Research Article.

International Research Journal of Ayurveda & Yoga

An International Peer Reviewed Journal for Ayurveda & Yoga

Physicochemical and Pharmaceutical Analysis of *Swarnagairikadi Gutikanjana* – An Ayurveda Herbomineral Formulation

Mahima Gujral,[1] Manjusha Rajagopala[2]

VOLUME 4 ISSUE 9

1. Final Year PG Scholar, Department of Shalakya Tantra, All India Institute of Ayurveda, New Delhi-110076
2. Professor and Head, Department of Shalakya Tantra, All India Institute of Ayurveda, New Delhi-110076

Corresponding Author :- Dr. Mahima Gujral, Final Year PG Scholar, Department of Shalakya Tantra, All India Institute of Ayurveda, New Delhi-110076

Article received on 11th Sept 2021 Article Accepted 24th Sept 2021 Article published 30th Sept. 2021

ABSTRACT: -

Eye is the most essential sense organ mentioned in Ayurveda. For the prophylactic as well as therapeutic purposes so many formulations are mentioned in *Susruta Samhita* for the eye and its disorders. One such formulation is *Swarnagairikadi Gutikanjana*. The preparatory procedure of such formulations needs authentication and standardization. Here modern day tools are applied for the pharmacognostical and pharmaceutical analysis which is necessary for scientific justification. The detailed analytical study helps in knowing the pharmacokinetics and pharmacodynamics of the formulation. The quality, efficacy, purity, and strength of the drug are also evaluated with the classical references of *Rasashashtra*. The analytical techniques of *Rasashashtra* as well as todays sophisticated qualitative and quantitative parameters are used in the processing of this formulation. The drug procurement, methodology of preparation and various parameters have been described in detailed manner with an objective of its reproducibility.

Key Words – *Swarnagairikadi Gutikanjana*, Herbomineral formulation, *Gutikanjana*, Ocular Ayurveda formulation

How to cite this article: Gujral M, Rajagopala; Physicochemical And Pharmaceutical Analysis Of *Swarnagairikadi Gutikanjana* – An Ayurveda Herbomineral Formulation IRJAY. [Online] 2021;4(9):114-125. Available from: http://irjay.com ;

DOI: https://doi.org/10.47223/IRJAY.2021.4913

INTRODUCTION

Eye allows us to capture light and convert it into an electrical signal. It is mainly responsible for the sense of sight. One of the most common eye diseases which can result in irreversible loss of vision is Glaucoma. It is the chief cause of irreversible blindness all over the world.[1] It is a group of disorders identified by chronic progressive optic neuropathy which lead to damage of Optic nerve head and irreversible Visual function loss, frequently associated with raised IOP. It affects all segments of the society and causes significant health and economic consequences. Most of the symptoms of Primary Open angle Glaucoma are similar to that of *Kaphaja Adhimantha* which is mentioned by *Acharya Sushruta* as an acute eye sensation in which the eye appears to be being pulled and churned up, with the involvement of the head's half in relation to specific elements of the particular *dosha* involved. For treatment of the *Adhimantha* and other eye disorders various *Anjana yogas*[2] are advised in *Samhitas*. *Swarnagairikadi Gutikanjana*[3] is mentioned in *Vatabhishyanada Pratishedha Adhyaya* which is a herbo-mineral formulation. This formulation contains *Gairika, Saindhava, pippali* and *Shunthi*. The lack of standardization in poly herbal formulations makes it challenging to validate efficacy and maintain formulation quality standards. To assure the quality and standardization of manufactured medicine, identification of raw materials using microscopic and morphological characteristics, as well as appropriate analytical procedures, is required. Hence, *Swarnagairikadi Gutikanjana* is subjected for pharmacognostical, HPTLC and pharmaceutical analysis.

