PIJAR
Paryeshana International Journal of Ayuredic Reserach
www.pijar.org
ISSN:2456:4354

ANALYTICAL STANDARDIZATION OF HAMSA MANDOORA AND VIDANGADI LOHA

Dr. D. Narapa Reddy[1], Dr. Arun Kumar Das[2], . Dr.Prashant Kumar Jha[3], Dr K. Haranath Reddy[4]

[1]Ph.D. Scholar, [2]HOD, Dept. of RS & BK, Gopabandhu Ayurveda Mahavidyalaya, Puri, Odissa,[3]Head, QC Lab., ALN Rao Memorial Ayurvedic Medical College, Koppa
Director, S V Gosamrakshana Shala, TTD Tirupati AP

Abstract:

Ras-shastra is science of metals, minerals, as well as herbo-mineral preparations. Standardization of herbo-mineral drug is today's burning issue due to its complexity. So multi dimensional approach is essential for standardizing compound drugs. In the present time apart from insufficient knowledge of Ayurveda, the standards of Ayurvedic formulations are into worst predicament than ever before because of highly evolved technology and scanning of human system coupled with health awareness. Hence, study of Standardization of Hamsa Mandura & Vidangadi Loha is undertaken to understand the basic idea about the present Drug Standardization, Bhasma kalpana and Kharaliya kalpana, as per modern analytical methods as well as Ayurvedic textual parameters. Establishing qualitative and quantitative parameters of medicines is the major step in developing safe and effective medicines. Analytical standardization is helpful in assuring quality standards of medicines. Such standardization for Ayurvedic classical dosage forms is needed to be evaluated. Incinerated metallic-mineral preparations have significant role in Ayurvedic therapeutics. Different organic functional groups are noted in Fourier transform infrared spectroscopy (FTIR). Even shapes are observed in various cubic forms from XRD analysis.

Keywords: Hamsa Mandoora, Vidangadi Loha, Herbo-mineral, metal, FTIR, XRD

INTRODUCTION:

Apart from the Ashatanga's of Ayurveda, there is the backbone of Chikitsa viz. Ras shastra, which has contributed much in the field of pharmaceutical science. In the present era Ayurvedic physicians are using medicines made up of minerals,

metals, gems and products derived from animal as well as vegetable source. Among these, preparations from minerals-metals, are supposed to be harmful to our body as per western medical system. But it is very surprising to know that in Ras-shastra text the side effect are already mentioned if we use this medicine not made properly. And to avoid such side effects different Ayurvedic pharmaceutical processing techniques such as *shodhana, marana, murchana, jarana* etc. to convert metallic preparation into non toxic form of medicines, are mentioned and also standardization of that processes according to Ayurveda as well as modern analytical methods of standardization is also given in Ayurvedic texts. Standard is a numerical value which quantifies the parameters and thus denotes quality and purity of material. World Health Assembly in May 2003 under a resolution on traditional medicine (WHA56.31) urged member states to set national standards for traditional formula to ensure safety, efficacy and quality of medicines[11]. Many of the formulations are standardized for quality, still good number of formulations are yet to be investigated. Further similar formulations by means of ingredients or uses are needed for analytical, chemical and other analysis. Hamsa Mandoora and Vidangadi Loha are two different formulations with almost similar ingredients in similar proportion but with iron in two different forms (*mandoora & loha*) which are not screened for chemical analysis to cross the forms of irons or other organic compounds included in course of processing. Hence, such study becomes need of time.

The present study of Standardization of HAMSA MANDOORA & VIDANGADI LOHA was undertaken for standardization of metallic i.e. herbo-mineral preparations on the basis of modern analytical methods and simultaneous Ayurvedic textual standards. Characterization of Ayurvedic drugs ensures the chemical configuration and Physico-chemical changes due to various Ayurvedic processing methods. It also helps to know the probable role of a media during the pharmaceutical processing. Analytical study provides standards to judge the quality of raw material as well as finished product. Analytical

study also interprets the probable pharmacokinetics and pharmacodynamics of the drug. Ayurveda has also mentioned various analytical techniques to access the quality of selected material and final product. Although Ayurvedic analytical techniques are time tested but are not adequate to answer the queries of modern science. Hence for better utilization of *Ayurvedic* pharmaceutics, it is need of the hour to analyze the drug through both classical as well as modern qualitative and quantitative parameters.

