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Comparative Assessment of Grahyagrahyatva of Nilanjana (Galena) By Using Ancient and Modern Parameters

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Abstract:

Rasashastra is a specialized branch popularly known as Ayurvediya Aushadi Nirman. It is the branch of Ayurveda in which metallic substances are studied with respect to their remedial efficacy including processing and refining of these substances to prepare the medicines viz. Rasakalpas. Ayurvedic Pharmaceutics uses drugs from 3 main sources. They are classified as Plant origin, animal origin and mineral origin. One of the mineral origin drugs is Anjana. Anjana kriya is one of the popular daily regimes accepted by major portion of population. Anjana kriya with its netrya action is also beneficial in the diseases of eyes like Netrabhishand and Timir etc. Nilanjana is mentioned as a type of Anjana. Thus, this study was conducted to assess and compare grahyagrahyatva and physico–chemical characteristic of Nilanjana (Galena) by using ancient and modern parameters: so as to standardize Nilanjana (Galena) as a raw- material. For this, an attempt was made to examine 13 samples obtained from various places and correlate the grahya-agrahya lakshanas of Nilanjana (Galena) with modern parameters.

Key-words: Rasashastra, Rasakalpas, Nilanjana, Anjana, Netra

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INTRODUCTION:

Ayurveda is the science of 'Ayu' that is life. It emphasizes not only on treatment of diseases, but also focuses on maintenance of health and prevention of diseases. This science of life primarily focuses on Triskand, viz. Hetu (i.e Aetiology), Linga (i.e Sign and symptoms of disease), Aushadi (i.e treatment of disease). Rasashastra is a specialized branch popularly known as Ayurvediya Aushadi Nirman. The word Rasashastra literally means "the science of mercury". It is the branch of Ayurveda in which metallic substances are studied with respect to their remedial efficacy including processing and refining of these substances to prepare the medicines viz. Rasakalpas. Rasakalpas are better than the herbal preparations because they are effective even in small doses, they are palatable and they revive the health in no time. The formulations from the Rasashastra are extensively used because of these exclusive features but the efficacy of any kalpa directly depends upon the purity, potency and quality of a raw-material. Hence it becomes mandatory to standardize the quality of the raw materials. Ayurvedic Pharmaceutics uses drugs from 3 main sources. They are classified as Plant origin, animal origin and mineral origin. Gandhaka, Gairik, Kasisa, Kankashi, Hartala, Manashila, Anjana and Kankushta are eight dravyas categorized as Uprasa as per Rasaratnasamucchya. These are useful in experiments on mercury.

Importance of Anjana:

Anjana is stated in Uprasa varga by Rasahrudaytantra, Rasaprakashsudhakar, Rasendrasarsangrha, Rasamanjari, Anandkand and Ayurveda Prakash along with Rasaratnasamucchya. Rasashastra states five types of Anjana – Srotoanjana, Sauveeranjana, Pushpanjana, Rasaanjana and Nilanjana.

The Ayurvedic Pharmacopeia of India (API)5 states the synonyms of Sauveeranjana as Nilanjana. This reference indicates the probable use of Nilanjana for Anjana kriya in daily regime. The drug Nilanjana is chemically known as Lead sulphide. Nilanjana is employed for various therapeutic uses in Ayurveda so to achieve good results from therapeutic formulations, it is important to use the best quality of Nilanjana. This fact establishes a strong need for the standardization of Nilanjana as a raw-material. Hence, it is selected as the drug for this research project.

Properties of Nilanjana-

Nilanjana is of dark bluish colour, Guru, Snigda, Netrya, Tridoshagna, Rasayan, Suvarnagna and Lohamardavkar.

Therapeutical Uses of Nilanjana

Nilanjana is sheeta, chakshushya i.e beneficial to eyes, vishaghna and rasayana. Nilanjana is used in various textual formulations which are used internally as well as externally.

AIM:

To assess and compare grahyagrahyatva and physico–chemical characteristics of Nilanjana by using ancient and modern parameters.

