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FORMULATION AND EVALUATION OF MANDUR BHASMA TABLET IN THE TREATMENT OF IRON DEFICIENCY ANEMIA

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ABSTRACT:

Ayurveda is the oldest system of medicine. Ayurvedic preparation of Mandur bhasma is used in the treatment of iron deficiency anemia with less side-effects. The main problem regarding with the powder dosage form is difficult in administration of accurate dose, bitter in taste leads to the patient incompliance's. Tablet is most conventional dosage form as it has many advantages such as proper administration of drug within a biological system, patient compliances, easy to dispense, more stability, accuracy of dosages. Mandur bhasma is widely used in Ayurvedic clinical practice as hematinic and in the treatment of iron deficiency anemia. Mandur bhasma consists of incinerated iron oxide (Fe2O3) is one of such preparation which is mentioned to be very effective in treating anemia. The detailed evaluation of this Mandur bhasma tablet product was studied for the following parameters: Preformulation study (angle of repose, bulk and tapped density, carr's index, Hausner's ratio.) and Post formulation study (hardness, thickness, friability, drug content, disintegration time, *In-vitro* dissolution profile). The calibration for the Mandur bhasma drug was done over the range of 4-20µg/ml with the regression equation y = 0.0457x + 0.0285 and regression coefficient i.e. r2=0.9922.

KEYWORDS: Ferric Iron, Mandur Bhasma, Anemia.

INTRODUCTION

The empirical use of different preparations of iron in the treatment of anemia dates from ancient times.[1] The incinerated iron preparation of Ayurveda is known as Mandur bhasma. This herbal mineral formulation known as Mandoor/ Mansur Bhasma is made from calcined iron. When iron keeps lying under the surface of earth for years, it starts rusting which is chemically known as ferric Oxide. According to Ayurveda 80- 100 years old is considered to be supreme. This ferric oxide is purified and crushed to form Mandur Bhasma. As it is made from ferric oxide, it helps in curing anemia, liver and spleen disorders. It has potent hematinic, hematogenic, anthelmintic, fat burning and Carminative properties.

The preparation of this bhasma is followed according to unique methods described by ancient scholars includes shodhana (purification), marana (incineration) and several grades of incineration under the term puta. Incineration of iron is done not only for making it finer but also for increasing its quality.[2] So that it can be specifically effective for the eradication of different ailments. Mandur bhasma is the most commonly used preparation of incinerated iron. This is indicated for the same as well as different diseases. So many studies have so far been carried out on the Mandur bhasma preparation. The innate qualities like quick action, lesser dose, tastelessness, prolonged shelf life, better palatability of Rasaushadhies have helped them to conquer the

demand of patients as well as pharmaceutical proprietors. Among different forms of Rasaushadhies, Bhasma is the most used dosage form.

Anemia is a common nutritional deficiency disorder and global public health problem which affects both developing and developed countries with major consequences for human health and their social and economic development (WHO 2005). According to WHO (2004) reports, one third of the global populations (over 2 billion) are anemic due to imbalance in their nutritious food intake. WHO estimates that even among the South Asian countries, India has the highest prevalence of anemia. What is even more important is the fact that about half of the global maternal deaths due to anemia occur in South Asian countries; India contributes to about 80 per cent of the maternal deaths due to anemia in South Asia.[3]

Iron is essential for the various activities of the human body especially in the hemoglobin synthesis. Iron deficiency anemia is a condition in which the body has too little iron in the bloodstream. This form of anemia is more common in adolescents and in women before menopause. Blood loss from heavy periods, internal bleeding from the gastrointestinal tract, or donating too much blood can all contribute to this disease. A low level of iron, leading to anemia, can result from various causes. The causes of iron deficiency anemia are pregnancy or childhood growth spurts, Heavy menstrual periods, Poor absorption of iron, Bleeding from the gut (intestines), dietary factors (iron poor or restricted diet), medication (aspirin, ibuprofen, naproxen and diclofenac), Lack of certain vitamins (folic acid and vitamin B12), Bleeding from the kidney, Hookworm infection, Red blood cell problems, Bone marrow problems.