Materials and Methods:

Drugs were processed in pharmacy attached to *Gopabandhu Ayurveda Mahavidyalaya*, Puri, Odissa. *Hamsa Mandoora* was prepared as per the procedure mentioned in *Yogaratnakara*[12] , while *Vidangadi Loha* was prepared following the method given in *Chakradatta*[13]. Hamsa Mandoora and Vidangadi Loha were packed in airtight container and were brought to QC Laboratories, ALNRMAMC, Koppa for chemical analysis. Organoleptic characters, total ash and acid insoluble ash were determined with PID controlled muffle furnace of *Exacta*[14]. Loss on drying was measured using hot air oven of *Thermotech* and analytical balance of *Contech*[14]. pH was determined in 10% aqueous solution using pH meter of Labtronics and double calibrated buffers of pH 4 and pH 9.2 from *Nice Chemicals*. Ferrous and ferric type of irons were determined by methods mentioned in pharmacopoeial standards for ayurvedic formulations using reagents and chemicals manufactured by *Nice Chemicals*. For Fluorescence study, both drugs were observed under visible light and under long UV after treating with deionized water, methanol, 10% each of sodium hydroxide, hydrochloric acid, sulphuric acid, nitric acid and ammonia in aqueous media.

FTIR and XRD studies were done in *Indian Institute of Chemical Technology(IICT), Tarnaka*, Hyderabad

Result/Observation:

A. Organoleptic Characters

	Hamsa Mandoor	Vidangadi Loha
Colour	Brick red	Brownish red
Taste	Astringent	Astringent, slightly bitter
Odour	Characteristic	Characteristic
Texture	Semi-amorphous	Semi-amorphous

B. Physico-chemical Parameters

	Hamsa Mandoor	Vidangadi Loha
Loss on Drying at	105°C 2.78%	3.25%
Total Ash	58.40%	58.25%
Acid Insoluble Ash	5.55%	5.24%
pH	5.46 $\pm$ 0.10	4.13 $\pm$ 0.10

C. Preliminary Phytochemical Tests

	Hamsa Mandoor	Vidangadi Loha
Carbohydrate	Present	Present
Protein	Absent	Absent
Alkaloid	Present	Present
Anthraquinone Glycosides	Present	Present
Flavonoids	Present	Present
Tannin	Present	Present
Terpenoids	Present	Present
Phytosteroids	Present	Present
Saponins	Present	Present

D. Fluorescent Tests

i. Hamsa Mandoor

	Under visible light	Under long UV
Sample	Brick red	Brown
Sample + water	Tortilla	Light green
Sample + methanol	Yellowish-brown	Fluorescent yellow
Sample + 10% NaOH	Reddish brown	Reddish yellow
Sample + 10% HCl	Light brown	Light green
Sample + 10% H_2SO_4	Light yellow	Light green
Sample + 10% HNO_3	Light yellow	Light yellow
Sample + 10% NH_3	Yellowish brown	Yellow

ii. Vidangadi Loha

	Under visible light	Under long UV
Sample	Brownish red	Caramel
Sample + water	Creamish brown	Creamish green
Sample + methanol	Pale yellow	Fluorescent white
Sample + 10% NaOH	Garnet	Yellowish green

Sample + 10% HCl	Caramel	Yellowish brown
Sample + 10% H_2SO_4	Creamish brown	Lemon yellow
Sample + 10% HNO_3	Yellowish brown	Light yellow
Sample + 10% NH_3	Brown	Green