It becomes necessary to apply modern day available tools to provide scientific justification of the various undergoing processes of *Rasa shashtra* (Iatrochemistry of Ayurveda)[4]. Analytical research on a drug also aids in the interpretation of its pharmacokinetics and pharmacodynamics. Analytical research has two goals: to scientifically understand *Rasashastra* principles and to evaluate them for efficacy, quality, purity, and strength. Physico-chemical analysis gives objective metrics for establishing quality standards for raw pharmaceuticals, in-process products, and finished products. In Ayurveda, analytical approaches have always been regarded as a means of determining the ultimate product's quality. However, in order to justify their acceptability in the medical science system, qualitative and quantitative study of medicines using modern scientific procedures and tools is critical.

MATERIALS AND METHODS:

CTRI Registration Number – CTRI/2020/05/025043

Authentication and identification -

The drugs in their natural state are identified, authenticated and microscopically evaluated in the pharmacognosy lab of AIIA, New Delhi.

Method of preparation of *Swarnagairikadi Gutikanjana*

There are 4 ingredients in the *Swarnagairikadi Gutikanjana.*

1. *Shuddha Swarnagairika* powder 10gm (procured from AIIA pharmacy)
2. *Saindhav Lawan*a 20gm (purchased from open market)
3. *Pippali* powder 40gm (purchased from open market & sifted in a 80 number sieve)
4. *Shunthi* powder 80gm (purchased from open market & sifted in a 80 number sieve)

Net dry ingredients taken were 150gms which were ponded with 150 ml goat's milk (procured from a local herdsman) in the 1st *Bhawana.* The first mixture got dried after 3 days of trituration in a mortar & pestle made of stone. On the 4th Day, 150 ml goat's milk was added to the dry mixture again and triturated for 3 more days until the whole mixture got dried. The absorption of milk got reduced in successive trituration, so for the 3rd & 4th trituration only 100 ml milk was added to the mixture. Later it was further reduced to 50 ml in last 3 trituration. In total 7 times the trituration was done for preparation of this drug as the exact amount was not mentioned in the text. After drying of the last (7th) mixture, 9 *gutikas* of various sizes (200-300mg) were prepared and kept in oven at 50 degree Celsius for 2 days to get the desired weight (120mg) of *Swarnagairikadi gutikanjana*. Finally, the 220 mg *gutika* dried to 120mg. Considering that as a standard we proceeded further for rolling of the pills. Each pill was measured and given shape of a *yavakara varti*. Later, all were dried maintaining the sterile conditions in an electric oven at 50 degree Celsius.

