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Synthesis And Characterization Of Ayurvedic Loha Bhasma(Powder) By Different Method

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Abstract

Pure Iron powder taken as a key material to synthesize Loha Bhasma in powder form, followed by purification with different herbal juices treatment to soften malleability of the metal. After herbal treatment known multiple incinerations are given at higher temperature (600^0C) in natural putta Bhatti (red fire) then the final bhasma is ready for the intended purpose.

Uses: It is useful in treating iron deficiency, Anemia, also acts as hematinic. It is essential to maintain daily iron level need in human body. Vital in females to maintain Iron level during menstruation cycle. Natural immunity booster.

Loha powder is initially treated with juice of Ficus amplissima (Pimpri) ,Banana leaves extract, Triphala decoction is used to soften the Loha metal & to remove impurities from it. This herbal juices treatment is known as bhavana. In allopathy medicines Ferric ammonium citrate is used as iron supplement which is chemically synthesized. Chemically manufactured substances has side effects and has metallic smell which may cause omitting in children's & elder too. But Loha bhasma synthesized by natural process has no metallic smell & it is tasteless so there is negligible possibility of omitting sensation.

The preparation of loha Bhasma s followed step by step shodhan, special shodhan and marana.
Process of maran is carried out at 600^0C and 800^0C to compare the quality of final product. The Bhasma formed at 600^0C found in proper colour & meeting all quality parameters than 800^0C.

Advanced analytical instruments technique used to evaluate the quality of Loha bhasma such as ICP-OES, FTIR, XRD. The physico chemical tests, Ayurvedic parameters are also checked to evaluate purity of the product which gives high degree assurance of final product which is used as ayurvedic medicine.

Keywords: Bhavana, Shodhan, Marana.

1.0 Introduction

Iron is an essential for body that is included in many over-the-counter multivitamin and mineral supplements and is used therapeutically in higher mg doses to treat or prevent iron deficiency anemia. Iron is main part of our blood in our body[1]. When taken at the usual recommended daily allowance or in replacement doses, iron has little or no adverse effect on the liver[2].

Micron, nano[3] iron particles of this transition metal are used to cure diseases such as anaemia, liver disorders ,worm infestation ,chronic skin ailments ,irregular fat metabolism, rhinitis and chronic heart diseases[1].

The effective dosage of Loha bhasma may vary from person to person depending upon the age and health condition of the person. Generally 100 to 200 mg of Loha bhasma powder can be taken twice a day or as directed by physician with honey or lukewarm water[4]. Black pepper, ginger can also be taken with it. Metal bhasma is also known as herbomineral preparations[5-6].

Side effects: Allopathy iron supplements used such as ferrous fumarate, ferrous gluconate, ferrous sulfate , ferric ammonium citrate etc. has side effects we can replace these with alternate ayurvedic medicine[7]. Loha Bhasma for iron supplement has no or negligible side effects[1]. Ayurvedic herbal medicines are ancient known science[8-9] .

Loha Bhasma is one such complex mineral preparation made of iron which is a crucial element for human body. It also show immunomodulatory activity.[10]

During Covid-19 need for alternate medicine arised and Indian Ayurvedic science has strength for immunomodulatory medicines as bhasma preparations.[11]

2.0 Materials and Method:

LOHA SHUDDHI

Batch Qty : 50 gm,**Yield :**. 99.5%

Formula : Table 1

Sr.No.	Ingredients	Qty in gms
1	Ashuddha Loha	50.0
2	Bhavana:-Triphala	12.5
A	Water	100 ml
B	Ficus Amplissima(Pimpri)leaves extract	50 ml
C	Baniyan Leaves extract	50 ml

Steps of Shodhan:

Clean all the equipment's before using them.