E. Quantitative Estimation

	Hamsa Mandoor	Vidangadi Loha
Total iron	26.34%	28.36%
Ferric	5.36%	22.11%
Ferrous	20.98%	6.25%

F. FTIR

Figure Number: 1

Showing Fourier Transform Infrared Spectroscopy Peaks of Hamsa Mandoora

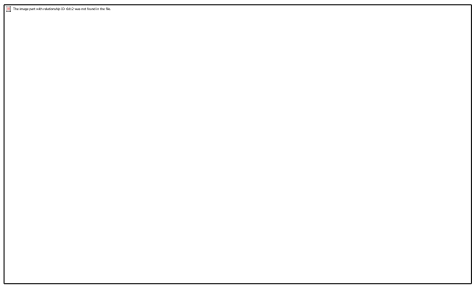

Figure Number: 2

Showing Fourier Transform Infrared Spectroscopy Peaks of Vidangadi Loha

Table Number: 1

Showing Characteristic Absorption and Respective Functional Groups

HM

Characteristic Absorption (cm^{-1})	Functional group
469.84	Polysulphide or Aryl disulphide
538.76	Disulphide (weak vibration)
1033.38	C-N or O-C (2 bonds)
1380.69	N-O (strong vibration 2 bonds)
1450.00	-C=C (medium or weak, multiple bonds)
1627.94	N-H (bending)
2925.32	C-H (stretch)
3421.84	N-H (1°-amine)
3693.93	N-H (stretch, Amide)

	VL
458.33	Aryl disulphide
547.36	C-Br (stretch strong)
1028.83	C-O (Ether group, stretch strong)
1371.48	N-O (strong vibration 2 bonds)
1628.71	C=C (stretch variable)
2927.03	C-H (stretch strong)
3413.37	N-H (primary amine 2-bonds and secondary amine

Figure Number: 3
Showing XRD peaks of Hamsa Mandoora

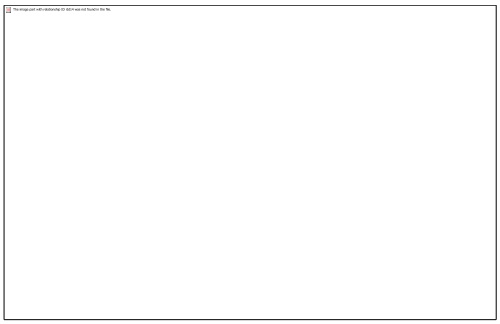

Figure Number: 4
Showing XRD peaks of Vidangadi Loha

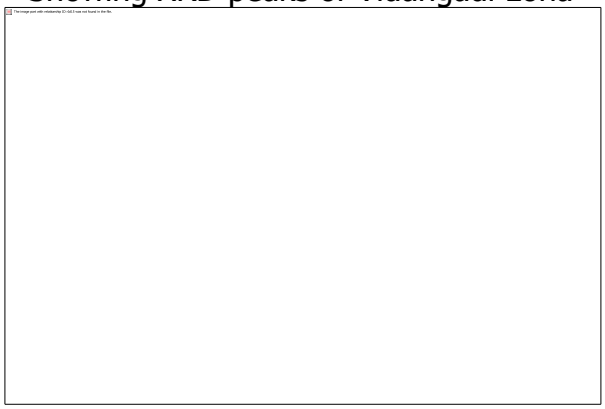

Table Number: 2
Showing Inter-planar space and relative miller indices

2-Theta	Inter-planar space (D-value in 10^{-10} m)		Miller Indices
30.15	2.96235	P	BCC
33.30	2.68819	P	BCC FCC
35.73	2.51114	P	BCC
54.23	1.69165	P	BCC
62.58	1.48360	P	BCC

64.18	1.45216	P	BCC
VL			
33.39	2.68126	P	BCC FCC
35.77	2.50837	P	BCC
54.23	1.69007	P	BCC

P : Primitive cubic
BCC : Body centered cubic
FCC : Face centered cubic

Discussion:

Organoleptic characters of Hamsa Mandoor and Vidangadi Loha shows slight variation in colour and taste only, as Hamsa Madoor is brick red in colour and astringent in test while Vidangadi loha is brownish-red with astringent taste having slight bitterness.