Mandur bhasma is widely used in Ayurvedic clinical practice as hematinic and in the treatment of iron deficiency anemia. Mandur bhasma consists of incinerated iron oxide (Fe_2O3) is one of such preparation which is mentioned to be very effective in treating anemia.[4] In the Ayurveda practice the Mandur bhasma sample is given in the form of the powder to treat the anemia. The main problem regarding with the powder dosage form is difficult in administration of accurate dose, bitter in taste leads to the patient incompliance's, powder dosage form may absorb the moisture from surrounding environment and leads to degradation.

Among the various routes of drug delivery oral route is most preferred route. Tablet is most conventional dosage form as it has many advantages such as proper administration of drug within a biological system, patient compliances, easy to dispense, more stability, accuracy of dosages.

MATERIALS AND METHOD

Chemicals and Reagents

Mandur Bhasma as active pharmaceutical ingredient, Gum Acacia, PVP, and HPMC K4M are used as binder in the different concentration, starch is used as the disintegrant, lactose is used as the diluent, magnesium stearate is used as lubricant and talc is used as the anti-adherent. Composition of ingredient used for the formulation is shown in the table 1. Nine batches were prepared with varying the concentrations of binder.

Table 1: Formulation of Mandur bhasma tablet

Ingredient (mg)	F1	F2	F3	F4	F5	F6	F7	F8	F9
Mandur bhasma	125	125	125	125	125	125	125	125	125
Gum acacia	25	50	75	-	-	-	-	-	-
PVP	-	-	-	25	50	75	-	-	-
HPMC K4M	-	-	-	-	-	-	25	50	75
Starch	10	10	10	10	10	10	10	10	10
Lactose	80	55	30	80	55	30	80	55	30
Mg stearate	5	5	5	5	5	5	5	5	5
Talc	5	5	5	5	5	5	5	5	5

Assay and Calibration Curve For Ferric Ion In Mandur bhasma[5]

Accurately weighed 100mg of Mandur Bhasma in which the amount of Iron is to be determined is dissolved in suitable amount of Concentrated HCL and evaporate nearly to dryness to expel excess of acid. 1ml of this solution was taken and placed in 25ml of graduated flask, and added 5ml of Thiocyanate solution and 3ml of 4M nitric acid solution and added deionized water to dilute up to mark. The absorbance of sample was measured in spectrophotometer at 480nm. Concentration of this solution was measured by comparing values on reference curve obtained in the same way from different concentration of standard solution. Standard solution was prepared by dissolving 0.864 gm of Ammonium Iron (III) Sulphate in water, added 10 ml con HCL and diluted up to 1000 ml (1ml = 0.1 mg of Fe).

Formulation of Mandur bhasma Tablets

Each tablet containing 125 mg of Mandur bhasma were prepared by direct compression method using capsule shape punch and die set. 9 batches were prepared as per the formulae given in the table 1. The following parameters for the tablet were studied.

Pre-Compression Evaluation[6, 7]

Angle of Repose

The angle of repose for powder mixture was determined by the funnel method. The accurately weight powder mixture were taken in the funnel. The powder mixture was allowed to flow through the funnel freely on to the surface. The diameter of the powder cone was measured and angle of repose was calculated using the following equation: tan θ = h/ r or θ = tan-1 (h/ r) Where, θ = angle of repose, h = height of the cone, and r = radius of the cone base

Bulk Density

Bulk density (Db) was determined by measuring the volume (Vb) of known weighed quantity (W) of powder mixture using bulk density apparatus and can be calculated by using the formula: Db = W/ Vb

Tapped Density

Tapped density (Dt) was determined by measuring the volume (Vt) of known weighed quantity (W) of powder mixture using bulk density apparatus and can be calculated by using the formula: Dt = W/ Vt

Hausner's Ratio

The Hausner's ratio was calculated by dividing the tapped density by the bulk density of the powder mixture Hausner's ratio = Dt /Db Where, Dt is the tapped density and Db is the bulk density.

