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PHYSICOCHEMICAL AND PHYTO CHEMICAL ANALYSIS OF MASHA AND MUDGA W.S.R. TO GURU AND LAGHU GUNA

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ABSTRACT

While studying the *Dravya*, all the materials that are stated as *Dravya* are useful for humans. These *Dravyas* are used on the basis of *Gunas* (properties) associated with them. All the *Dravya* that possess medicinal properties are superior due to these *Gunas*, which are similar to that of composition properties in human body; hence they are also stated as *Gurvadi Gunas*, the 20 *Guruvadi*/ *Sharir Gunas* can be clubbed into two major *Guna* viz. *Guru* and *Laghu Guna*. In present scenario we have to work a lot to explain modern world about the functioning, action and interaction of these *Gunas*. Our ancient *Acharyas* describe *Guna* on the basis of effect observed after consumption. But some analysis can be made that can give us In-vitro results for same. *Masha* and *Mudga* following same category of food drugs were used for analysis to identify *Guru* and *Laghu Guna* present between them. A list of analytical experiments followed the conclusion.

KEYWORDS: Guru, Laghu, Guna, Phytochemical, Physicochemical, Dravya.

INTRODUCTION

Ayurveda is an ancient *Shashwat* science for maintaining health and wellbeing of human beings as well as other living beings since thousand decades.[1]

"सोऽयमायुर्वेदः शाश्वतो निर्दिश्यते, अनादित्वात, स्वभावसंसिदलक्शणत्वात्, भावस्वभावनित्यत्वाश्च ॥च.सु.३०/२७॥

It contains huge information of various methods and formulation of herbs, which are useful for clinical and medical purpose. To study this medicine a branch was developed by *Acharyas* named as *Dravyaguna Vigyan.*[2]

"द्रव्यणां नामरुपाणि गुणकरमाणि सर्वशः। प्रयोगाश्चापि वर्ण्यन्नते यास्मिन् द्रव्यगुणं हि तत्॥ Pg no 3 Dravyagunavigyan priyavrat Sharma"

While studying *Dravyaguna* we must be clear about *Padarthas* (substances). Seven *Padarthas* are mention in *Dravyaguna* viz. *Dravya*, *Guna*, *Rasa*, *Virya*, *Vipaka*, *Prabhav*, and *Karma*.

द्रव्य रसो गुणो वीर्य विपाकः शक्तिरेव च।

पदार्थः.....॥भा.प्र.पू.मि.६.१६९

Gunas are 41 which are classified under following category- 1) *Sharir* or *Gurvadiguna*, 2) *Vesheshguna*, 3)*Aatmaguna*, 4) *Paradiguna*.

The *Guruvadi Guna* are related to *Sharir Dhatu* and *Dravya*, therefore they are called as *Sharirguna* by *Kaviraj Gangadhar*. *Sharirguna* plays an important role in *Dravyagunavigyan*. The *Gurvadi Gunas* are present in *Dhatus* of body.

तत्रमे शरीरधतुगुणाः संख्यासामर्थ्यकराः.....द्रवाः॥च.शा.६/१०॥

These *Gunas* are also present in *Aushad* and *Ahara*. Use of drug depends on *Samanya* and *Vishesha Sidhhant* that means, *Dravya* increases *Dhatu* in bodies which are having similar quality of *Gunas*, while it decreases *Dhatu* having dissimilar quality of *Guna*.

Food is the basic component in the life of living being; all the activity of life only depends on the nature of food that we consume. *Acharyas* who practiced *Ayurveda* also stated food as medicine. In the concept of metabolism of both food and medicine *Acharya* cleared that food act by *Rasa* and medicine worked by *Virya*. Action of both medicine and food can be studied from the effect that caused on *Dhatu*, *Dosha*, and *Mala*; this action will be pacifying or aggravating on body component. Hence *Guna* present in *Dravya* plays an important role for selection of *Pathya-Apthya*, *Shodhan*-Shaman, *Aahara-Vihar* etc.

According to *Dravyagunavigyan*, *Guna* can be determined by *Pratyaksh*, *Anuman* and *Aptopdesh*. *Gunas* can be stated as pharmacological, Physical properties and chemical

properties of drugs. If it is so, then it may be possible to add some Physio-Chemical parameters or tools for determination of *Guna*. Among all twenty *Gurvadiguna Guru Guna* and *Laghu Guna* are important. In two main line of treatment that is *Santarpan* and *Apatarpan*, *Guru* and *Laghu Guna Dravya* are used. This group of *Guna* is applied in treatment of disease accordingly.

