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SHIGRU ARKA AND TRIPHALA ARKA – ANALYTICAL STUDY WITH REFERENCE TO TOPICAL USE IN COMPUTER VISION SYNDROME

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ABSTRACT

Computers and smart phones are now an integral part of our day-to-day lifestyle. With all its advantages, the flickering digital screens bring in certain health related issues, awareness of the same is very minimal. The shift from paper to computers has been so rapid and strong that the eye has not adopted to the new demands to work at near in a new stressful visual environment for extensive hours, especially post Covid Pandemic. The group of symptoms like eye strain, blurred vision, redness, ocular pain, dryness and neck-shoulder pain is termed as Computer vision syndrome or Digital eye strain. The disease can be correlated to Shushkakshipaka. Ayurvedic eye drops are known to show anti-inflammatory, antioxidant and antimicrobial activity due to their tannin content in aqueous extract of the herbs. '*Shigru*' (Moringa oleifera) is a well-known and widely available drug, considered as '*chakshushya dravya'* and indicated in almost all ailments of *Netra*. 'Triphala' (haritaki, vibhitaki and amalaki) is also a well-known and commonly used formulation for both local and internal administration in many forms, for the treatment of 'Netra roga'. It is also a known Rasayana and Chakshushya dravya. **Aim:** To conduct an analytical study on Shigru arka and Triphala arka after obtaining the distillate as per SOP. **Materials and Methods:** A literature search was carried out pertaining to Computer vision syndrome and Shushkakshipaka. Apt formulations i.e Shigru arka and Triphala arka were chosen for the study and were prepared as per standard references. The

distillate was subjected to physic-chemical parameters like Volatile matter, Specific matter, Refractive index, Viscosity, Total acidity and pH. Thorough microbial load analysis of dry samples and Arka obtained was done. The obtained results were analyzed for further ophthalmic topical use as eye drops in clinical study.

KEYWORDS: Shushkakshipaka, Physico-chemical parameters, Eye drops.

INTRODUCTION

Eyes are the main link between man and his environment. Eighty percent of what we perceive comes through our sense of sight.[1] With the advent of time, inevitable changes in food habits, life styles, occupational challenges and environment, has led to manifestation of new disorders. Computer vision syndrome (CVS) is one among such disorders occurring in computer professionals and other mobile device users (tablets, e-readers, cell phones etc) characterized by complex eye and vision problems related to near work.

It is reported that around 60 million people suffer from CVS globally, and that a million new cases occur each year.[2] The Computer using population in India is more than 40 million and 80% of them have discomfort due to CVS.[3,4] The contemporary treatment of Computer vision syndrome has relied predominantly on artificial tears and lubricants with some Ergonomics. As Computer vision syndrome is a recent occupational eye disease, it has no direct reference in Ayurvedic classics. However, it can be largely correlated to the symptoms of Shushkakshipaka of Sarvakshiroga,[5] as dryness is its main symptom.

'Shigru' is considered as 'chakshushya dravya' by Acharya Sushruta[6] and Bhavaprakasha.[7] It is a significant herbal drug indicated in all Netra Rogas[8], in specific it is indicated in Vataja Netra Rogas according to Charaka samhita[9] and Bhaishajya ratnavali.[10] 'Shigru patra' by virtue ofits 'madhura rasa' and sheeta guna[11] is going to pacify vata dosha, which is vitiated in Shushkakshipaka. 'Shigru' is mentioned as 'tridosha-shamaka'[12] (mitigates all three doshas); it also acts as 'Rasayana'[13] (rejuvenator); it is indicated in 'Shiroroga'[14]; and it exhibits 'Shothahara'(anti-inflammatory) and 'Shulahara'[15] (analgesic) properties.

'Triphala' (haritaki, vibhitaki and amalaki) is a well-known and commonly used formulation for both local and internal administration in many forms, for the treatment of 'Netra roga'. It is also a known Rasayana (rejuvenator) and Chakshushya dravya.[16]

Aschyotana has been explained as a 'Prime Local Therapy' in all the diseases of eye,

especially in the conditions which present with ama-lakshanas like irritation, redness, ocular pain,etc.[17] Since the symptoms seen in CVS are similar to them, Aschyotana seem to counter the diseasesuccessfully, as the application in the form of eye drops makes the drug available for immediate action and most convenient method of topical application, especially for daytime use.

