WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 11, Issue 12, 220-226. Review Article ISSN 2277– 7105

ROLE OF ANALYTICAL INSTRUMENTS IN THE STANDARDIZATION OF AYURVEDIC FORMULATION

Dr. Nishakumari P. R.[1]* and Dr. Sujnan Jain[2]

[1]Associate Professor, Dept. of Rasashastra and Bhaishajya Kalpana, B.G Garaiya Ayurveda Garaiya, Rajkot, Gujarat.

[2]Professor, Dept. of Kriya Sharir, B.G Garaiya Ayurveda Garaiya, Rajkot, Gujarat.

Article Received on
25 June 2022,

Revised on 15 July 2022,
Accepted on 05 August 2022

DOI: 10.20959/wjpr202212-25195

***Corresponding Author**
Dr. Nishakumari P. R.
Associate Professor, Dept. of Rasashastra and Bhaishajya Kalpana, B.G Garaiya Ayurveda College, Rajkot, Gujarat.

ABSTRACT

Ayurveda, the ancient system of Indian medicine mainly deals with herbo- mineral formulation. The herbo -mineral formulationis having high clinical value, due to their long shelf life, lesser dosage and high potency. Standardization of herbo-minernal is the need to make our formulation stand out in global scenario. So to obtain a standard product attention should be paid at three levels, raw materials, process and final product. The analytical study of ayurvedic products reveals the physical and chemical changes take place after each and every process. To establish the efficacy of the ayurvedic formulation it is necessary to evaluate the analytical study. The presence of free metal or particle is of large size in any formulation can lead to the damage of the vital organs. Hence analytical instruments are employed for gaining information about the identity, particle size and structure of the contents of the formulation. Now, Modern technology has many analytical instruments which help in determining the various values with much accuracy and precision. Considering this an effort is made to analyse the formulation using analytical instruments like XRD, SEM, EDAX, CHROMATOGRAPHY.

KEYWORDS: Ayurvedic formulation, XRD, SEM, EDAX, CHROMATOGRAPHY.

INTRODUCTION

Ayurveda, the oldest Indian system of medicine is accepted by the people with out-stretched hand, but it needs to be prepared to answer the questions of modern man, who have the right to know about the drug which he is consuming. Earlier small amount of medicine were being prepared by the physician in his own pharmacy. As the need increased large amount of

medicine started being manufactured, hence to maintain some sort of uniformity in production analysis of medicine is of utmost importance. Without analytical study the study of drug is incomplete. The word analyze means the detailed examination which reveals the minor but important aspect regarding the drug.

In Ayurveda pharmaceutics especially herbo mineral products, it is very difficult to fix quality standards of the final product. Development of newer quality standards is an ongoing process. This is very essential in the advancement of Quality assurance. Some of these techniques are listed below.

XRD (X-RAY DIFFRACTION)

Principle

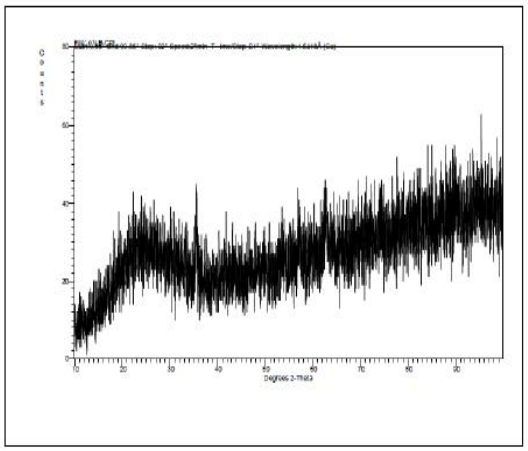
When a beam of x-radiation is incident upon a substance, the electrons constituting the atoms of the substances become as small oscillators. These oscillate at the same frequency as that of incident x-radiation. These scattered waves come from electrons which are arranged in a regular manner in a crystal lattice and then travel in certain directions. If these waves undergo constructive interference they are said to be diffracted by the crystal plane. Every crystalline substance scatters the x-rays in its own unique diffraction pattern producing a finger print of its atomic and molecular structure.

Applications: Characterizing the crystallographic structure and characterizing heterogenous solid mixtures. It is used in determining relative abundance and actual state of chemical combination. It is only a method, available for determining polymorphs of a substance. The effect of polymorphism on solubility is particularly important from pharmaceutical point of view.

Uses in Ayurveda to test different formulations like bhasmas, sindura, pottali kalpana etc Ex Dhathri louha.[1] It is an Herbo-mineral formulation which containing the ingredients Loha bhasma, Dhathri choorna and Yashtimadhu choorna are to be mixed with a specified ratio and levigated with Guduchi Kashaya. This drug is given in especially Iron Deficiency Anaemia.

This test was carried out for the crystalline phase identification of the compounds present in the sample.