1. Receive all the ingredients as per the batch qty.
2. Take Ficus amplissima leaves(Pimpari) extract & reduce to half filter it.
3. Take Baniyan tree green leaves extract juice & reduce to half qty.Filter through muslin cloth.
4. Take Triphala in a steam vessel. Add water to it. Boil the mixture on low steam till the volume of liquid reduces to half. Filer through muslin cloth.
5. Strain the decoction through a muslin cloth. Note the yield (Should not be less than 50 ml).
6. Take 25 ml of Triphala decoction in a clean S.S. vessel.
7. Heat Ashuddha Loha powder in a frying pan on Woodfire Bhatti, till it becomes red hot.
8. Dip the red hot powder in banana tree leaves extract repeat it twice .
9. Dip the red hot powder in Ficus amplissima leaves(Pimpari) extract repeat it twice

10. Put again Iron powder in Bhatti make it red hot . Dip red hot iron powder in Triphala decoction with help of a curve dip stick with long rod. The process is called as 'Nirvapan'.
11. Decant the decoction in another vessel. Take Loha powder back in the frying pan.
12. Repeat steps no. 10 for 6 times again. Maintain the volume of decoction to 30 ml by occasional addition of decoction, whenever the level goes down.
13. Finally wash Shuddha Loha powder with water (Take Shuddha Loha in a vessel. Add sufficient quantity of water to it. Move the powder and allow it to settle. Decant the water. Follow the procedure twice).
14. Heat Shuddha Loha on Woodfire Bhatti, till it completely dry.
15. After cooling, pack the product
16. check following parameters:
    a) Description
    b) Elemental Assay : Fe

PREPARATION METHOD (AFTER SHODHAN)

Product : **Loha Bhasma** Dosage Form : Powder (Bhasma)

Yield : NLT 60.000 g. i.e. 100%

Table 2:

Sr.No.	Ingredients	Qty in gms
1	Shuddha Loha	50.0
2	Bhavana:-Triphala	7.5
A	Harada	2.5
B	Behada	2.5
C	Avalkathi	2.5
D	Water	60.0ml
E	Kwath	75.0ml

Steps followed during preparation:

Clean all the equipment's in water and ensure that they are clean before use.

1. Weigh all the ingredients as per batch quantity.
2. Add ingredient no. 1 to the mortar pestle (triturating tool) and grind it.
3. Clean ingredient no. 2 (Triphala) manually to remove the rotten and/or contaminated parts, if any.
4. Take ingredient no. 2 in a steam vessel. Add water (60 ml) to it.
5. Prepare an extract with help of steam heating. Reduce the extract to one fourth.
6. Strain the extract through 80 mesh.
7. Add the extract to mortar pestle. Continue trituration till all the extract is digested into the bulk .
8. Collect the bulk in the sharava (flat earthen pots) in the qty of approx. 2.4 gm to 2.5 gm per sharava (approx. 21 sharava are used)
9. Cover each sharava by placing another sharava on it mouth to mouth. The assembly is called as 'Sharava Samputa'.
10. Arrange approx. 120 of cow dungs (1-2 gunnies) in layers in Gajaputa - Bhatti.
11. Place eight 'Sharava Samputas' on cow dungs in a circular manner. Seven sharava samputas will form the circumference & the eigth will be in the centre as appropriate.
12. Again, cover the sharava samputas by approx.80 no. of cow dungs (2 gunnies) to form a heap of cow dungs.
13. Fire the bhatti . Note the temperature on pyrograph.Proper bhasmikaran to follow.[12]
14. On cooling take out the sharava & add the Bhasma to the Khal.

15. Repeat steps no. 4 to 14 for ten times.
16. Then add water (Approx. 20 ml.) to mortar pestle . Run the Khal for two days.
17. When mortar pestle becomes difficult to run, collect the bulk in clean s.s.trays in the quantity of Approx.6 gm per tray.
18. Dry the material at 70 ^{0} C ± 5 ^{0} C.
19. After drying add the whole bulk again to the (Morter pestle)Khal. Run the Khal to get fine powder.
20. Pass the Bhasma through 80 Mesh.
21. Powder the remainder coarse powder again in same pestle and again pass through 80 Mesh.
22. When whole batch is passed through 80 Mesh, note the yield
23. Check following parameters.
    a) General Apperance : Colour, Odour, Taste, Touch.
    b) L.O.D. at 110 ^{0} C .
    c) Loss on ignition.
    d) Acid insoluble ash.
    e) Ayurvedic parameters like Rekhapurnatra, Varitaratva, Nishchandratva.
    f) Elemental assay for Fe.

Take 10gm x 5 in separate lots of bhasma add honey in frying pan heat at low temperature till honey get evaporated then go for amrutikaran.