Literature Review:

The classical texts of Ayurveda Charak samhita, Sushrut Samhita and Ashtang Hruday mainly deals with herbal medicine. These classical texts have also stated Rasadravya in therapeutics.

In Shaligram Nighantu, Nilanjana is mentioned as synonym of Sauveeranjana (Sulphuret of antimony) which is described under Dhatupdhatu Varg. Raj Nighantu mentioned Nilanjana as Suvarnadi varg.

Formulation of Nilanjana-

Vatnashno Ras, Bhairavnathi Panchamrutparpati, Manikya Rasayan, Pushparag Rasayan, Mahabhutankush Ras, etc.

Some formulations of Nilanjana used externally are Garudanjana**,** Timirharanjan**,** Drushtiprada Anjana, Nayanamrutanjana.

Modern review of Galena/ Lead Sulphide

Galena is one of the most abundant and widely distributed sulfide minerals. Galena is widely used in the eye as cosmetic kohl. In Ancient Egypt, this was applied around the eyes to reduce the glare of the desert sun and to repel flies, which were a potential source of disease. Galena is the primary ore of lead, which is mainly used in makinglead acid batteries; however, significant amounts are also used to make lead sheeting and lead shot. Galena is often mined for its silver content.

Table no. 1 Properties of Galena:

Chemical formula	PbS
Molar mass	239.30 g/mol
Appearance	Black
Density	7.60 g/cm3
Melting point	1,118 °C (2,044 °F; 1,391 K)
Boiling point	1,281 °C (2,338 °F; 1,554 K)
Solubility in water	2.6×10−11 Kg/Kg

CONCEPTUAL STUDY OF GRAHYAGRAHYATVA

The word ‘Grahyagrahyatva’ is synthesis of two words Grahya and Agrahya. The word ‘Grahya’ means to be “approved or accepted or preferred”. The word Agrahya denotes exactly opposite of ‘Grahya’. In ancient

texts, the grahya norms of raw materials were cited in various rasashastra granthas which should be fulfilled by the raw material in order to be used in medicines. Thus, they signify quality of raw material.

Standardization-

Medicines play an important to human life and any kind of negligence in the preparation of the drugs can result in severe problem. But recently many cases of adulteration, substitution have been noted. Thus, it is very important to have some standard practices while preparing it. Standardization of drug means confirmation of its identity, quality and purity throughout all phases or its cycle. The standardization process involves following steps:

1. Raw material Standardization
2. In process Standardization
3. Final product Standardization

Standardization of drug according to Ayurveda-

Ayurvedic texts also have mentioned standardization of drug.

1. Raw drug standardization –

In Charaka samhita the drug standardization had been explained in terms of Bheshaja Pariksha.

2. In process standardization in Ayurveda-

Different manufacturing techniques should be utilized to increase the potency, efficacy of drug and to reduce unwanted side effects.

3. Final product standatdization-

Tests of Bhasma as, Rekhapurnatva, Varitaratva, Nishchandratva these are examples of the standardization of final product.

Ayurvedic compound formulations are broadly classified under the heading of

1]Rasausadhi (predominantly metals and minerals are used for preparation and dealt in Rasashastra)

2]Kashtausadhi (predominantly plant drugs are used for preparation and mainly dealt in Bhaisajyakalpana).

Minerals and metals which are taken from the mines have impurities, and toxins. So purification process is followed first and used thereafter.

GRAHYAGRAHYATVA OF NILANJANA:

The standard parameters for the selection of Nilanjana as a medicine or in any medicinal formulation were given in rasashastra texts. These are termed as grahyagrahyatva lakshanas of Nilanjana. The

grahyagrahyatva of Nilanjana was considered as best in qualities. Some of the grahyagrahya lakshanas of Nilanjana are Neela, Kapot/Kapotakam, Snigdha Oily,Unctuous, etc.