Figure XRD of LB (Graph & Values)



No	Angle	Counts	Dspace	Rel I
1	35.56	43	2.525	68
2	53.54	39	1.712	62
3	62.6	46	1.484	73
4	67.499	43	1.388	68
5	70.96	43	1.328	68
6	75.42	40	1.26	63
7	75.62	40	1.257	59
8	77.681	52	1.229	83
9	82.074	47	1.174	75
10	82.3	49	1.172	78
11	82.604	49	1.168	78
12	82.88	41	1.165	65
13	85.18	44	1.139	70
14	87.9	55	1.111	87
15	90.98	50	1.081	79
16	92.54	51	1.067	81
17	93.08	53	1.062	84
18	94.68	49	1.048	78
19	95.381	63	1.042	100
20	97.42	52	1.026	83
21	98.68	57	1.016	90
22	99.062	51	1.013	81

Phase identification of Loha Bhasma sample Iron oxide ($Fe_2 O_3$) as major phase and iron (FeS) as minor phase.

Scanning electron microscope (SEM)[2]

The scanning electron microscope (SEM) is a type of electron microscope that images the sample surface by scanning it with a high-energy beam of electrons in a raster scan pattern. An electron microscope is a type of microscope that uses a particle beam of electrons to illuminate a specimen and create a highly-magnified image. Electron microscopes have much greater resolving power than light microscopes that use electromagnetic radiation and can obtain much higher magnifications of up to 2 million times, while the best light microscopes are limited to magnifications of 2000 times.

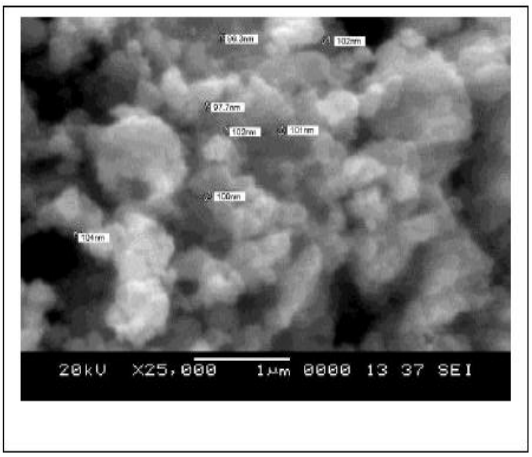
Application: Composition, Crystallographic Information, Topography, Morphology.

Uses in ayurveda

Sem-Edax of kasisa bhasma[4]

Kasisa bhasma is used in many herbo-mineral preparation like Rajapravarthni vati. Rajapravarthni vati is mainly used in menstrual disorders. Mineralogically Kasisa is considered as Ferrous Sulphate. Through SEM-EDAX Iron percentage was calculated.

Nano particles were visualized in the sample at 25000X. The magnification in Kasisa bhasma with a particle less than 100nm (96.7nm) were also observed confirming presence of nano particle in both samples.



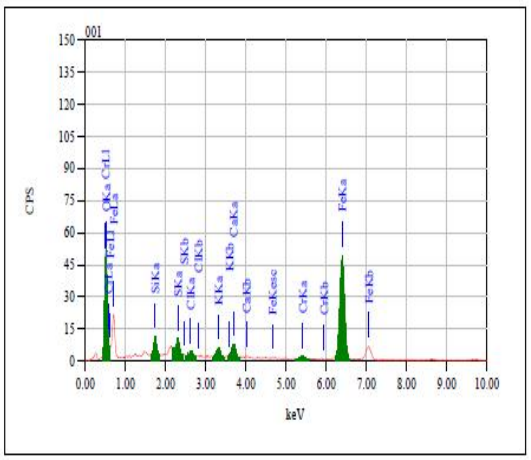


Table no. 4.16: Sem edx elemental composition in mass % of kasisa bhasma.

Element	Image 1	Image 2	Image 3	Image 4	Image 5	Image 6	Average
Fe	55.62	96.01	93.22	54.36	58.73	94.73	75.44 %
S	0.64	-	-	0.61	-	-	0.62 %
Si	2.74	-	-	2.19	1.92	-	2.28 %
K	1.65	-	-	1.85	2.11	-	1.87 %
Ca	2.52	-	-	3.43	3.26	-	3.07 %

Chromatography[5]

Chromatography is obtained from Greek word Chroma means 'Colour' and Graphein 'to write'. Chromatography is the collective term for set of laboratory techniques for the separation of mixtures. It involves passing a mixture dissolved in a 'mobile phase' through 'stationary phase', Which separates the analyte to be measured from other molecules. Thin layer chromatography is widely employed in laboratory technique and is similar to paper chromatography. Here stationary phase of a Thin layer adsorbent like silica gel, alumina, cellulose is used.

Uses in ayurveda

Thin layer chromatography[6]

Thin layer chromatography is widely used as an important tool for both qualitative and quantitative evaluation of drugs. In the present study TLC has been adopted as a separation technique. By this, we can separate individual compound from a mixture. Rf value refers to the ratio of distance moved by the solute to the distance moved by the solvent on a thin layer of an absorbent. Rf value of a compound under a given condition is characteristic and can be used to identify the compound by comparison with the reference standard. The intensity of

the colour of the compound under test can be utilized for quantitative estimation of principle in the drug.