In this present study following two *Ahara Dravya* they are:- 1) *Masha*[3] (Phaseolus mungo), 2) *Mudga*[4] (Phaseolus radiates) will be taken for analysis of *Guru* and *Laghu Guna*, by the application of Physico-Chemical and Phyto-chemical parameters.

1. माशो गुरुर्भिन्नपुरीशमूत्रः स्निग्धोश्णोव्रुश्यो मधुरोऽनिलघ्न।

सन्तर्पण स्तन्यकरो विशेशाद् बलप्रदः शुक्रकफावहश्च॥सु.सु.४६/३४॥

2. मुद्गो रुक्श लघुग्राही कफपित्तहरो हिम।

स्वादुरल्पनिले नेत्र्यो ज्वरघ्नो वन्जस्तथा॥भा.प्र.८/३८॥

Sr No	Dravya Selected	Rasa	Virya	Vipak	Guna	Type of Dravya	Refrence
1	Masha (Phaseolus mungo)	Madhur	Ushna	Madhur	Guru	Ahara	Su.Su. 46/34
2	Mudga (Phaseolus radiates)	Madhur	Sheet	Madhur	Laghu	Ahara	Bha.pra. 8/38

Review of Literature

The literature concerned with *Guna* and physical, chemical, physio-chemical analysis was assessed for determination of *Guna* by using *Ayurvedic Samhita*, *Vedas*, *Nighantus*, modern literature and available data.

MATERIALS AND METHODOLOGY

Materials

Masha as Phaseolus mungo, Mudga as Phaseolus radiates, Instruments according to test done.

Methodology

After studying the previous research work done by research scholars on *Guna*; different analytical tests were selected for the present study through which *Guru and Laghu Guna* was studied at the molecular level.

A. Collection of Sample

Samples were self-collected from field by taking all required steps and precautions.

B. Identification of sample of Drugs

Identification of *Masha as Phaseolus mungo, and Mudga as Phaseolus radiates,* was done by Taxonomist.

C. Physio-chemical and Phytochemical Analysis

a. Moisture content[5]

b. Ash value[6]

c. Acid insoluble ash value[7]

d. Water soluble ash value[8]

e. Sulphated Ash[9]

f. Atomic Weight[10]

g. Glycemic Index[11]

h. pH of 5% w/v Suspension[12]

i. Aqueous extract value[13]

j. Alcohol extract value[14]

k. UV-VIS Spectrophotometry[15]

l. High Performance Liquid Chromatography (HPLC)[16]

m. Protein Content[17]

n. Thin-Layer Chromatography (TLC).[18]

Observations

Sr.No	Test Done		Masha		Mudga	
1	Moisture Content		2.24%		2.19%	
2	Total Ash Value		2.91%		2.83%	
3	Acid Insoluble Ash		<0.1%		<0.1%	
4	Sulphated Ash		0.11%		0.14%	
5	Glycemic Index		30		38	
6	pH of 5% w/v suspension		6.04		5.97	
7	Aqueous extract		60.74%		14.56%	
8	Alcohol extract		49.64%		13.07%	
9	Protein Content		4.3%		3.4%	
10	Atomic Weight		Phenol - 347.2585		Phenol - 133.3114	
11	TLC	UV 365nm light	**Rf Value**	**Colour**	**Rf Value**	**Color**
			0.89	Gray	0.62	Yellow
					0.67	Yellow
					0.73	Yellow
			0.99	Pink	0.87	Yellow
					0.95	Yellow

					0.99	Yellow
		Iodine Chamber	0.89	Gray	0.62	Yellow
					0.67	Yellow
					0.73	Yellow
			0.99	Pink	0.87	Yellow
					0.95	Yellow
					0.99	Yellow
13	HPLC		Bound Phenolic acid & Free Phenolic acid		Bound Phenolic acid & Free Phenolic acid	

