigrupunarnavadi Yoga

Drugs Required	Botanical name	Used part	Quantity
Shigru[4]	*Moringa oleifera* Lam.	Bark	100 gm
Punarnava[5]	*Boerhaavia diffusa* Linn.	Root	100 gm
Haridra[5]	*Curcuma longa* Linn.	Rhizome	100 gm
Vacha[4]	*Acorus calamus* Linn.	Rhizome	100 gm
Rakta Chandana[6]	*Pterocarpus santalinus* Linn.	Heartwood	100 gm
Patha[5]	*Cissampelos pareira* Linn.	Rhizome	100 gm
Ishwari mula[6]	*Aristolochia indica* Linn.	Root	100 gm

Yashtimadhu[5]	*Glycyrrhiza glabra* Linn.	Root	100 gm
Shirisha[6]	*Albizia lebbeck* (L.) Benth.	Bark	100 gm
Gokshura[5]	*Tribulus terrestris* Linn.	Fruits	100 gm

Figure 1: Shigru

Figure 2: Punarnava

Figure 3: Haridra

Figure 4: Vacha

Figure 5: Rakta Chandana

Figure 6: Pata

Figure 7: Ishwaramooli

Figure 8: Yashti

Figure 9: Shirisha

Figure 10: Gokshura

Figure 11: Shigrupunarnavadi kwatha choorna

Figure 12: Shigrupunarnavadi kwatha

Method of preparation of Shigrupunarnavadi kwatha
One part of standardised Shigrupunarnavadi kwatha choorna (coarse powder) was mixed with eight parts of water and reduced to one-quarter of its original volume, yielding Shigrupunarnavadi kwatha. [7]

Instrumentation and Techniques
All the analytical studies were conducted from the S.D.M. Centre for Research in Ayurveda and Allied Sciences, Kuthpady, Udupi, Karnataka, India.

Physicochemical parameters

Table 2: Analysed physicochemical parameters of kwatha choorna and kwatha

Kwatha Choorna	Kwatha
Organoleptic characters	Organoleptic characters
Moisture content[7]	Determination of pH[7]
Total ash[7]	Refractive index[7]
Acid insoluble ash[7]	Total solids[7]
Water soluble ash[7]	Specific Gravity[8]
Alcohol soluble extractive value[7]	Viscosity[7]
Water soluble extractive value[7]	----------

RESULTS AND DISCUSSION

Assessment and Standardisation of kwatha choorna

Organoleptic Characters: Colour, odour and taste were adequately tested and tabulated.

Table 3: Organoleptic characters of kwatha choorna

Parameters	Result
Colour	Ash yellow (Figure 11)
Odour	Aromatic pleasant
Taste	Sweet Astringent

Moisture content (Loss on drying at 105 ^{0}C)
The method involved placing 10 g of the sample in a tared evaporating dish and then drying it at 105 ^{0}C for 5 hours in a hot air oven before weighing it. The drying process was continued until the difference between two successive weights was no more than 0.01 after cooling in a desiccator. The moisture percentage was then calculated with reference to the weight of the sample, which was found to be 7.68±0.03%w/w for Shigrupunarvadi kwatha choorna. This percentage indicated a safe shelf life for the product, ensuring it was free from any fungal or bacterial growth. [8]

Total ash
In the experiment, 2 g of the sample were incinerated in a tared platinum crucible at a temperature not exceeding 450 ^{0}C until carbon-free ash was obtained. The ash percentage was then calculated based on the sample's weight, resulting in 7.19±0.06% w/w. This indicated the presence of both organic and inorganic compounds in the kwatha choorna. [8]

Acid insoluble Ash
25 ml of dilute HCl was added and boiled to the crucible containing the total ash. The insoluble matter was collected on ashless filter paper (Whatman 41) and washed with hot water until the filtrate was neutral. The filter paper containing the insoluble matter was transferred to the original crucible, dried on a hot plate, and ignited to a constant weight. The residue was allowed to cool in a suitable desiccator for 30 minutes and then weighed without delay. The content of acid-insoluble ash, with reference to the air-dried drug, was calculated, resulting in 2.41±0.02% w/w. This indicated the quantity of inorganic compounds such as sand, metal particles, and other impurities in the sample and the presence of oxalates, carbonates, phosphates, oxides, and silicates. [8]