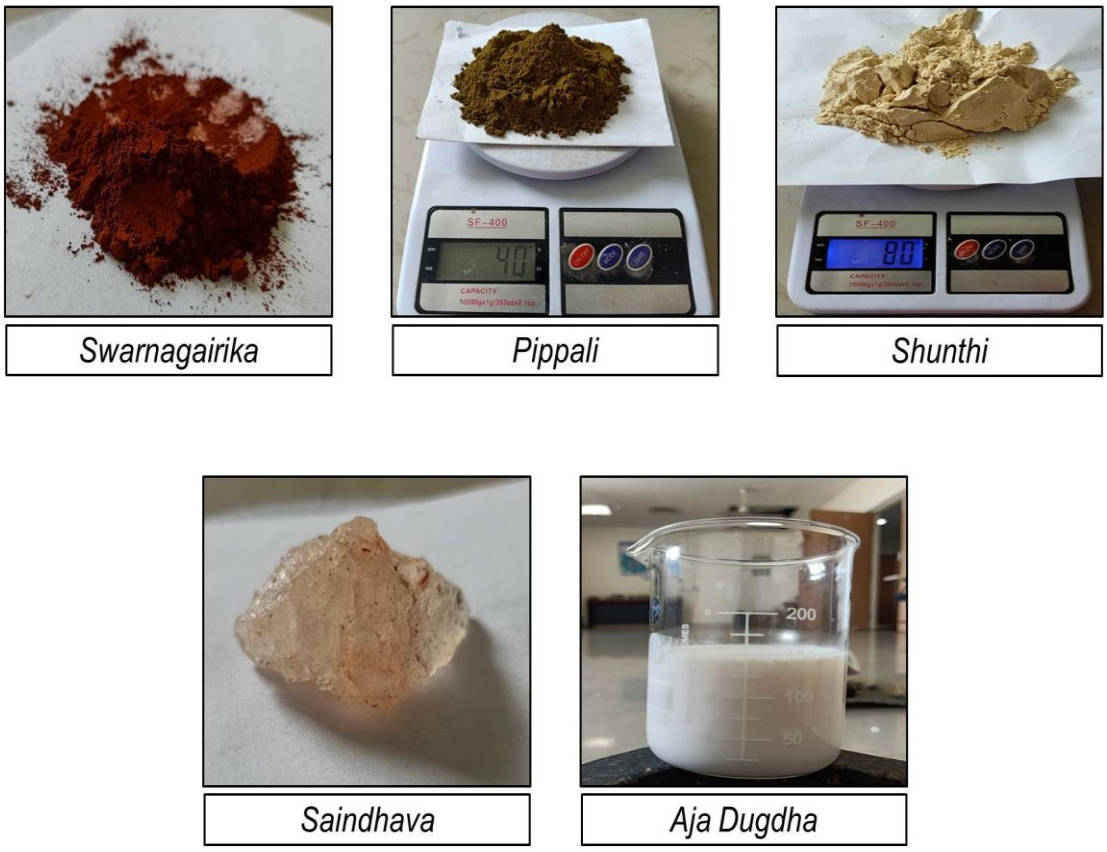

Figure 1 Contents of *Swarnagairikadi Gutikanjana*

Figure 2 Procedure followed in the preparation of *Swarnagairikadi Gutikanjana*

The following tests were carried out for the prepared formulation–

A. **Organoleptic parameters -** It includes sensory characters of drug like *Sparsha* (Consistency), *Rupa* (Colour), *Rasa* (Taste) and *Gandha* (Odour).
B. **Physical tests -** It includes characters like Shape, Diameter, Hardness[5], Uniformity of weight[6], Friability[7] of the prepared formulation.
C. **Physicochemical evaluation -** To determine the parameters like pH value[8], Loss on drying at 105°C[9], Ash value[10], Acid insoluble ash[11], Water soluble ash[12], Water soluble extractives[13], Methanol soluble extractives[14] values.
D. **Sophisticated instrumental analysis like HPTLC**

OBSERVATIONS AND RESULTS

A. **Organoleptic characters:** Recorded using sensory organs and written in table no.1

Table 1 Organoleptic characteristics of *Swarnagairikadi Gutikanjana*

Parameters	**Readings**
***Sparsha* (Consistency)**	Smooth
***Rupa* (Colour)**	Reddish brown
***Rasa* (Taste)**	*Eshat Tikta* (Mild Bitter)
***Gandha* (Odour)**	*Aja Dugdha* (Goat milk)

B. Physical tests:

Table 2 Physical analysis of *Swarnagairikadi Gutikanjana*

Parameters	**Readings**
Shape	*Yavakara*
Dimensions – Length & width (mm)	18.45mm X 4mm
Hardness (kg/cm^2)	14.3
Weight of Pill (mg)	150 ± 5
Friability (%)	1.05 %

C. Physico-chemical Parameters:

Table 3 Physicochemical parameters of *Swarnagairikadi Gutikanjana*

Parameters	**Readings**
pH at 25^{0}C	6.45
Loss on drying (%w/w) at 105°C	6.79 %
Ash value (%w/w)	19.91 % (not more than 25%)
Acid insoluble ash (%w/w)	51.07%
Water soluble ash (%w/w)	60.77%
Water soluble extract (%w/w)	27.8% (not less than 25%)
Alcohol soluble extract (%w/w)	26.8% (not less than 18%)
Phytoconstituents present in Methanol soluble extract	Alkaloids & Carbohydrates
Phytoconstituents present in Aqueous soluble extract	Alkaloids, Carbohydrates & Saponins
Phyto constituents Absent in Methanol soluble extract	Reducing sugars, Flavonoids, Saponins, Tannins, steroids, Glycosides & Phenol
Phyto constituents Absent in Aqueous soluble extract	Reducing sugars, Flavonoids, Tannins, steroids, Glycosides & Phenol

D. Sophisticated instrumental analysis - High Performance Thin Layer Chromatography (HPTLC)

HPTLC is a type of TLC that is more advanced and automated. For the examination of botanical materials, HPTLC is a useful quality assessment technique. It provides for the efficient and cost-effective analysis of a wide range of chemicals. Furthermore, multiple samples can be analysed in a single analysis, significantly lowering analytical time. The study can be viewed using different wavelengths of light using HPTLC, resulting in a more complete picture of the plant than is usually seen with more particular sorts of examinations.