Arka is a unique preparation in which water soluble active principles and essential oils from the herbal drugs are extracted through drugs soaked in water using Arka yantra or any convenient modern distillation apparatus.[18] Triphala Arka[19] and Shigru Arka[20] are the formulations explained in 'Arka Prakasha' and are indicated in Netra Roga. Therefore, the study has been taken up to compare the efficacies of Shigru Arka eye drops with Triphala Arka eye drops in the effective management of 'Computer Vision Syndrome'.

Both *Shigru arka* and *Triphala arka* were extracted through simple distillation method using simple distillation apparatus at SDM Centre for research in Ayurveda and Allied Sciences, Udupi. They were subjected to various analytical tests as per the required standards, to quantify their physical as well as chemical attributions.

EXTRACTION OF *'SHIGRU ARKA'* AND *'TRIPHALA ARKA'*

Using simple distillation apparatus method, 1.5 liters of *'Shigru arka'* and 1.5 liters *'Triphala arka'* were obtained.

When the distillate was still lukewarm, it was packed in the sterile 20ml airtight dropper bottles, capped well, labelled as 'Eye drop- 1 and 2 respectively' along with their date of preparation.

Both *shigru arka* and *triphala arka* were colorless liquids with characteristic odour and watery touch. The detailed article on pharmaceutical aspect of above preparations is already published.

PHOTOGRAPHS

SHIGRU ARKA

TRIPHALA ARKA

||Om Shri Manjunathaya Namaha||

SRI DHARMASTHALA MANJUNATHESHWARA CENTRE FOR RESEARCH IN AYURVEDA AND ALLIED SCIENCES

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ANALYSIS REPORT FOR 1302/21092401-02

Part A: Particulars of sample submitted

Test requested by	: Dr. Jyothi S, Assistant Professor, GAMC, Mysore
Requested on	: 27-03-2023
Investigation to be performed	: Volatile matter, specific gravity, refractive index,

viscosity, and total acidity.

Sample coded as : 21092401-02

Sample details : Moringa arka drops, Triphala arka drops

Part B: Methodology

Volatile matter

10 ml of sample was extracted 2 times with 20 ml n-hexane. Hexane soluble portion was taken in a pre-weighed china dish and evaporated to room temperature. Noted the weight difference calculated the volatile matter.

Specific gravity

Cleaned a specific gravity bottle by shaking with acetone and then with ether. Dried the bottle and noted the weight. Cooled the sample solution to room temperature. Carefully filled the specific gravity bottle with the test liquid, inserted the stopper and removed the surplus liquid. Noted the weight. Repeated the procedure using distilled water in place of sample solution.

Refractive index

Placed a drop of water on the prism and adjusted the drive knob in such a way that the boundry line intersects the separatrix exactly at the centre. Noted the reading. Distilled water has a refractive index of 1.33206 at 29˚C. The difference between the reading and1.3320 gives the error of the instrument. If the reading is less than 1.3320, the error is minus (-) then the correction is plus (+) if the reading is more, the error is plus (+) and the correction is minus (-). Refractive index of oil is determined using 1 drop of the sample. The correction if any should be applied to the measured reading to get the accurate refractive index. Refractive index of the test samples weremeasured at 29˚C.

Viscosity

The given sample is filled in a U tube viscometer in accordance with the expected viscosity of the liquid so that the fluid level stands within 0.2 mm of the filling mark of the viscometer when the capillary is vertical and the specified temperature is attained by the test liquid. The liquid is sucked or blown to the specified height of the viscometer and the time taken for the sample to pass the two marks is measured. Viscosity is measured using the formula.

$$\eta 1 = \frac{\rho 1 t 1}{\rho 2 t 2} \times \eta 2$$

η1 – Viscosity of sampleη2 – Viscosity of water

t1 and t 2- time taken for the sample and water to pass the meniscusρ1 and ρ2 – Density of sample and water

X= Specific gravity of sample x 0.9961/specific gravity of water

Π= Xx Time for samplex1.004/specific gravity of waterx70sec

Total Acidity

Take 1 gram of the sample in a suitable titration flask & Dissolved in 75ml of CO_2 free water. Mix throughly, Titrate against std NaOH solution using 4-6 drops of phenolphthalein indicator till the pink colour persists for 10 sec.

$$\% \text{ Acidity} = \frac{0.23 \times V}{M}$$

V=Corrected volume of 0.05 N NaOH used M=Weight in grams of the sample taken for the test.