12 UV-VIS Spectrophotometry

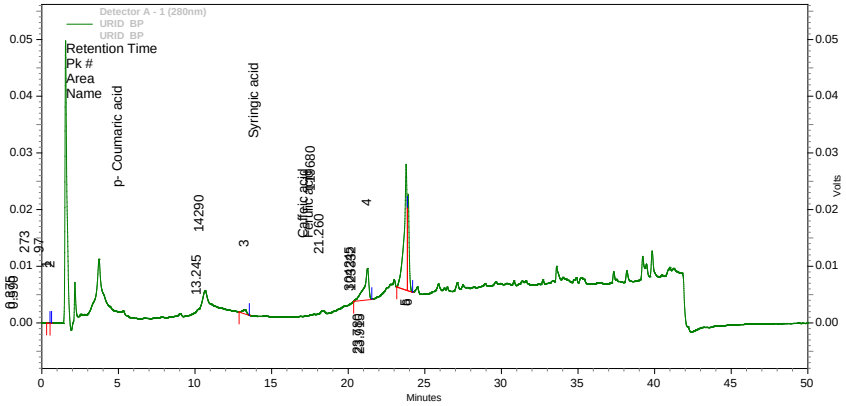
Masha		
Wavelength	**Absorption**	**Peak/Valley**
213.Onm	0.857	Peak
265.Onm	0.096	Valley
269.Onm	0.097	Peak
376.Onm	0.002	Valley
421.Onm	0.007	Peak
435.Onm	0.004	Valley
441.Onm	0.005	Peak
460.Onm	0.000	Valley
470.Onm	0.001	Peak
527.Onm	-0.014	Valley
617.Onm	-0.010	Peak
630.Onm	-0.011	Valley
666.Onm	-0.001	Peak
709.Onm	-0.014	Valley
721.Onm	-0.013	Peak
732.Onm	-0.015	Valley
752.Onm	-0.013	Peak
808.Onm	-0.015	Valley
906.Onm	-0.011	Peak
908.Onm	-0.012	Valley
987.Onm	-0.010	Peak
988.Onm	-0.011	Valley
1093.Onm	-0.029	Valley
Mudga		
Wavelength	**Absorption**	**Peak/Valley**
213.Onm	0.880	Peak
375.Onm	0.033	Valley
443.Onm	0.081	Peak
465.Onm	0.058	Valley
472.Onm	0.061	Peak
578.Onm	-0.005	Valley
612.Onm	-0.002	Peak
637.Onm	-0.003	Valley
666.Onm	-0.007	Peak

843.Onm	-0.008	Valley
906.Onm	-0.006	Peak
985.Onm	-0.005	Peak
986.Onm	-0.006	Valley
1094.Onm	-0.019	Valley

13 HPLC- Masha- Bound Phenolic acid

Table 1: Value observed for Masha (Bound Phenolic acid).

Peak	Detector A-1	Observed	Retention Time
3	280nm	p- Coumaric acid	13.245
4	280nm	Syringic acid	21.260
5	280nm	Caffeic acid	23.780

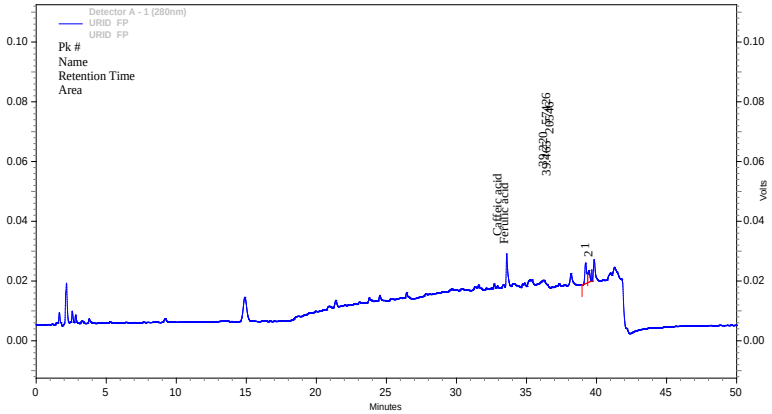


Graph 1: Peak observed for mash (bound phenolic acid).

Masha- Free Phenolic acid

Table 2: Value observed for Masha (Free phenolic acid).