REVIEW OF ANALYTICAL METHODS

A) Nature- Most of the minerals belong to solid crystalline substances. Naturally occurring minerals may be in the following forms-

- Crystalline
- Amorphous (massive, earthy)
- opaque, transparent and translucent
- Aggregate (granular)

The nature of Galena is usually lumps and heavy cubic crystals.

B) **Colour**-Colour of mineral can be observed on freshly broken surface. It gives aconstant distinctive colour. Galena has grey colour.

C) Streak- Galena gives grey colour streak when rubbed on a streak plate.

D) Luster- Galena has Metallic Luster.

E) Transparency- Galena is Opaque material which is not able to transmit light.

F) Effects of Acids[62]:

1. Chemical test with dil.Nitric acid is done by adding dil. Nitric acid in double quantity to the sample of galena in a test tube and heated further till liberation of brownish fumes.

2. Chemical test with Hydrochloric acid is done by adding dil.HCl in double quantity to the sample of galena in a test tube and heated till it evolves H_2S gas,as detected by its odour of rotten eggs.

G) X-Ray diffraction technique (XRD)

X-Ray Diffraction is an advanced technique generally used in the study of the crystalline materials producing the diffraction, with the help of X-Rays. In powder Crystal Method, source of X-Rays which are monochromatized by a filter is allowed to fall on the powdered specimen through slits. Diffraction pattern analysis plays an important role in such diverse application as solving molecular structures, identifying compounds and the fabrication of materials. X-Ray powder diffraction can provide a powerful tool in an inorganic Qualitative Analysis, where both the compounds themselves and their chemical derivatives can be identified. This method is useful to make distinction between the allotropic modifications of the same substance.

H) XRF SPECTOGRAPHY- X-ray fluorescence (XRF) is used for the qualitative and quantitative analysis of the elements. These can be environmental, geological, biological or industrial samples.it is non-destructive, multi elemental, fast and cost effective.

MATERIALS AND METHODS:

All the texts mentioned in Bibliography were referred. Broadly –Ayurvedic samhita, Nighantus, API and authentic Rasashastra texts were studied thoroughly with reference to grahyagrahytva of Nilanjana. The 13 samples of Nilanjana were purchased from various market places from all over India. Ayurvedic stores, Institutions were the places of procurement. The 13 samples were stored in different plastic containers with proper labelling. Instruments used for physico-geological, Chemical and analytical tests.

a) Moh's scale of Hardness b) Streak plate c)Glass Beaker, Test tube d) Pair of tongs

e) Chemical balance of 0.001 g sensitivity f) Special stone of metal examination (Kasauticha dagad)

g) XRF h) XRD Analyser i) Hydrochloric acid j) Nitric Acid

METHODOLOGY:

An observational descriptive study was conducted in the laboratory of the concerned institute.

Analysis of Physico-Chemical and the other Analytical tests:

1. Samples were subjected to physico-chemical tests.

2. Tests from modern science viz.

i)Hardness ii)Specific gravity iii)Nature iv) Colour v) streak vi)Fracture vii)Lustre viii)Tenacity ix)Transparency were done in geological department under supervision of geological and analytical experts.

3. Two samples having highest score and two samples having lowest score were selected for chemical test viz. Effects of acid.

3. The exact laboratory observations were noted in the tabular form so as to compare all the samples simultaneously.

4. Two samples were selected for analytical tests by XRD and XRF according to maximum and minimum scores. Analytical tests like XRD (X Ray Diffraction) and XRF (X Ray Fluorescence) of selected samples were conducted in the authenticated laboratories and research institutes. The selected samples were converted to powdered form using Loha khava yantra and then subjected to XRD and XRF test.

Guidelines for the Assessment of "Nilanjana" sample.

- The 13 samples of Nilanjana were collected from different markets.
- The proforma is prepared for assessment of every sample as per Garhya-agrahya norms mentioned in Ancient literature.
- The meaning of these criteria is attached to the proforma.
- For every criteria and for every sample there is marking scale from 0-10
- An expert can choose any number between the ranges of 0-10 after assessing the sample by organoleptic test.