The principle is the same as for TLC, viz adsorption. A thin layer of adsorbent deposited on a chromatographic plate is used to spot one or more chemicals. Capillary action causes the mobile phase solvent to pass through (against gravitational force). The component that has a stronger affinity for the stationary phase travels more quickly. On a thin layer chromatographic plate, the components are separated according to their affinity for the stationary phase.

Steps involved in HPTLC:

- Selection of chromatographic layer.
- Sample and standard preparation.
- Application of samples
- Chromatographic development.
- Detection of spots.
- Scanning.
- Documentation of chromatic plate

Preparation of test solutions: 1 gm powder each of *Swarnagairikadi gutikanjana* was accurately weighed and added in 10 ml of distilled water and methanol respectively. For the first 6 hours, the solutions were shaken every 30 minutes, and then left still for 18 hours. Next morning, the solutions were sonicated for 20 minutes and then filtered through Whatman filter paper no.1. The filtrates were collected, coded as SG-1(Aqueous extracts) and SG-2, (Aqueous extract with added honey) and SG-3 (Methanolic extracts) and SG-4 (Methanolic extract with added honey).

Chromatographic conditions:

- Sample application: Applicator- CAMAG Linomat V" Linomat 5_230245" S/N 230245 (1.00.13) , Syringe size- 100 micro liter
- Band width – 8.00 mm
- Filtering System : Whatman filter paper No. 1
- Stationary Phase : Plate size-10×10 cm, Material-TLC plates silica gel 60 F 254, Manufacturer- E.MERCK KGaA
- Sample application volume : 10 µl
- Development mode : CAMAG TLC Twin Trough Chamber 10×10 cm
- Chamber saturation time : 30 minutes
- Mobile phase : Toluene : Ethyl acetate : Acetic acid (7:2.1)
- Solvent front- 70.00 mm, vol.- 10 ml, Drying device- TLC Plate Heater, Temperature- 60^0C
- Visualization : at 254nm, 366nm and 540nm
- Detection instrument- CAMAG TLC scanner"Scanner_230698(2.01.02), Slit dimensions- 6,.00×3.45 mm, micro, Scanning speed- 20nm/s, Lamp- D2 for 254 nm, Hg for 366nm , W for 540 nm
- Measurement type- Remission, Measurement mode- Absorption

Table 4 Rf values of *Swarnagairikadi Gutikanjana* at 254nm wavelength

Position of band	Name of sample	No. of Spots	Rf values
1	SG-1	9	0.06, 0.18, 0.23, 0.28, 0.35, 0.59, 0.65, 0.69, 0.75
2	SG-2	6	0.05, 0.28, 0.30, 0.35, 0.66, 0.70,
3	SG-3	8	0.03, 0.10, 0.15, 0.24, 0.34, 0.47, 0.65, 0.69,
4	SG-4	5	0.03, 0.36, 0.67, 0.71, 0.99