The TLC study of Bhringaraja a herbal palnt, shuddha Kasisa means is mineral containing Ferrous sulphate which has undergone purification process, Kasisa bhasma was carried out. Thin layered Chromatography of the herbal ingredients of the test product Bhringaraja were developed along with the sample of shuddha Kasisa and Kasisa bhasma. This was to compare and observe the presence of the components of the ingredients in shuddha Kasisa and Kasisa bhasma.

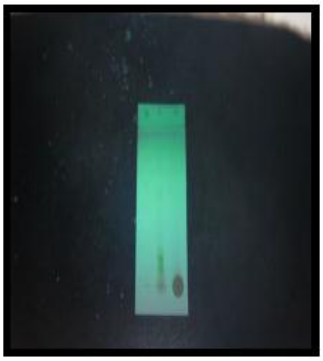
R_f value = Distance travelled by solute front

Distance travelled by solvent front

Detection	**Samples**		
	Shuddha Kasisa	Bhringaraja	Kasisa bhasma
Visible light	Not visibile	Visibile	No spot
Short UV 254nm	Not visibile	Not visibile	No spot
Modified Dragendroff"s reagent for vapourization	No spot	No spot	No spot
Long UV 366nm	_	0.0941 SB	_
	_	0.14117 SB	_
	_	0.51764 B	_
	_	0.5647 R	_
	0.6705 LB	0.6705 LB	_
	_	0.7764 DR	_
	0.8705 DY	0.8705 DY	_
	_	0.9294 SB	_

(LY-light yellow, **Y**-yellow,**R –** red, **DR**-dark red,**B** - blue, **SB**-sky blue, **LB**-light blue)

F108-TLCVisiblelight



F109-Short UV (254NM)

F110-Long UV (366nm)

DISCUSSION

- Instrumental analysis plays a very important role in assessing the different constituents of the formulation
- XRD of loha bhasma in Dhathri Loha tablet showed that major phase was ferric oxide .So by pharmaceutical process the change as been occurred. so Iron which is present in Dhathri loha is in ferric oxide form which gets absorbed easily in our body
- SEM reveals nano particles were visualized in both sample at 25000X.The magnification in Kasisa bhasma with a particle less than 100nm (96.7nm) were also observed confirming presence of nano particle in both samples.
- EDAX shows elemental analysis in which the presence of certain element in percentage. EDAX of Kasisa bhasma showed presence of Iron percentage as 75.4
- TLC is a simple yet highly useful technique for the standardization of herbal and herbo mineral product. The essential chemical constituents of herbs can be determined in the final product which will increase the therapeutic activity of the drug. Shuddha Kasisa showed 2 spots which reveals the presence of constituents of bhrinagaraja in purified

CONCLUSION

Analytical study is an essential part of research work. It helps to know the certainty of our assumption and prevent from miss interpretions. Chemical analysis of any drug should be done before experimental and clinical trials. They ensure the chemical constituents, tell us the standards of preparation and give us suggestion for further advancement. This also evaluates quality of finished product.

Analytical instruments like XRD helps in the determination of the structure of crystalline materials. SEM helps in elemental microanalysis and particle characterization. EDAX is an analysis tool used to determine the elemental composition of a sample. TLC is simple technique for quick assessment of the quality of herbal preparation, semi quantitative assessment of the chemical constituents of a preparation. All these technique are helpful in the Standardization of herbo-minernal formulation.

REFERANCES

1. “A Comparative Pharmaceutico- chemical study of Dhathri Louha samples with special reference to duration of bhavana”, Dr. Sajna, muniyal institute of Ayurveda medical sciences, Manipal.

2. Tridib Kumar Bhowmick, Akkihebbal K. Suresh, Shantaram G. Kane, Ajit C. Joshi and Jayesh R. Bellare Physicochemical characterization of an Indian traditional medicine, Jasada Bhasma: detection of nanoparticles containing non-stoichiometric zinc oxide Journal of Nano particle research, 2009; 11: 3.
3. Naresh Vyas, Nirmal Chakraborty, PAN alytical India, Spectris Technologies Pvt. Ltd, High-tech Elemental Analysis for Traditional Medicines-A Study of Ayurvedic Bhasma Powders Using XRF and XRD, G.I.T. Laboratory Journal GIT VERLAG GmbH & Co. KG, Darmstadt, Germany, 2006; 01: 21-23.
4. "A Pharmaceutico-analytical and comparative antimicrobial study of Shuddha Kasisa and Kasisa bhasma'', Dr.Nisha kumara.P.R, muniyal institute of Ayurveda medical sciences, Manipal, 2014-2015.
5. A Hand book of Standardization of Ayurvedic Formulation, Dr. Sudheendra v. Honwad.
6. A Pharmaceutico-analytical and comparative antimicrobial study of Shuddha Kasisa and Kasisa bhasma'', Dr. Nisha kumara. P. R, muniyal institute of Ayurveda medical sciences, Manipal.