- Later on number will be calculated and master chart will be prepared for stastical analysis.
- Before filling the proforma experts can ask question or discuss with the scholar.

Assessment of Samples-

Assessment proforma for Grahyagrahyatva of Nilanajana

1. Rupa Priksha

a) Coiour - Marks allotted - 0 to 10

1. Neel (Dark blue colour)
2. Kapot/ Paravat (Colour of feather of pigeon)
3. Krishna / Mechak (Blackish dark blue colour)

b) Luster - Marks allotted - 0 to 10

Snigdha (Shinning, Glossy, Glistening)

c) Shape - Marks allotted - 0 to 10

Valmikashirsh Pratibham (similar to any hill tops)

2. Sparsh Pariksha - Marks allotted(0 to 10)

1. Snigdha (Oily, unctuous)
2. Sheeta (Cool)
3. Guru/gurutaram (Heavey / weighty)

Methodology for the assessment of parameters of Nilanjana-

1. Rupa Pariksha
2. Sparsha pariksha

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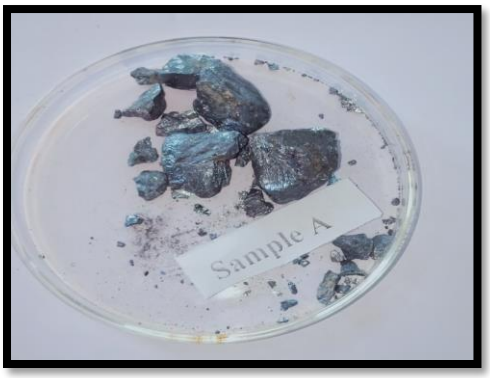

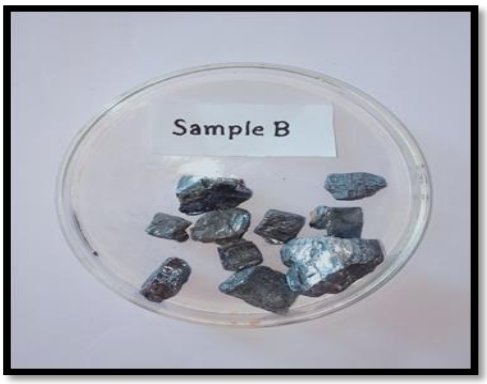

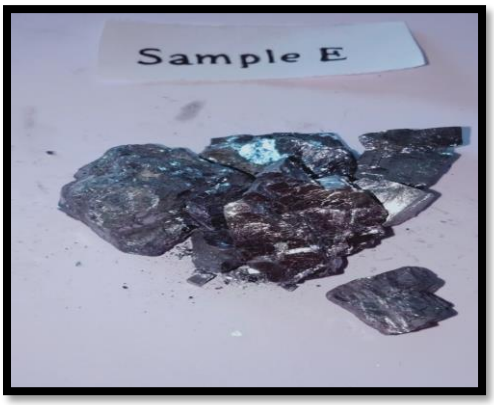

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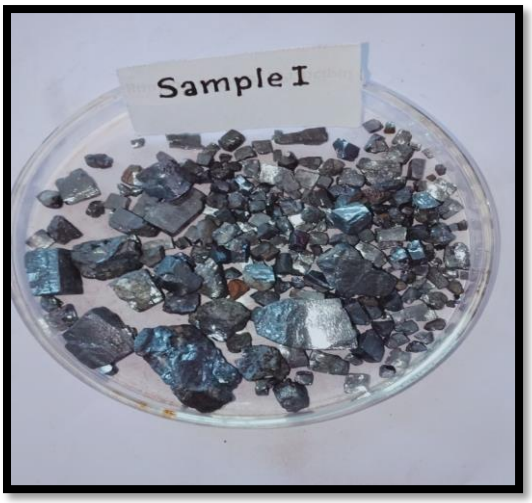