Carr's Index

The Carr's index (% compressibility) of the granules was calculated from the difference between the tapped and bulk densities divided by the tapped density and the ratio expressed as a percentage. Carr's Index (%) = Dt - Db X 100 Dt Where, Dt is the tapped density and Db is the bulk density.

POST FORMULATION STUDIES[8, 9]

Tablet Thickness

The thickness of the tablets was determined by using vernier caliper. Three tablets were used, and average values were calculated.

Hardness

Hardness indicates the ability of a tablet to withstand mechanical shocks while handling. The hardness of the tablets was determined using Monsanto hardness tester. It is expressed in kg/cm2. Three tablets were randomly picked and hardness of the tablets was determined.

Weight Variation

To study weight variation, twenty tablets of the formulation were weighed using a digital balance and the test was performed according to the official method. The specification for weight variation of tablets as per USP was mentioned in Table 2. Twenty tablets were selected randomly and weighed individually to check for weight variation.

Table 2: Specification for weight variation of tablets as per USP

Average weight of tablets (mg)	% Difference
130 or less	10
From 130 to 324	7.5
More than 324	5

Friability

The friability of tablets was determined using Roche Friabilator. It is expressed in percentage (%). Ten tablets were initially weighed and transferred into friabilator. The friabilator was operated at 25 rpm for 4 minutes. The tablets were weighed again. The % friability was then calculated by:

% Friability = Initial Weight – Final Weight/ Final Weight X 100

Percentage friability of tablets less than 1% are considered acceptable.

Content Uniformity

Mandur bhasma tablet contain Ferric ion as active constituent, the Ferric ion was estimated in the tablet. Five tablets were weighed individually and powdered. The powder equivalent to 100 mg of Mandur bhasma was weighed and added in HCL solution and evaporate nearly to dryness to expel excess of acid, and diluted slightly with water and volume was made up to the 100 ml. from this solution 2 ml was taken and transferred in to 25 ml volumetric flask, to this 5 ml of thiocyanate solution and 3 ml of 4M nitric acid and volume was made up to mark. The absorbance of this solution was taken at 480 nm. The drug content was estimated from the standard curve of ferric ion in Mandur bhasma.

Disintegration Time

Disintegration time test was carried out according to USP specification. 6 tablets were placed in a disintegration tester filled with distilled water at 37±0.20^{o}C. The tablets were considered completely disintegrated when all the particles passed through the wire mesh. Disintegration times recorded are mean of two determinations.

***In vitro* drug release study**

This test was carried out using dissolution test apparatus containing specified volume of 900 ml 0.1N HCL and the temperature were maintained at 37±0.50^{o}C. The tablets are directly placed in a medium and immediately the paddles were started at the specified rate (50 RPM). Within the time interval specified (15, 30, 45, 60, 90, 120, 180, and 240 min) 5 ml of sample were withdrawn. The samples were filtered and added 5 ml of thiocyanate solution and 3 ml of 4M nitric acid. These samples are analyzed at 480 nm for ferric ion and further calculation is carried out to get drug release. The drug released data were plotted.