Water soluble ash
The ash was boiled in 25 ml of water for 5 minutes. The insoluble matter was filtered using ashless filter paper, rinsed with hot water, and ignited for 15 minutes at a temperature not exceeding 450 ^{0}C. The water-soluble ash content was determined by subtracting the weight of the insoluble matter from the total ash weight. For the air-dried Shigrupunarnavadi kwatha choorna sample, this value was found to be 5.45±0.02% w/w. This measurement indicated the amount of organic compounds likely to be absorbed by the body and contribute to the therapeutic effect. [8]

Alcohol soluble extractive
Accurately weighed, 4 g of the sample was placed in a glass stoppered flask. 100 ml of distilled alcohol (approximately 95%) was added, and the mixture was shaken occasionally for 6 hours. It was then allowed to stand for 18 hours. The solution was rapidly filtered, ensuring no solvent was lost. 25 ml filtrate was pipetted into a pre-weighed 100 ml beaker, evaporated to dryness on a water bath, and kept in an air oven at 105 ^{0}C for 6 hours. After cooling in a desiccator for 30 minutes, the beaker was weighed. The percentage of alcohol-extractable matter was calculated. The experiment was repeated twice, and the sample's average value was 7.27±0.02% w/w. This value indicated the presence of mid-polar and non-polar phytoconstituents in the sample. [8]

Water soluble extractive
Accurately weighed, 4 g of the sample was taken in a glass stoppered flask. 100 ml of distilled water was added, shaken occasionally for 6 hours, and then allowed to stand for 18 hours. The mixture was filtered rapidly so as not to lose any solvent. 25 ml filtrate was pipetted into a pre-weighed 100 ml beaker and evaporated to dryness in a water bath. The beaker was then placed in an air oven at 105 ^{0}C for 6 hours, cooled in a desiccator, and weighed. The experiment was repeated twice, and the average value for the sample was recorded as 14.87±0.01% w/w. This value indicated the presence of purely polar phytoconstituents in the sample, which are responsible for absorption, distribution, excretion, and metabolism in the body. [8]

Table 4: Results of standardisation parameters of Shigrupunarnavadi kwatha choorna

Parameter	Results n = 3%w/w (Avg ± SD)
Loss on drying	7.68±0.03
Total Ash	7.19±0.06
Acid Insoluble Ash	2.41±0.02
Water soluble Ash	5.45±0.02
Alcohol soluble extractive value	7.27±0.02
Water soluble extractive value	14.87±0.01

Assessment and Standardisation of kwatha

Organoleptic Characters: Colour, odour and taste were adequately tested and tabulated in Table 5.

Table 5: Organoleptic characters of kwatha

Parameters	Result
Colour	Dark Orange (Figure 12)
Odour	Aromatic, pleasant smell
Taste	Sweet Astringent

Determination of pH

Preparation of buffer solutions:
Standard buffer solution: One tablet was dissolved in 100 ml of distilled water at pH levels 4, 7, and 9.2.

Determination of pH: 1 ml of the sample was taken and diluted to 10 ml with distilled water, then stirred well and filtered. The filtrate was used for the experiment. The instrument was turned on and allowed to warm up for 30 minutes. The pH meter was first calibrated with the pH 4 solution, adjusting the knob to 4.02 at room temperature (30°C). The pH 7 solution was then introduced, and the pH meter was adjusted to 7 using the knob. Next, the pH 9.2 solution was introduced, and the pH reading was checked without making any adjustments. Finally, the sample solution was introduced, and the reading was noted. The test was repeated four times, and the average reading was recorded as 6.0% w/w for the sample. This indicated a weak acid nature, which helped disintegrate alkaline stones such as calcium oxalate crystals, aiding their excretion through urine. [8]