Observations were noted as –

1. Sample G had scored maximum scores in 5 grahya parameters (Neel, Kapot, Snigdha, Sheeta and Guru).
2. Sample M had scored maximum marks in Krishna parameter and minimum score in Kapot parameters.
3. Sample L had scored maximum marks in Valmikashirsh pratibham parameter which is agrahya parameter.
4. Sample G and J had scored maximum marks in Bhange Nilotpalnibham which is agrahya parameter.
5. Sample F had scored minimum marks in 5 parameters (Neel, Krishna, Snigdha, Guru and Gharshane Gairikprabham).

Comparative assessment of Physico-Geological and Chemical properties:

Table 2 shows comparative assessment of Physical and Geological properties of all samples.

Sr.no	Parameters	API Values	A	B	C	D	E	F	G	H	I	J	K	L	M
1.	Nature	Usually lumps, heavy crystals	+	+	+	+	+	+	+	+	+	+	+	+	+
2.	Colour	Grey	+	+	+	+	+	+	+	+	+	+	+	+	+
3.	Streak	Grey	+	+	+	+	+	+	+	+	+	+	+	+	+
4.	Fracture	Even	+	+	+	+	+	+	+	+	+	+	+	+	+
5.	Luster	Metallic	+	+	+	+	+	+	+	+	+	+	+	+	+
6.	Tenacity	Brittle	+	+	+	+	+	+	+	+	+	+	+	+	+
7.	Transparency	Opaque	+	+	+	+	+	+	+	+	+	+	+	+	+
8.	Hardness	Around 2 to 3	+	+	+	+	+	+	+	+	+	+	+	+	+

Table no 3 shows comparative assessment of Specific gravity and Cleavage of all samples.

Sample	Specific gravity(API- 7 to 8)	Cleavage (API- Cubic)
A	7.2	Cubic with 3 sets (not very clear)
B	7.4	Cubic sets not seen
C	7.2	Cubic sets not seen

D	7.6	Cubic with 3 sets
E	7.6	Cubic with 3 sets
F	7.2	Cubic with 3 sets
G	7.6	Cubic with 3 sets
H	7.4	Cubic with 3 sets
I	7.2	Cubic with 3 sets
J	7.2	Cubic with 2 sets
K	7.4	Cubic with Poor 2 sets
L	7.4	Cubic with Indistinct
M	7.2	Cubic with 3 sets

Table 4 Observations of Chemical test viz. Effects of acid on Nilanjana (galena)

Sr. No	**Name of Test performed (As per API)**	**Sample G**	**Sample D**	**Sample F**	**Sample I**
1	Effect with Nitric acid on the samples of Nilanjana (Galena)	Brownish fumes seen ++, Clearly visible	Brownish fumes seen ++, Clearly visible	Brownish fumes seen + but not visible clearly	Brownish fumes seen+ but not visible clearly
2	Effect with Hydrochloric acid on the samples of Nilanjana (Galena)	Strong smell of rotten eggs +	Strong smell of rotten eggs +	Weak smell of rotten eggs +	Weak smell of rotten eggs +

Comparative values obtained after assessment of scores of Grahya and Agrahya samples of Nilanjana

Table no. 5 Comparative values obtained after assessment of score of grahya and agrahya samples of Nilanjana-

Sr. No.	Sample	Sample G Grahya	Sample F Agrahya	Difference
1.	Neel	6.3	2.5	3.8
2.	Kapot/Paravat	8.2	5.5	2.7
3.	Krishna/Mechak	5.2	2.9	2.3
4.	Snigdha(Roopa pariksha)	8.8	3.8	5
5.	Valmikashirsh pratibham	3.5	3.2	0.3
6.	Bhange Nilotpalnibham	3.9	3.3	0.6
7.	Gharshne Gairikprabham	0	0	0
8.	Snigdha(Sparsh pariksha)	5.7	2.5	3.2
9.	Sheeta	5.8	4.6	1.2
10.	Guru	8.8	5.1	3.7
	Total	41.6	20.6	21

Statistical analysis of the assessment of score:

One-way Annova test was applied to compare 13 samples statistically and it is seen that the sample D and E did not show significant variation from the Grahya sample G and hence can be considered as allowable samples. The sample A,B,C,F,H,I,J,K,L,M showed significant variation from Grahya sample G. Hence can be considered as Agrahya samples.