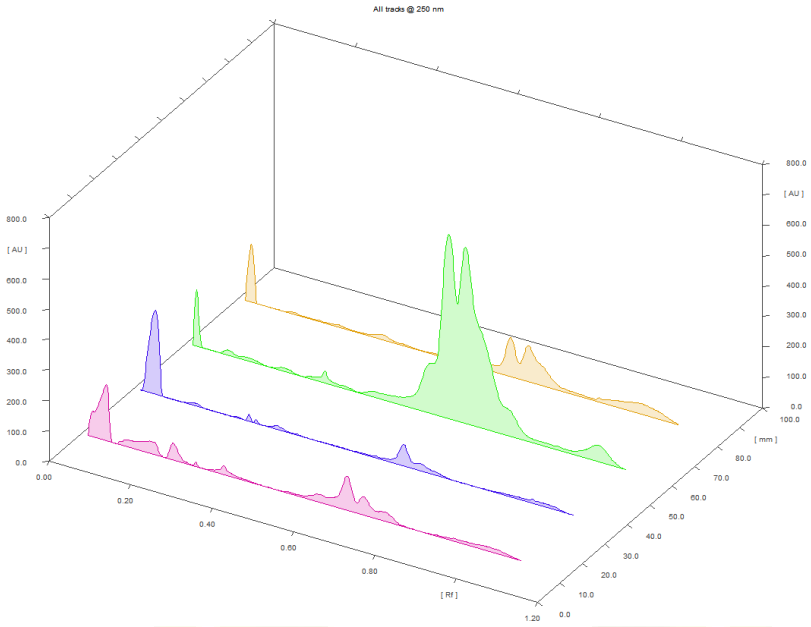

Figure 3 Densitogram at 254nm wavelength

Table 5 Rf values of *Swarnagairikadi Gutikanjana* at 366nm wavelength

Position of band	Name of sample	No. of Spots	Rf values
1	SG-1	6	0.06, 0.18,0.22, 0.28, 0.35, 0.65,
2	SG-2	3	0.05, 0.28, 0.66,
3	SG-3	8	0.03, 0.26, 0.34, 0.49, 0.60, 0.65, 0.70, 0.75,
4	SG-4	7	0.03, 0.62, 0.67, 0.72, 0.78, 0.89, 0.99

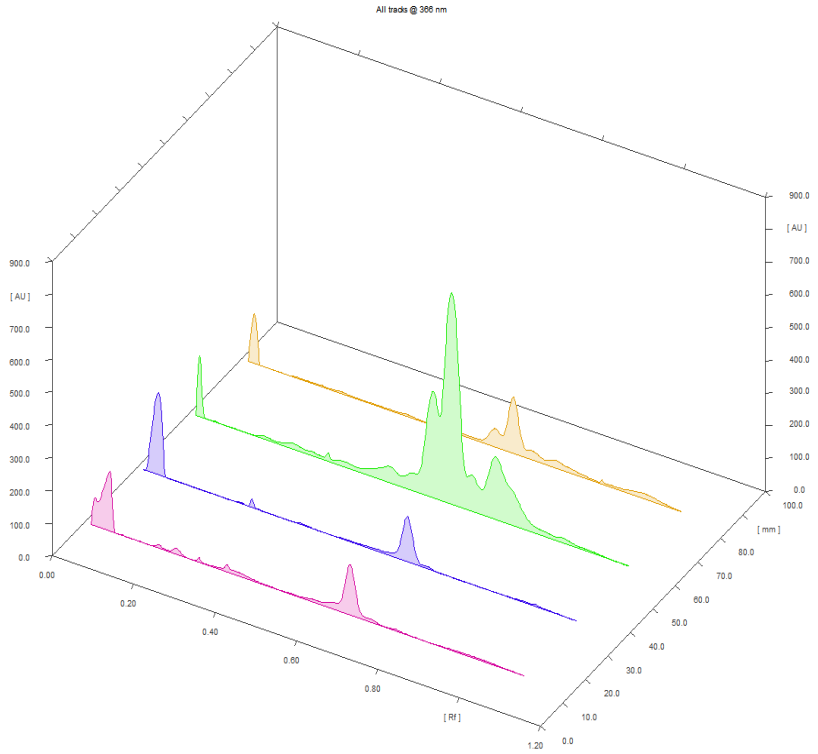

Figure 4 Densitogram at 366nm wavelength

Table 6 Rf values of *Swarnagairikadi Gutikanjana* at 540nm wavelength

Position of band	Name of sample	No. of Spots	Rf values
1	SG-1	1	0.02
2	SG-2	1	0.05
3	SG-3	2	0.02, 0.60
4	SG-4	3	0.03, 0.62, 0.89