Loss on drying is loss of weight expressed as percentage w/w resulting from water (moisture) and volatile matter of any kind[18]. Total ash determination is done to determine the amount of inorganic constituents left after biological materials are burnt[19]. Both Hamsa Mandoor and Vidangadi loha read nearby values respectively being 58.40% and 58.25%. Out of obtained ash, 5.55% and 5.24% were respectively insoluble in diluted HCl.

pH is numeric scale to specify acidity or basicity of aqueous solution. Every single difference in pH measurement is equivalent to a tenfold difference in hydrogen ion concentration[20]. Difference of 1.33 was noted in both as Hamsa Madoor being 5.46 while Vidangadi loha being 4.13.

Preliminary phytochemical tests for both Hamsa Mandoor and Vidangadi loha exhibited similar pattern of constituents. Protein was observed as absent while carbohydrate, alkaloid, anthraquinone glycosides, flavonoids, tannin, terpenoids and phytosteroids were noted present. Differences in fluorescence testings are quite obvious as colour of Hamsa Mandoor was brick red while Vidangadi loha was brownish red. The ingredients of Hamsa Mandoor and Vidangadi loha differ in forms of iron as ferric and ferrous. Accordingly, they react differently with bases and acids displaying colour differences in fluorescence tests.

Elemental qualitative tests using EDX shows elements viz., Si, S, S, Rh, K, Ca, Ti, Cr, Mn, Fe, Cu, Zn and Ar are present in both cases while Sr, V, Zr, Al and P are only present with Hamsa Mandoor. Even the quantitative

estimation out of total inorganic constituents shows differentiation in common elemental percentage. Iron is 73.52% of total inorganics in Hamsa Mandoor while it is reported 95.12% of total inorganics in Vidangadi loha. Another greater difference among the inorganics is calcium and silicon being 6.53% and 9.32% in Hamsa Madoor. Only they are respectively 0.70% and 1.00% in Vidangadi loha. Potassium is also marked more in Hamsa Mandoor than Vidangadi loha being 3.64% and 1.79% in sequence.

Quantitative estimation shows absolved difference in quantity of iron as well as form of iron present with Hamsa Mandoor and Vidangadi loha. Total iron is with difference of 2.02% being 26.34% in Hamsa Mandoora while 28.36% in Vidangadi Loha. But greater differences lie with form of iron as ferric form was noted more in case of Vidangadi loha with 22.11% in comparison to 5.36% of Hamsa Mandoor while ferrous form was recorded 20.98% in Hamsa Mandoor in comparison to 6.25% of Vidangadi loha.

XRD shows differences in peaks with 2-theta values, inter-planar space and, therefore, in miller indices with respective peaks except nearly similarities inter-planar distances of 2.68, 2.50-2.51 and 1.69 at 2-theta of 33.30-33.39, 35.73-35.77 and 54.23. Only peak of 33.30-33.39 2-theta values exhibited miller indices of face centered cubic. All other peaks in both cases are either of primitive cubic or body centered cubic[21,22].

FTIR analysis reveals peaks of transmittance versus characteristic absorption with chances of different functional groups. Both shows aryl disulphide, C-O stretch, N-O stretch, C=C stretch and N-H stretch. Slight variation is seen in Vidangadi loha with C-Br stretch as it is not marked in Hamsa Mandoor[23,24,25,26].

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Corresponding author:
Dr. D. Narapa Reddy Ph.D. Scholar,
Dept. of RS & BK, Gopabandhu Ayurveda Mahavidyalaya, Puri,Odissa
Email: manikya-2004@rediffmail.com

Source of Support: NIL
Conflict of Interest : None