RESULT AND DISCUSSION

All the tablets were prepared by direct compression method and the compositions of all the formulations was given in (Table 1) the Formulations F1 to F9. In all the formulations, 125 mg of Mandur bhasma was incorporated and final weight was made up to 250 mg. The powder mixture of different formulations was evaluated for angle of repose, bulk density, tapped density, compressibility index and Hausner's ratio. The results are shown in (Table 3). Angle of repose values ranged from 20.54°-22.83° indicates excellent flow property of powder mixture. The free flowing properties of powder mixture were further confirmed by determining carr's index and Hausner's ratio. The carr's index values and Hausner's ratio values were ranged from 11.18-19.20 and 1.11- 1.23 respectively. The values of bulk density ranged from 0.691-0.703 gm/ml and the values of tapped density range from 0.778-0.859 gm/ml, were found to be within the limits as per USP. Tablets of all the formulations were subjected to many in-process evaluation parameters such as physical appearance, content uniformity, weight variation, hardness and friability tests, results are shown in the (Table 4). All the tablets were capsule in shape with no visible cracks and having smooth appearance. The average percentage weight variation of 20 tablets from and the average was remained within ±0.1%. This weight variation test revealed that the tablets were within the range of Pharmacopoeial limit. Drug content of all batches of tablets were within the range of 68.19 to 69.61 % indicating good uniformity among different formulations of the tablets. All the formulations showed good hardness values ranged from 2.3to 3.4 kg/cm^2. Further, to strengthen these values friability values are also considered. Among all the formulations F4 showed maximum drug release of 69.458±1.54% in 240 min. F4 formulation was found to be more suitable to give a better formulation having good drug release characteristics and stability.

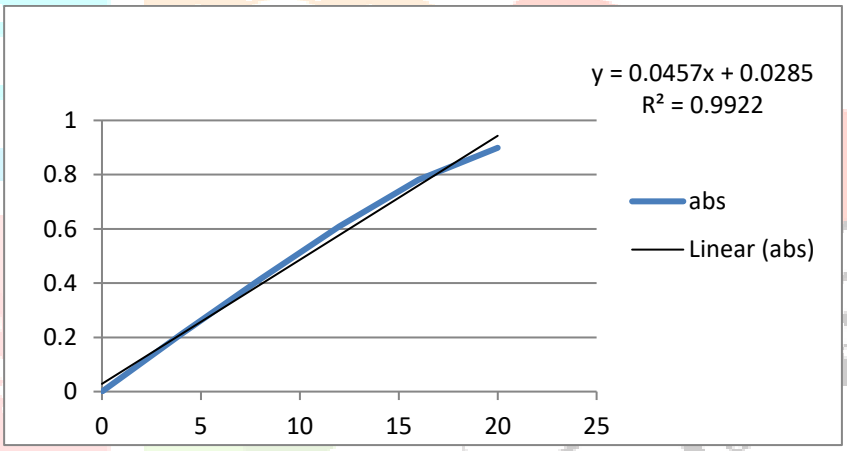

Fig 1: calibration curve for ferric ion in Mandur bhasma

Table 3: Preformulation Studies

Formulation batches	Angle of repose	Bulk density	Tapped density	Hausner's ratio	Carr's index
F1	20.54±0.64	0.691±0.0018	0.778±0.0085	1.12	11.18
F2	22.63±0.69	0.694±0.0038	0.859±0.017	1.23	19.20
F3	21.35±0.79	0.709±0.0048	0.846±0.013	1.19	16.19
F4	21.08±1.05	0.702±0.0028	0.816±0.009	1.16	13.97
F5	20.41±1.24	0.703±0.0071	0.828±0.007	1.11	15.27
F6	22.07±0.33	0.696±0.0050	0.781±0.001	1.12	11.90
F7	21.53±0.32	0.696±0.0053	0.854±0.017	1.22	18.03
F8	21.62±0.77	0.699±0.0072	0.803±0.003	1.14	11.80
F9	22.83±1.77	0.693±0.0043	0.821±0.002	1.18	14.73

Table 4: Post Formulation Studies

Formulation batches	Hardness Kg/cm2	Thickness (mm)	Friability (%)	Weight variation	Drug content (equivalent % of fe)	Dis-integration time
F1	2.4±0.24	0.3	0.653	251±9.09	68.29±0.28	12.61±0.37
F2	2.3±0.26	0.3	0.983	249±7.49	69.31±1.22	12.05±0.35
F3	2.5±0.25	0.3	0.336	252±8.50	69.19±0.37	12.35±1.30
F4	2.7±0.36	0.3	0.689	253±7.08	69.61±0.71	14.08±0.79
F5	2.9±0.10	0.3	0.310	247±7.62	68.55±0.46	13.07±1.18
F6	2.4±0.04	0.3	0.321	245±7.85	68.64±0.48	11.34±0.76
F7	3.4±0.25	0.3	0.673	249±9.20	69.09±1.51	13.54±0.39
F8	2.4±0.14	0.3	0.367	251±8.87	68.72±0.76	13.07±0.63
F9	2.5±0.18	0.3	0.598	252±7.92	69.23±0.76	11.32±0.78