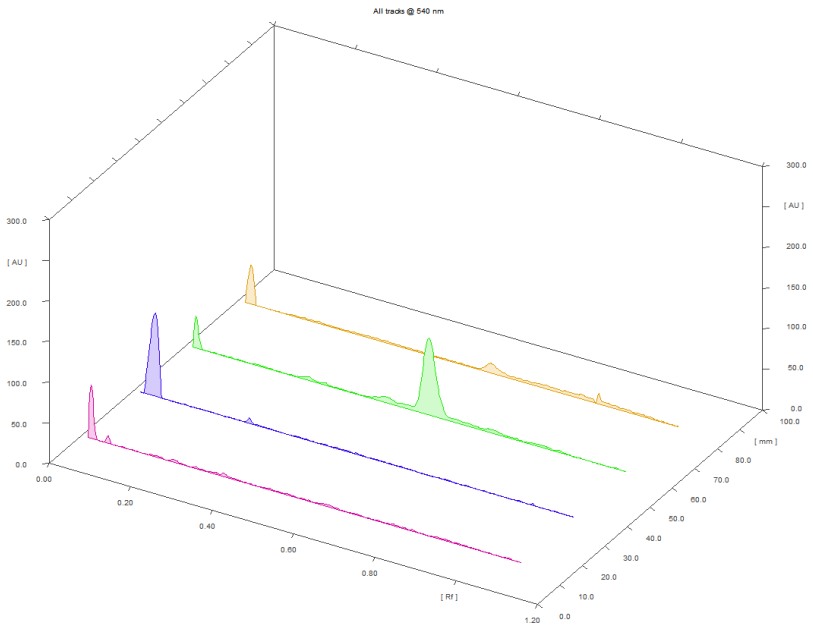

Figure 5 Densitogram at 540nm wavelength

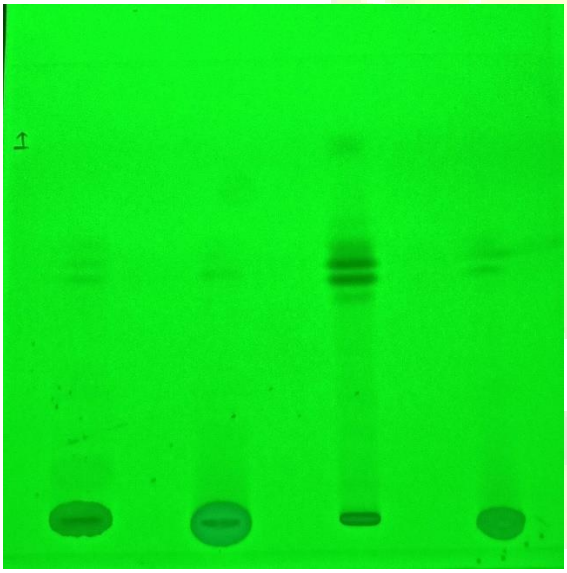

Figure 6 HPTLC plates at 254nm

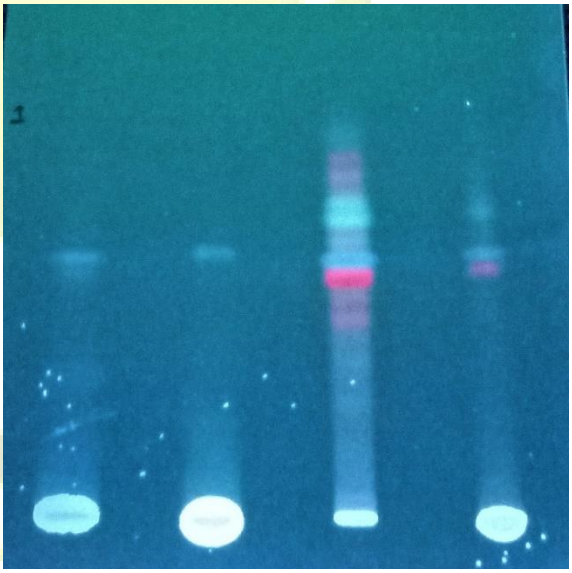

Figure 7 HPTLC plates at 366nm

Organoleptic Study

Swarnagairikadi Gutikanjana was evaluated for organoleptic characters i.e. taste, odour and colour & texture etc**.**

Microscopic study

Diagnostic microscopic characters of *Swarnagairikadi Gutikanjana* showed that Border pitted vessels, Starch grains and Oleoresin contents of *Shunthi* (*Zingiber officinale* Roscae) oleoresin contents, Bottleneck stone cell and Aloerone of *Pippali* (*Piper longum* Linn*).*

DISCUSSION

The *Swarnagairikadi Gutikanjana,* used in the clinical study showed encouraging results, has been analyzedfor pharmagnostical and analytical parameters, which is a step towards standardization of the drugs.