INFERENCES:

a) **Scores of assessments of samples**: There was statistically significant difference between the scores of the samples. This shows significant variation in the organoleptic tests of the samples. It was found that Sample no. G had highest score (41.6) while sample F had lowest score (20.6). So Sample G was considered as the Grahya sample and Sample F was considered as Agrahya sample. Sample D (37.4) and sample E (37.1) were having score near to sample G. So these samples can be considered as grahya samples.

The greatest score achieved by sample G which finally proved to be most grahya sample of Nilanjana out of 13 samples procured. The lowest score achieved by sample F which proved to be most agrahya sample of Nilanjana (galena).

b) **Analysis of selected samples by Physico-chemical tests and analytical test:**

1. Based on the scores of assessments, the most grahya sample is G, the agrahya sample F were selected for the further analytical study.

2. Physico-chemical test showed that grahya sample G has more Sp.Gravity 7.8 than sample F 7.2. This specific gravity can be correlated with Guru Guna of Nilanjana.

3. Snigdha parameter can be correlated with Luster. Luster showed by grahya parameter G was found to be more than that of agrahya Sample F.

4. After chemical test with Nitric acid , it was observed that concentration of fumes was more in sample G than sample F and in chemical test with HCl , the intensity of smell of rotten eggs in sample G was stronger in sample G than sample F. this proved that quality of sample G is better than sample F.

5. XRF reports shows that Percentage of Lead in sample G (83.05%) is 4.936% more than sample F (78.95%). Percentage of Sulphur (15.01%) in sample G is more than 2.99% than sample F (14.56). Percentage of Silicon in Sample G (1.38%) is 293.47% lesser than sample F (5.43%). Percentage of Calcium in sample G (0.35%) is 74.28% lesser than sample F (0.61%). Percentage of Iron (0.21%) is 114.28 % lesser in sample G (0.45%) than sample F. This proved that quality of sample G is better than sample F.

6. X- ray diffraction study reveals that graphs of sample G showed prominent peaks from 5 2θ to 89 2θ with intensity value of 276 and 114 respectively. Highest peak was found at 30.04 2θon X axis with intensity value 7794 on Y axis. X- ray diffraction graphs of sample F showed prominent peaks from 5 2θ to 79 2θ with intensity value of 166 and 178 respectively. The XRD study of the selected samples showed that the sample G and sample F were of crystalline nature.

DISCUSSION:

The goal of this research work was to assess various purchased samples of Nilanjana with respect to Grahyagrahyatva using ancient and modern parameters. All available ancient texts were reviewed and parameters of grahyagrahyatva of Nilanjana were assembled and enlisted systematically.The parameters of grahyagrahyatva of Nilanjana were categorized according to the organoleptic tests (Pancha Dnyanendriya Pariksha) Rupa and Sparsha Pariksha and co-related with modern physical norms to develpoe authenticated proforma for the assessment of the raw samples of Nilanjana.Thus the proforma was designed for the grahyagrahyatva of Nilanjana to assess organoleptic tests of the samples of Nilanjana. Thirteen samples of Nilanjana were procured from various places such as market and Institution. Each and