Determination of pH

Preparation of buffer solutions: Standard buffer solution: Dissolved one tablet of pH 4, 7 and 9.2 in 100 ml of distilled water.

Determination of pH: 1 ml of sample was taken and make up to 10 ml with distilled water, stirredwell and filtered. The filtrate was used for the experiment. Instrument was switched on. 30 minutestime was given for warming pH meter. The pH 4 solution was first introduced and the pH adjustedby using the knob to 4.02 for room temperature 30°C. The pH 7 solution was introduced and the pH meter adjusted to 7 by using the knob. Introduced the pH 9.2 solution and checked the pH reading without adjusting the knob. Then the sample solution was introduced and reading was noted. Repeated the test four times and the average reading were taken as result

Part C: RESULTS

Table 1: Organoleptic Characters.

Parameter	***Results n = 3% w/w***	
	Moringa arka	Triphala arka
Volatile matter (%)	0.82	1.05
Specific gravity	0.4180	0.9610
Refractive index	1.33256	1.33206
Viscosity (kg/ms)	0.4192	0.9913
Total acidity	0.015	0.018
pH	7.0	7.0

Part D: Results

The given sample of Moringa arka and Triphala arka has been standardized as per standard testing protocol. The results of standardization parameters are represented in respective Table 1.

|| Om Sri Manjunathaya Namaha ||

Sri Dharmasthala Manjunatheshwara Centre for Research in Ayurveda and Allied Sciences(AYUSH Centre for Excellence and Recognized SIROs by DSIR)

Laxminarayana Nagar, P.O. Kuthpady – 574 118, Udupi [Karnataka]

TEST REPORT Date: 27-03-2023

Part A: Particulars of sample submitted

Test requested by	: Dr. Jyothi Ravindra Angadi Asst. Professor, Dept of Shalakyatantra, Govt. Ayurveda Medical College, Mysore.
Test to be performed	: Microbial load analysis
Sample name	: Eye Drop -1 (Shigru Eye Drops)
Sample Code	230325
Sample presentation	: Plastic bottle

Part B: Methodology

Preparation of Casein Soya bean Digest Agar Medium (CSDAM).

Casein peptone (15 g), soya peptone (5 g), Sodium Chloride (5 g) were taken and dissolvedin 990 ml distilled water and pH was adjusted to 7.3±0.2 and make up the volume to 1000 ml. Finally add 15 g of agar to the media and autoclaved at 121˚C for 20 minutes.

Preparation of Buffered Sodium Chloride Peptone Solution (BSCPS) pH 7.0:

Dissolve potassium dihydrogen phosphate (3.56 g), disodium hydrogen phosphate (7.23 g), Sodium Chloride (4.3 g), peptone (1.0 g) were taken and dissolved in 990 ml distilled water. The pH was adjusted to 7.0 and make up the volume to 1000 ml. Then above buffer solution wasautoclaved at 121˚C for 20 minutes.

Part C: Results

Table 1: Microbial load analysis of: Eye Drop -1 (Shigru Eye Drops).

Sl. No.	Dilutions	Number of Colonies (NOC)		CFU/ml
1	Direct	0	0	0

CFU- Colony Forming Units

Conclusion: Eye Drop-1 (Shigru Eye Drops) is free from microorganisms.

|| Om Sri Manjunathaya Namaha ||

Sri Dharmasthala Manjunatheshwara Centre for Research in Ayurveda and Allied Sciences(AYUSH Centre for Excellence and Recognized SIROs by DSIR)

Laxminarayana Nagar, P.O. Kuthpady – 574 118, Udupi [Karnataka]

TEST REPORT Date: 27-03-2023.

Part A: Particulars of sample submitted

Test requested by : Dr. Jyothi Ravindra Angadi
Asst. Professor, Dept of Shalakyatantra, Govt. Ayurveda Medical College, Mysore.

Test to be performed : **Microbial load analysis**

Sample name : Eye Drop -2 (Triphala Eye Drops)

Sample Code 230325

Sample presentation : Plastic bottle

Part B: Methodology

Preparation of Casein Soya bean Digest Agar Medium (CSDAM)

Casein peptone (15 g), soya peptone (5 g), Sodium Chloride (5 g) were taken and dissolvedin 990 ml distilled water and pH was adjusted to 7.3±0.2 and make up the volume to 1000 ml. Finally add 15 g of agar to the media and autoclaved at 121˚C for 20 minutes.