Swarnagairikadi Gutikanjana comprises of *Swarnagairikaika Bhasma, Saindhava Lawana, Pippali* and *Shunthi Churna*. It's indicated in treatment of *Vatabhishyanada*. The ***Swarnagairika bhasma*** is *Snigdha, Madhura, Kashaya* rasa, and having *sheeta* property. Its *chakshushya* in nature and expels *Pitta, rakta* and *kapha dosha*.[15] ***Saindhava lawana*** is *Rochaka, Deepan, Chakshushya*, and *Avidahi*. It is *Madhura rasa* and has *Tridosha shaman* property. It is considered the best among all different varieties of salts.[16] ***Pippali*** has *Vata Kapha shaman* property. When it's combined with *madhu* it is supposed to reduce *Medo dhatu* and *Kapha dosha*.[17] Even though this is explained in context of its oral intake, the same action can be assumed in local application also as honey itself has *Kaphahara* action. ***Nagara*** or *shunthi* is said to be rich in *aagneya mahabhuta* and thus helps in drying out the water content[18]. This is also explained in context to its systemic effect but locally the same principle can be advocated and the squeezing out water content can be considered as one factor for drying out the excess aqueous and hence reducing the raised Intra Ocular Pressure in Glaucoma. ***Madhu*** is said to *be Nayanaamaya haram* and *laghu guna*. It is also termed as *chakshushya* and hence used with so many ocular formulations. It has *Madhura rasa* and *Kashaya Anurasa* but it is *Ruksha* having *Agni deepana* property. Acharya Sushruta called it as *chakshushya*, *prasandana* and *Sukshama maarganausari* means it can reach to the minute channels. It has *Kaphaghna* action and reduces *vata* and *pitta* as well.[19]

The organoleptic parameters were assessed with the help of sensory organs. *Swarnagairikadi gutikanjana has* smooth consistency, reddish brown colour, bitter taste and very specific Goatee smell to it. The Shape of the *Vartis* was *Yavakara* (like Barley). The physical test like Shape diameter and length of *vartis* was done using a digital venire caliper. All the values were taken in triplicated manner and average value is recorded in the table. The hardness of the *Vartis* was analyzed by checking hardness of 10 similar *Vartis* using a Monsanto apparatus. The average hardness of each *Varti* was 14.3kg/cm^2. Likewise, the weight variation of each pill separately and altogether was measured by taking 20 different *Vartis*. Friability was recorded as 1.05%. The Physicochemical parameters like pH was 6.45 (slightly alkaline), the moisture content was also low when assessed by Loss on drying (6.79%) indicating that the drug was properly prepared and has good stability , Ash Value was 19.91% which was within limit according to API standards, Acid insoluble ash was 51.07% which indicates earthy impurities present in the drug , Water soluble ash was 60.77%, Water soluble extract (27.8%), Alcohol soluble extract (26.8%) were found to be within normal limits when compared with the API standards. Non-volatile organic substances are indicated by the Ash value. Qualitative Alkaloids and carbohydrates were found in the methanol soluble extract, but reducing sugars, flavonoids, saponins, tannins, steroids, glycosides, and phenol were not. Alkaloids, carbohydrates, and saponins were also found in the aqueous soluble extract. Reducing sugars, Flavonoids, Tannins, Steroids, Glycosides, and Phenol were all found to be negative in the test. Saponins protect the nervous system. HPTLC was used to visualise four

different samples (aqueous extract, aqueous extract with honey, methanolic extract, methanolic extract with honey) at 254nm, 366nm, and 540 nm. The highest peaks were recorded in methanolic extract.