Peak	Detector A-1	Observed	Retention Time
1	280nm	Caffeic acid	39.220
2	280nm	Ferulic acid	39.465

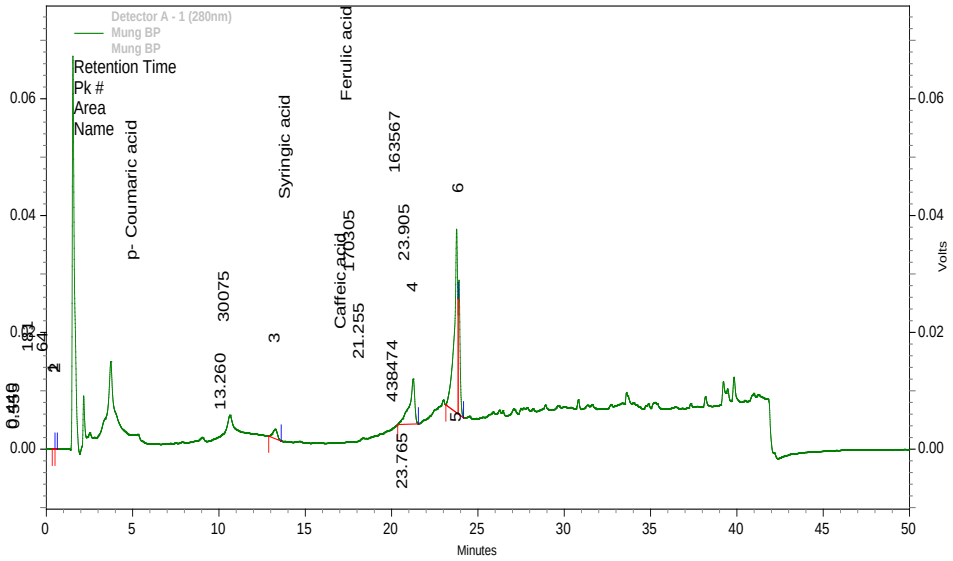


Graph 2: Peak observed for Mash (Bound Phenolic acid.

Mudga- Bound Phenolic acid

Table 3: Value observed for Mudga (Bound Phenolic).

Peak	Detector A-1	Observed	Retention Time
3	280nm	p- Coumaric acid	13.260
4	280nm	Syringic acid	21.255
5	280nm	Caffeic acid	23.765
6	280nm	Ferulic acid	23.905

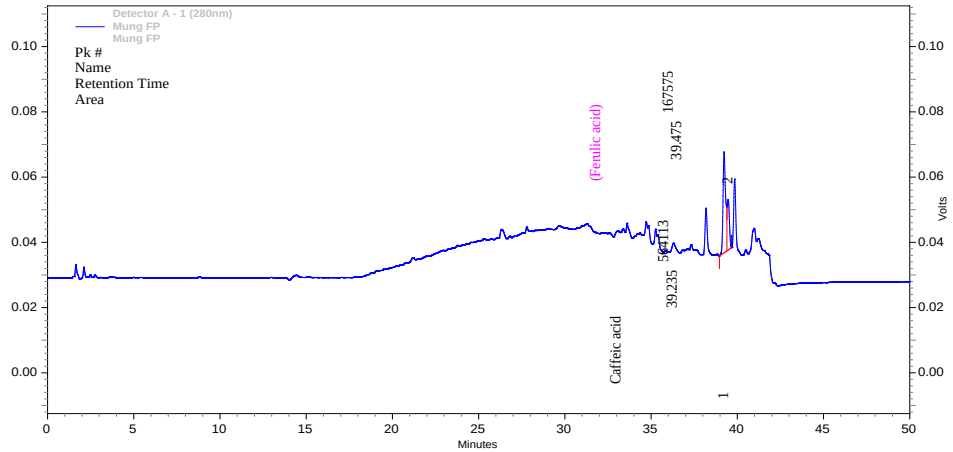


Graph 3: Peak Observed For Mudga (Bound Phenolic acid).

Mudga Free Phenolic acid

Table 4: Value observed for Mudga (Free Phenolic acid).

Peak	Detector A-1	Observed	Retention Time
1	280nm	Caffeic acid	39.235
2	280nm	Ferulic acid	39.475



Graph 4: Peak Observed for Mudga (Free Phenolic acid).

RESULT AND DISCUSSION

While reviewing 20 *Gurvadi Guna* it was observed that, *Acharya Sharangdhar* stated only five *Guna* with due respect to five *Mahabhutas, Prithvi- Guru, Jala- Snigdha, Teja- Tikshna, Vayu-Ruksha, Akasha-Laghu,* and all other remaining *Gunas* come under these five *Gunas.* Also there is a vast difference in type of *Guna* stated by different *Acharyas*. Earlier *Guna* were studied with reference to composition of *Mahabhuta*, *Rasa-Virya-Vipaka Adhishthan,* and effect on *Dosha*, *Dhatu*, *Mala*, *Agni*, *Strotas* with their utility in treatment. But in the developing modern world there is need of new techniques to be developed for proofing the *Guna*.