Refractive index

A drop of water was placed on the prism, and the drive knob was adjusted so that the boundary line intersected the separatrix precisely at the centre, and the reading was noted. Distilled water has a refractive index of 1.33194 at 30 ^{0}C. The difference between the reading and 1.33194 indicated the instrument error. If the reading was less than 1.33194, the error was negative (-), and the correction was positive (+). Conversely, if the reading was higher, the error was positive (+), and the correction was negative (-). The refractive index of the kwatha was determined using one drop of the sample. The refractive index of the test samples was measured at 28 ^{0}C and recorded as 1.33729% w/w, which indicated the clarity, dispersion, and amount of solid content in the kwatha sample. [8]

Total solids

50 g of the sample was accurately weighed and transferred to an evaporating china dish that had been dried to a constant weight. The sample was then evaporated to dryness on a water bath and dried at 105°C for 3 hours. After cooling, the dish containing the residue was placed in a desiccator for 30 minutes and weighed immediately. The weight of the residue should meet the requirements specified in the individual monograph, which was 3.13±0.01% w/w for the sample. This result indicated the dissolved solid content in the kwatha. [8]

Specific gravity

A specific gravity bottle was cleaned by shaking it with acetone and then with ether, which was dried and weighed. The sample solution was cooled to room temperature. The specific gravity bottle was carefully filled with the test liquid, the stopper was inserted, and any surplus liquid was removed. The weight was noted. The procedure was repeated using distilled water in place of the sample solution. The specific gravity of the sample was recorded as 0.998%w/w, which indicated the dispensing of kwatha in terms of posology. [9]

Viscosity

The given sample was filled in a U-tube viscometer according to the expected viscosity of the liquid, ensuring that the fluid level stood within 0.2 mm of the filling mark when the capillary was vertical, and the specified temperature was reached. The liquid was adjusted to the specified height of the viscometer, and the time taken for the sample to pass between the two marks was measured. The viscosity was calculated using the formula provided, and the obtained result for the kwatha was 1.44% w/w, indicating that it had sufficiently required pourability. [8]

Viscosity formula used for calculation:

$$\eta 1 = \rho 1 t 1 \text{ X } \eta 2 / \rho 2 t 2$$

η1 - Viscosity of sample
η2 - Viscosity of water
t1 and t 2 - time taken for the sample and water to pass the meniscus
ρ1 and ρ2 - Density of sample and water
X= Specific gravity of sample x 0.9961/specific gravity of water
Π= X x Time for sample x 1.004/specific gravity of water x 70sec

Table 6: Results of standardisation parameters of Shigrupunarnavadi kwatha

Parameter	Results n = 3%w/w (Avg ± SD)
pH	6.0
Refractive index	1.33729
Specific gravity	0.998
Viscosity	1.44
Total solids	3.13±0.01

CONCLUSION

The pharmaceutico-analytical study of Shigrupunarnavadi Yoga (kwatha choorna and freshly prepared kwatha from it) established standard limits for analytical parameters. This work provided a benchmark for future research related to Shigrupunarnavadi Yoga, as it introduces a novel indication for internal administration. In this study, the pH of kwatha is of a weak acid nature, which indicates a standard loop diuretic effect. Reassuring the quality of drugs used in a formulation is the need of the hour to safeguard well-being and allow the study to accomplish worldwide acceptance. Hence, the present study concluded that Shigrupunarnavadi yoga is a safe and effective formulation to administer internally.

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Cite this article as:

Arundhathi Prasad, Ravikrishna S and Suchitra N. Prabhu. Pharmaceutico-analytical study of Shigrupunarnavadi yoga: A poly-herbal preparation. Int. J. Res. Ayurveda Pharm. 2024;15(4):70-74
DOI: http://dx.doi.org/10.7897/2277-4343.154120

Source of support: Nil, Conflict of interest: None Declared