Preparation of Buffered Sodium Chloride Peptone Solution (BSCPS) pH 7.0.

Dissolve potassium dihydrogen phosphate (3.56 g), disodium hydrogen phosphate (7.23 g), Sodium Chloride (4.3 g), peptone (1.0 g) were taken and dissolved in 990 ml distilled water. The pH was adjusted to 7.0 and make up the volume to 1000 ml. Then above buffer solution

wasautoclaved at 121˚C for 20 minutes.

Part C: RESULTS

Table 1: Microbial load analysis of: Eye Drop -2 (Triphala Eye Drops).

Sl. No.	Dilutions	Number of Colonies (NOC)		CFU/ml
1	Direct	0	0	0
CFU- Colony Forming Units				

Conclusion: Eye Drop-2 (Triphala Eye Drops) is free from microorganisms.

DISCUSSION

Enormous time spent over computer screens or over any digital screens on daily basis has created alarming concerns to a vital sense organ i.e. Eye. Covid pandemic and consequent online classes over screens has worsened the situation. Even the school going children are now experiencing digital eye strain and its related symptoms. This alarming occupational eye syndromeneeds to be tackled soon.

Researchers are untiringly on a hunt to identify plants, metals and minerals with medicinal properties. Though there has been immense evolution in the medical science, there are numerous challenging problems yet to be solved, before modern ophthalmologists to develop unexplored fields of medical knowledge hidden in ancient Ayurveda medical texts.

Aschyotana is the instillation of the drug in the form of drops into the eyes from a height of two *Angulas*. In *Netra Rogas* when the symptoms like *Ruk, Toda, Kandu, Gharsha, Kleda, Ashru, Daha, Raga,* and *Shotha* are present, *Aschyotana* is the treatment of choice, hence also in CVS due tosimilar type of symptoms. Among all the topical ophthalmic dosage forms, eye drops are easy to instillrepeatedly and carry to the work places.

Distillation is a prominent method of extraction of herbal active principles in the form of ‘distillate’. *Arka* is a suspension of the distillate in water with slight turbidity and color according to nature of drugs used and smell of the predominant drug. *Arka* analytical parameters include everything from basic organoleptic characters, physical tests to microbial analysis. Apart from basic analysis parameters, for Arka to be used as eye drops, pH value and Microbial analysis are very vital.

Analytical study of the given sample of Shigru arka and Triphala arka revealed that the volatile matter (%) respectively was 0.82 and 1.05. Specific gravity was 0.4180 and 0.9610

respectively. Refractive index was 1.33256 and 1.33206 respectively. Viscosity (kg/ms) was 0.4192 and 0.9913 respectively. Total acidity was 0.015 and 0.018 respectively. And pH was 7.0 for both the samples.

The microbial analysis of both Shigru arka and Triphala arka have shown absolutely nil microbial load and hence, are sterile for ophthalmic usage. The analytical findings of both the samples of Moringa arka and Triphala arka are in the permissible range for ophthalmic clinical use. The neutral pH of both the prepared eye drops is suitable for ophthalmic use and lies in the normal pH range of tears of eye.

The shelf life of these arka preparations in the study is considered as one year or until the appearance of slightest turbidity in them. Every year new samples of these arka will be prepared and thorough analysis of the samples will be carried out for clinical use.

CONCLUSION

1. Computer vision syndrome is a serious problem for the millions of people who spend hours infront of a computer.
2. Distillation is the most important way of extracting the herbal active principles in the form of‘distillate’.
3. The properties of *Arka*, like reduced dosage, tastelessness, colorless, clarity and stability have made them better patient compliance and has allowed for vast opportunities in Pharmaceuticaland Clinical researches in the field.
4. Standardization of topical eye drops (Aschyotana) includes applying the standard analytical parameters right from the raw material collection till the application of obtained distillate in the form of eye drops.
5. *Arka* analytical parameters include Volatile matter, Specific gravity, Refractive index, Viscosity, Total acidity and pH.
6. Physico-chemical profile of Shigru eye drops and Triphala eye drops is the most essential parameter for quality assurance in the present work and the results obtained were well within the standard norms.
7. Thorough microbial load analysis prior to clinical use is a vital parameter for the prepared eyedrops to prevent ocular infections and to abide by ethical principles.
8. When the standard analytical parameters are accessed at every stage in preparation and administration of eye drops, it strengthens the quality compliance and assures presumable clinicaloutcome.

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