Researches on food are done to evaluate nutritional value, pharmacokinetics, propagation etc. Masha classified in Shimbi Dhanya in Brihat Trayi, Sushruta also describe in Kakolyadi Gana. Bhavprakash, Kaidev, Priya, Madanpal classified under Dhanyavarga while Raja Nighantu describe in Shalyadi Varga, and in Suvarnadi Varga by Dhanvantari Nighantu. Botanically Masha classified in Fabaceae family genus phaseolus to vigna. All Acharya consider Rasa-Panchak of Masha as Rasa- Madhur, Virya-*Ushna*, *Vipaka-Madhur*, *Guna-Guru*, *Snigdha* only *Kaidev* has given *Amla Anurasa* for *Masha*. *Masha* has *Balya*, *Brihan*, *Vrishya*, *Stanya* etc *Santarpan Karma*. It shows following bioactivity- Emollient, Astringent, Thermogenic, Diuretic, Aphrodisiac, Nutritious, Galactogauge, Appetizer, Laxative, Styptic, Spermatopoetic, and Nervine Tonic, etc.

Mudga vastly used in India, China, Nepal, Shrilanka, as a major food ingredient. Different trials are conducted on *Mudga* in china to study its Pharmacology and bioactivity. *Mudga* is mention as *Pathya* by *Acharyas* used in different kind of *Aahar Kalpana* for treatment. It is classified under *Shimbidhanya Varga* by *Charak*, *Sushruta*, *Vagbhatta*. In *Nighantu* it is classified under *Dhanya Varga* by all *Nighantukar* except *Raj Nighantu*, here it is mention in Shalyadi varga. Botanically it is classified in class Phaseolus. *Mudga* has *Madhur- Rasa, Madhur-Vipaka*, *Sheeta Virya*, *Laghu*, *Rukasha- Guna,* mention in *Samhita* and *Nighantu*. But *Charaka* and *Sushruta* consider *Kashaya Anurasa*, also *Sushruta* has different opinion about *Vipaka* he mention *Katu Vipaka* of *Mudga*. *Mudga* considered *As Pathya*, *Varnya*, *Netrya*, *Jwarnashak* etc.

The loss on drying indicates the water and moisture content in *Dravya* at 110^0C. In *Masha* and *Mudga* sample it was 2.24% and 2.19% water or moisture can be assume as *Jala-Mahabhuta* so the parsent of Jala in Dravya was 2.24% and 2.19% for *Masha* and *Mudga.*

After incineration of powder leave organic ash determined by **total ash**, **Acid insoluble ash**. Ash value determines the quantity of the inorganic material present in the drug and higher value is suggestive of thermo non labial/heat stable or inorganic constituents. Ash assume as *Kshar* having *Prithvi Mahabhuta*. The percentage of total ash, acid insoluble ash of *Masha,* and *Mudga* shows ash value 2.91, and 2.83. *Mudga* shows relatively high total Ash value. There are traces of acid insoluble ash in *Mudga* and *Masha* has < 0.1%, acid insoluble ash.

The sulphated ash test utilizes a procedure to measure the amount of residual substance not volatilized from a sample when the sample is ignited in the presence of sulfuric acid. The test is usually used for determining the content of inorganic impurities in an organic substance. *Masha* has 0.11% and *Mudga* has 0.14% of sulphated ash.

Molar mass is a unit that enables scientists to calculate the weight of any chemical substance, be it an element or a compound. In derivation of molar mass of sample it was observed that *Masha* and *Mudga* are *ahar dravya* they contain phenolic acid as active principle, one of phenolic acid in *Masha* has 347.2585 molar mass and that of *Mudga* has 133.3114 molar mass. From this it can be conclude that *Masha* is *Guru* and *Mudga* is *Laghu* at molecular level.

Glycemic index is calculated from the raised blood sugar after consuming food or drug, it is debar of insulin level in blood. The food having high GI breaks down quickly and shoots up blood sugar level rapidly; while food having lower GI takes longer time to get digested and absorbed, resulting in lower and gradual increase in blood sugar level. GI of *Aahar dravya Masha* was 30 which is low GI concluding that *Masha* takes more time to digest, it proves *Guru Guna* of *Masha*; where *Mudga* has GI 48 which is high resulting in easy and fast digestion concluding *Laghu Guna* of *Mudga*.