CONCLUSION

Swarnagairikadi Gutikanjana, an effective drug in the treatment of *Adhimantha*, was studied in terms of pharmacognosy and phytochemistry. The substances employed confirm the quality of *Swarnagairikadi Gutikanjana*, according to preliminary organoleptic aspects and powder microscopy data. All of the ingredients were verified as legitimate and compared to the API specifications (Ayurvedic Pharmacopeia of India). Water soluble and alcohol soluble extracts, pH, and Ash values were evaluated in phytochemical analysis. Although the current study covers the groundwork for standardizing *Swarnagairikadi Gutikanjana*, additional crucial analysis investigations are needed to identify all of the active chemical elements of the test drug in order to substantiate the clinical efficacy. Additional criteria evaluated in this study can be used as a standard for future research.

ACKNOWLEDGEMENTS

The guidance provided by Prof. PK Prajapati (Professor and Head) and Dr. Pramod Yadav (Assistant Professor) from the Department of RSBK-AIIA is greatly appreciated. We wish to extend special thanks to the PG Scholars Dr. Deenadayal Devarajan, Dr. Robin Badal and PhD Scholar Dr. Shreshtha Kaushik for helping with the Analytical study. The study is conducted at Quality Control lab of All India Institute of Ayurveda and would not be possible without support of RSBK and DG Department.

Financial Support: All India Institute of Ayurveda, New Delhi**.**

Conflict of Interest: Nil

REFERENCES

1. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *Br J Ophthalmol*. 2006;90(3):262-267. doi:10.1136/bjo.2005.081224
2. Shastri A.D SushrutaSamhita Uttartantra18/83, Hindi Commentary Ayurveda Tattva Sandipika Chaukhambha Orientelia, Varanasi;2001.
3. Shastri A.D Sushruta Samhita Uttartantra9/16, Hindi Commentary Ayurveda Tattva Sandipika Chaukhambha Orientelia, Varanasi;
4. Savrikar SS, Ravishankar B. Introduction to 'Rasashaastra' the Iatrochemistry of Ayurveda. *Afr J Tradit Complement Altern Med*. 2011;8(5 Suppl):66-82. doi:10.4314/ajtcam.v8i5S.1
5. Anonymous, Indian Pharmacopoeia, Government of India, Ministry of Health and Family welfare, New Delhi, 1996, Volume II, pg 734.
6. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. III, 2010: Appendix-3, (3.15), Pg 205.
7. Anonymous, Indian Pharmacopoeia, Government of India, Ministry of Health and Family welfare, New Delhi, 1996, Volume II, Appendix – 7.1, pg. A-80.
8. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-3, (3.3), Pg 191.
9. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I,

2007: Appendix-2, (2.2.10), Pg. 141.
10. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-2, (2.2.3), Pg. 140.
11. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-2, (2.2.4), Pg. 140.
12. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-2, (2.2.5), Pg. 140.
13. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-2, (2.2.8), Pg. 141.
14. Anonymous, The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. of India: Ministry of Health and Family Welfare; Part II, Vol. I, 2007: Appendix-2, (2.2.7), Pg. 141
15. Mishra B.S Bhavamishra, Bhavaprakasha, Purvakhanda Mishraprakrana Chaukhamba Sanskrita Sansthana, Varanasi, 10th Edition 2002; 275-276.
16. Yadav T, Charaka Samhita Sutra 27/300, Varanasi: Chaukhamba Surbharati Prakashan; Reprint 2000
17. Mishra B.S Bhavamishra, Bhavaprakasha, Haritkyadi varga/49-53 Chaukhamba Sanskrita Sansthana, Varanasi; 2002.
18. Mishra B.S Bhavamishra, Bhavaprakasha, Haritkyadi varga/44, Chaukhamba Sanskrita Sansthana, Varanasi;2002.
19. Shastri A.D SushrutaSamhita Sutra 45/132 Hindi Commentary Ayurveda Tattva Sandipika Chaukhambha Orientelia, Varanasi;2001.