Amrutikaran :

24. Take a lot of 10 gm x5gm Bhasma in a frying pan. Add 10% qty.(1 gm for this lot) of cow ghee to it.
25. Heat the frying pan on low flame. Move the bulk in frying pan continuously. Fumes of ghee start coming out.
26. As soon as fumes of ghee stop coming, put off the flame. Continue moving of the bulk. The process is called as ' Amrutikaran '.
27. Then allow the Bhasma to cool on its own. Mix all 5 lots sample together to make 50gm of final finished product batch to get yield.
28. check following parameters :
    a) General Apperance : Colour, Odour, Taste, Touch.
    b) L.O.D. at 110 ^{0} C .
    c) Loss on ignition.
    d) Acid insoluble ash.
    e) Ayurvedic parameters like Rekhapurnatra, Varitaratva, Kachkach abhav,Unmantva.
    f) Elemental assay for Fe.

2.1 Organoleptic Evaluation

Organoleptic evaluations like colour, taste and texture of the samples of Loha analyzed as preliminary quality check.

2.2 Physico-chemical Tests:

In Physico-chemical Parameters such as Loss on Drying (LOD), Ash, Acid Insoluble ash (AIA), as per The Ayurvedic texts.

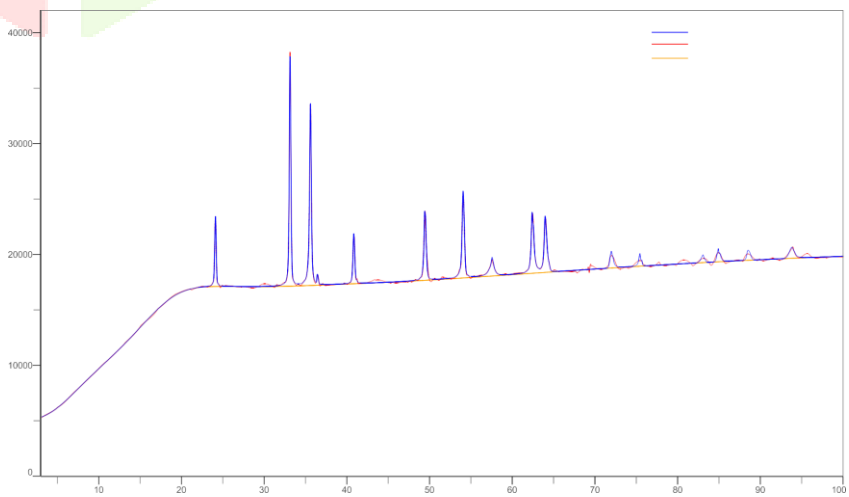
Table 3:

Product Name: Loha Bhasma	**Test observations**	**Limits**
Description	**Dark brown coloured powder,odourless,tasteless**	**Dark brown coloured powder,odourless,tasteless**
% LOD	**0.15, 0.18 ,0.11**	**NMT 0.5%**
% Loss on ignition	**0.8, 0.7, 0.62**	**Not more than 4.0%**
% Acid insoluble Ash	**91.82,81.84,91.23**	**Not more than 98.0%**
XRD	**Confirms the phase Iron oxide (Hematite)**	**Shows Hematite**
FTIR	**Confirms Fe-O**	**Shows Fe-O peak**
Elemental % Iron (Fe) by ICP-OES	**63.83, 63.71, 63.86**	**Not less than 60.0%**
Ayurvedic Parameters:		
Rekhapurnatva	**Passes**	**Passes**
Varitaratva	**Passes**	**Passes**
Kachkach abhav	**Passes**	**Passes**
Unmantva	**Passes**	**Passes**

3.0 Results and Discussion

Loha bhasma characterized as dark brown coloured powder.The Physico-chemical test Loss on drying (LOD) less than 0.5%. Loha bhasma shows Loss on Ignition not more than 4.0 %, Acid insoluble ash (AIA) not more than 98 %. Samples found to comply ayurvedic parameters such as Rekhapurnatva,Varitaritva, Kachkach abhav,Unmanatva. Loss on drying (LOD) is used to measure the amount of water and volatile matters in a sample when the sample is dried under specified conditions. The XRD profile of Loha bhasma confirms presence of 100% Hematite chemical phase[12]. FTIR confirms the presence of FeO (Iron oxide phase).ICP-OES ensure the percentage of Fe i.e 63.83.