every collected sample was assessed by 15 experts using the proforma. The score system was developed to assess each and every parameter regarding grahyagrahyatva of Nilanjana. Physico-chemicalanalysis of grahya and agrahya samples was done.The samples showed much variation in the organoleptic characters of each sample. According to scores of assessments, Sample G showed maximum score 41.6 and said to be grahya sample of Nilanjana. Sample F showed minimum score of 20.6 and said to be the agrahya sample of Nilanjana. Sample D and E can also be considered as grahya samples of Nilanjana. Sample G and F were subjected to further analytical analysis like XRD, Chemical test, Specific Gravity etc. The results of analytical tests also suggested that Sample G was grahya Nilanjana and Sample F was agrahya Nilanjana. Out of 13 purchased samples of Nilanjana, based on the scores of assessments given by 15 experts, there was not statistically significant difference between Samples D and E. Thus, they were grahya samples. The most grahya sample was Sample Gas it scored highest (41.6). There was statistically significant difference between Samples A,B,C,F,H,I,J,K,L,M and from grahya sample G. The most agrahya sample was Sample F as it scored lowest (20.6).On the basis of organoleptic assessment through the authenticated proforma of the samples, conclusion can be made that sample G is the most grahya sample and sample F is the most agrahya sample of Nilanjana. The organoleptic observation of Sample G and Sample F showed significant difference in all grahyagrahyatva parameters of Nilanjana. From the physicochemical analysis, it was observed that Specific gravity of Sample G (7.8) was more than Sample G (7.2).Thus the grahya norm Guru can be correlated with Specific gravity. The most grahya Sample G and most agrahya Sample F were further analysed by physico-chemical tests. The physico-chemical analysis of these two samples also showed differences in physico-chemical results of tests. The Chemical test done with Nitric acid and Hydrchloric acidalso indicates that sample G is more chemically better than Sample F. X-ray diffraction study of the selected samples showed that Sample G and Sample F were of Crystalline structure but there was difference in their peaks.

Thus, efforts had been made to correlate the ancient grahyagrahyatva norms of Nilanjana with the modern scientific parameters. This will be helpful for the vaidyas and pharmacies to procure the standard Nilanjana for the pharmaceutical purpose. The establishment of the norms of grahyagrahyatva of Nilanjana in terms of feasible physico-chemical parameters was achieved as the outcome of this research project.

CONCLUSION:

The detailed review of literature regarding grahya-agrahytva of Nilanjana lead to blueprint of reliable proforma for comparative assessment of Grahya-agrahytva of Nilanjana with 10 authenticated parameters. There was statistically significant difference in each parameter of every sample. This showed that the samples varied over a range in organoleptic tests and can be identified with these parameters. In

this study, we are able to see that the co-relation of ancient parameters for grahyagrahyatva with the modern scientific parameters was found feasible and fruitful in standardizing the raw material Nilanjana. Hence, the establishment of quality control norms of Nilanjana (Galena) is achieved for uniformity in ayurvedic pharmaceutics.

REFERENCES:

1. Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan;2008.Chap no 28/verse no 1,Pg.372

2. Acharya Shukla V., Prof.Tripathi R. Charakasamhita of Agnivesha.Delhi: Chaukhamba Sanskrit Pratishthan;2010. Chap no Sutrasthan 1/verse no70, Pg.42

3.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan;2008.Chap no 3/verse no 1,Pg.26

4. Acharya Shukla V., Prof. Tripathi R. Charakasamhita of Agnivesha,Delhi: Chaukhamba Sanskrit Pratishthan;2010.Chap no 5/verse no 18-19,Pg.92

5. Ayurvedic Pharmacopeia of India Part I –VOL VII. Government of India. Dept of AYUSH.New Delhi:Cirrus Graphics Pvt. Ltd. Pg no 31

6. Ayurvedic Pharmacopeia of India Part I –VOL VII. Government of India. Dept of AYUSH.New Delhi:Cirrus Graphics Pvt. Ltd.Pg no 31

7. Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 3/Verse no 106, Pg no. 36

8. Prof. Mishra S. Aanadkand of Bhairovokta. Varanasi: Chaukhamba orientalia;2008.Chap no 1/Verse no 286, Pg.679

9.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 21/Verse No 119-121,Pg no 279

10.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no14/Verse no 80-93,Pg no 169

11.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no14/Verse no 94-100,Pg 170