The ph value indicates the potential hydrogen ions available in particular substance. *Masha* and *Mudga* having ph values are 6.04, and 5.97 respectively. As per ph scale both drugs are acidic means liberate H^+ ion in solution. H^+ can be assumed as Vayu Mahabhuta.

Extractive value is indicative of the quantity of the constituents that can extract in liquid media. It is used as a valuable tool for assessment of the standard drug. The sub standard drugs containing a less amount of constituents can identify easily. The solubility depends on the behavior of the constituent's in different media. Higher extractive value denotes more the

principles. It is revealed that *Masha* has high extractive value in aqueous and alcohol medium which is 60.74% and 14.56%; and that of *Mudga* has aqueous- 49.64% and in alcohol- 13.07% respectively. This indicates that *Masha* has more active constituents than *Mudga.*

The **UV-VIS spectrophotometer** is most specific quantitative analysis. In UV-VIS spectrophotometry the response value is related not only to the concentration of the test solution, but also to the structure of the compound and response values is linear with the concentration of the test solution within a certain range. *Masha* has maximum absorbance at peak 0.857 at wavelength 213.Onm and found minimum absorbance at -0.29 at wavelength 1093. Onm; *Mudga* has absorbance at peak value of 0.880 at wavelength 213. Onm and minimum at -0.019 at wavelength of 1094.Onm.

HPLC analysis was carried and observation was recorded; Ethanol extract of Masha and Mudga was taken to observe bound phenolic acid and free phenolic acid, in Masha bound phenolic acid- p-Coumaric acid, Syringic acid, Caffeic acid and Ferulic acid was identified positive at retention time of 13.245, 21.260, 23.780, and 23.915 respectively; and Free phenolic acid were Caffeic acid and Ferulic acid at retention time of 39.220 and 39.465 respectively. In Mudga bound phenolic acid were p-Coumaric acid, Syringic acid, Caffeic acid and Ferulic acid was identified positive at retention time of 13.260, 21.255, 23.765, and 23.905 respectively; and Free phenolic acid Caffeic acid and Ferulic acid at retention time of 39.235 and 39.475 respectively. There was a very minute difference in retention time of bound and free phenolic acid of both Masha and Mudga. HPLC study gives a particular identification of chemical component in the given drug.

Protein content in a drug gives a brief idea on time taken by the food to digest in body; more the dense protein takes more time to digest where as less protein content takes less time to digest. Protein content of *Masha* was 4.3% and *Mudga* was 3.4%. In this study *Masha* is *Guru* and *Mudga* is Laghu *Aahar dravya.*

TLC is a technique that helps in separation, isolation, characterization of the drug in a preliminary and a valuable tool for standard of drug. Alcoholic extract of *Masha* and Ethanol extract of *Mudga* was run on TLC plate. TLC plate of *Masha* and *Mudga* observed under UV light of 365nm, respective spots were seen at respective Rf value. *Masha* plate shows 2 spots viz. gray and pink spot at Rf value 0.89 and 0.99. *Mudga* plate develops 6 spot at Rf value 0.62, 0.67, 0.73, 0.87, 0.95 and 0.99.

The TLC plate of *Masha* and *Mudga* also run and observed in Iodine Chamber, respective spots were seen at respective Rf value. *Masha* plate shows 2 spots viz. gray and pink spot at Rf value 0.89 and 0.99. *Mudga* plate develops 6 spot at Rf value 0.62, 0.67, 0.73, 0.87, 0.95 and 0.99. it was observed that Rf value seen under UV365nm and in Iodine chamber was similar.

CONCLUSION

Literary review of *Guna* gives detail knowledge of working of *Guna*, *Guru* and *Laghu guna* was reviewed thoroughly. This study strikes that pharmacological action is due to *Guna* can be evaluated by using modern tools.

Some of the Analysis methods applied in the study show the presence of *Guru* and *Laghu Guna* in *dravya* used for analysis.

Analysis of drugs through Atomic weight (Molecular weight), Glycemic Index, Protein content gives clear idea about *Guru* and *Laghu Guna* in *dravya.*

Beside all tools used in present study it is concluded that Guru and Laghu Guna can be differentiate by applying modern parameter. Glysemic index, Atomic weight, and Protein content are such parameters.

To evaluate efficacy and preciseness of these parameters more *dravyas* need to be studied, researchers need such studies designed for same.

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