XRD Profile:



3.1 X-ray Diffraction (XRD) Profile

X-ray diffraction (XRD) analysis of Loha bhasma carried out using Rigaku Miniflex 600 X-ray diffractometer with operating at 40 kV and 30 mA. The XRD Pattern was recorded for angle ranging from 3^0 to 100^0 at a scanning rate of 3^0/min. and scan step of 0.01^0. The of iron oxide phase is confirmed.

The XRD profile of Loha bhasma confirms presence of Hematite .

3.2FTIR:

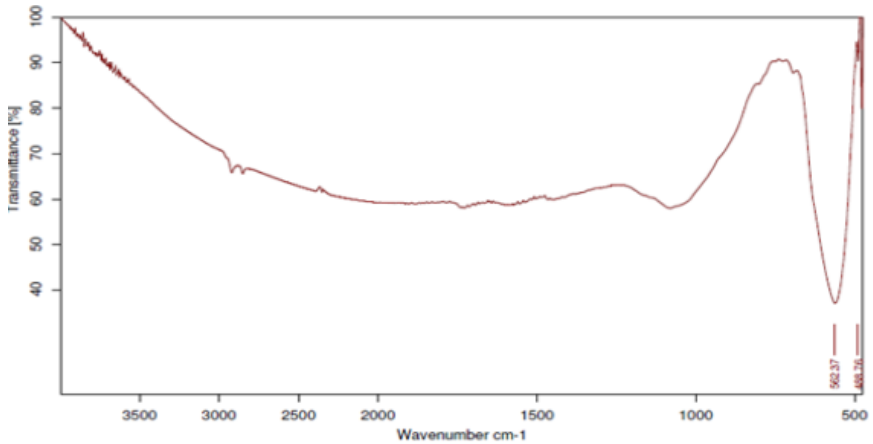


Table 4:

Name of The Product	**Loha Bhasma**
Wavenumber (cm^{-1})	**562** = Fe-O bond , **488=** Oxide phase
Remark	FTIR spectra of Loha bhasma shows the characteristic peaks at 562- cm^{-1} for Fe-O.

3.3 Elemental analysis by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)

The samples of Loha bhasma digested in a MARS 6 microwave digestion system (CEM corp., USA) equipped with Teflon closed vessels (Easy Prep Plus vessel) for safe operation under 800 psi. The instrumental conditions used for digestion of samples are given in **Table 6**. After completion of digestions elemental content Fe determined by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES). The instrumental conditions of ICP-OES used for Elemental analysis are given in

Table 5: **ICP-OES operating parameters**

Element	**Wavelength**	**Plasma (L/min)**	**AUX (L/min)**	**Neb (L/min)**	**Power (watts)**	**View Dist.**	**Plasma View**
Iron (Fe)	238.204	10	0.2	0.60	1300	15	Radial

Table 6 : CEM MARS 6 microwave digestion system operating parameters

Instrumental Parameters	**Iron (Fe)**
Acid used for Digestion	HCL
Method	Fe
Temperature	170^0C
Pressure	650 psi
Ramp Time	20 min.
Hold Time	10 min.
Cooling Time	15 min.

Calculation: Elemental Assay by ICP-OES:

Loha Bhasma:

$$\frac{3.255 \times 200 \times 25}{1 \times 1000 \times 25.5} \times 100 = \textbf{63.83 \% of Iron}$$

Table 7: Results of Elemental analysis in Loha Bhasma samples

Product Name	Batch no	Iron (Fe) in %
Loha Bhasma	S	63.83
Loha Bhasma	A	57.29
Loha Bhasma	B	58.16
Loha Bhasma	D	59.24
Loha Bhasma	E	58.06
Loha Bhasma	F	56.99

S:Sample prepared by our method. A,B,C,D,E,F:-Other market samples.

4.0 Conclusion:

To maintain the absolute trust in Ayurveda, it's necessity to ascertain the quality, efficacy & safety of Ayurvedic preparations on scientific lines with the use of modern techniques. The attempt of present work has been made to characterize with modern techniques such as Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES),FTIR,XRD. The Loha bhasma prepared by this method shows higher % of Fe content as compared to other market samples. Traditional ayurvedic medicines are safe to use and has no toxic effect[2].

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