12.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 23/Verse no44-45,Pg 310

13.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 23/verse no 46, Pg 310

14. Goswami K. 'Eye Cosmetic 'Surma': Hidden threats of Lead Sulphide poisoining [Internet], 2012 Aug 2[cited 2017 Jan 10] Available from:.www.ncbi.nlm.nih.gov

15. Shree. Khemraj SV. Shaligram Nighantu. Mumbai: Shree Krishnadas prakashan; 1999. Pg no.549-550

16. Dr.Tripathi I. Raj Nighantu. Fifth edition.Varanasi: Chaukhambha Krishnadas Academy; 2010. Pg no 445-447

17. Prof. Sharma P. Priya Nighantu. Second edition.Varanasi:Chaukhambha Surbharti Prakashan; 1995. Pg no 153

18. Acharya Sharma P., Dr.Sharma G. Dhanvantari Nighantu of Mahendra Bhogika.Varanasi: Chaukhambha Orientalia; 2008. Verse no136-137 ,Pg no 115

19.Vaidya Vaidopadhay R. Madanpala Nighantu.Mumbai: Khemraj Shreekrishnadas Prakashan; 1998. Verse no 37-38, Pg no 103

20.Acharya Sharma P, Dr. Sharma G. Kaiyadeva Nighantu.Varanasi: Chaukhambha Orientalia;1979.Verse no 37-38, Pg no 103

21. Vaidya. Nawre K. Nighantu Ratnakar.Delhi: Chaukhambha Sanskrit Pratishthan; 2011.Pg no 503

22. Dr.Tripathi I. Rasarnav naam Rastantra. Varanasi: Chaukhamba Sanskrit series office; 2001.Chap. 3/Verse no 2

23.Dr.Tripathi I. Rasarnav naam Rastantra. Varanasi: Chaukhamba Sanskrit series office; 2001.Pg no

24.Dr.Tripathi I. Rasarnav naam Rastantra. Varanasi: Chaukhamba Sanskrit series office; 2001.Chap no 7/Pg no 108

25.Dr.Tripathi I. Rasarnav naam Rastantra. Varanasi: Chaukhamba Sanskrit series office; 2001. Chap no 9/ Pg no

26. Acharya Sharma Mishhra G, Vd. Sharma S. Raskaamdhenu Purvaardh,Varanasi: Chaukhamba orientalia; 1992. Chap unmad nidan/ Pg no 163

27.Acharya Sharma Mishhra G, Vd. Sharma S. Raskaamdhenu Prathamupkaran paad,Varanasi:Chaukhamba orientalia, Varanasi; 1992. Pg no 184

28. Acharya Sharma Mishra G. Ayurved Prakash.Varanasi: Chaukhamba Bharati academy; 1999.Chap 2/ Verse 1 Pg no 252

29.Acharya Sharma Mishra G. Ayurved Prakash.Varanasi: Chaukhamba Bharati academy; 1999.Chap 2/ Verse 236 Pg no 318

30. Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 3/ verse no 98, Pg no 58

31. Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 3/ verse no 104-107, Pg no 61

32.Dr.Tripathi.I. Rasaratnasamuchchaya of Vagbhata. 2nd Edition. Varanasi: Chaukhamba Sanskrit Sansthan; 2008. Chap no 8/ verse no 39, Pg no 152

33. Pandit. Shastri K. Rastarangini of Shri Sadanand Sharma.11th Edition. Delhi:Motilal Banarsidas; 1979.Chap no 20/ verse no 36, Pg no 576

34.Pandit. Shastri K. Rastarangini of Shri Sadanand Sharma.11th Edition. Delhi:Motilal Banarsidas; 1979.Chap no 20/ verse no 38-40, Pg no 577

35.Pandit. Shastri K. Rastarangini of Shri Sadanand Sharma.11th Edition. Delhi:Motilal Banarsidas; 1979.Chap no 10/ verse no 13-40, Pg no 223

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