Table 5: Dissolution Studies

Time (min)	Cumulative % of ferric ion in Mandur Bhasma released								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	0	0	0	0	0	0	0	0	0
15	33.885±0.64	35.910±2.25	36.653±1.14	37.772±3.33	37.945±4.14	37.945±4.14	34.589±0.14	33.533±0.29	36.259±1.42
30	34.993±.037	36.696±1.89	38.685±0.65	41.307±3.53	38.392±0.40	38.392±0.40	35.978±0.21	34.743±0.26	46.294±17.07
45	36.169±0.36	36.011±5.38	41.199±0.72	43.253±4.74	41.394±0.94	41.394±0.94	38.494±0.33	35.550±0.12	40.357±2.15
60	37.255±0.45	38.625±2.95	43.159±.043	46.453±6.08	43.938±1.19	43.938±1.19	39.856±0.24	37.904±0.39	42.091±1.48
90	40.153±0.83	41.199±2.36	47.256±0.59	54.666±4.76	48.197±1.42	48.197±1.42	42.028±0.62	41.074±0.76	43.267±1.70
120	42.971±0.80	43.368±2.53	50.335±0.49	59.282±4.32	51.879±1.89	51.879±1.89	45.109±0.33	43.331±0.18	47.647±1.76
180	46.691±0.45	47.849±2.40	54.957±0.16	67.641±0.68	56.290±1.48	56.290±1.48	52.650±0.97	49.176±0.25	53.893±1.32
240	50.415±0.19	52.694±1.23	59.431±0.66	69.458±1.54	59.841±0.30	59.841±0.30	59.192±0.29	54.375±0.30	59.968±0.73

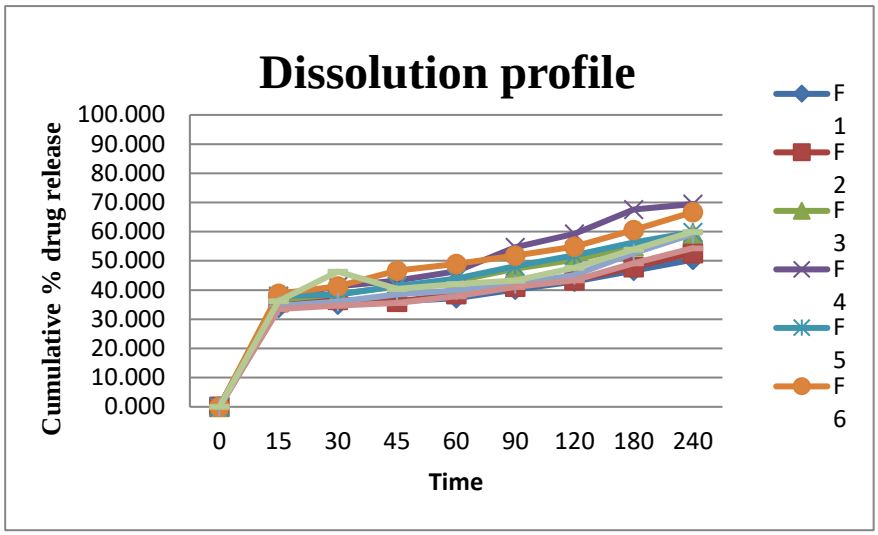

Fig 2: Dissolution Profile for Mandur Bhasma Tablets

CONCLUSION

All batches of the Mandur Bhasma tablet were prepared, the pre and post compression study for all batches were studied. From the study and test performed the F4 batch containing PVP shows the maximum drug release with 69.45% in four hours. F4 batch also shows good hardness, thickness, with disintegration time of 14.08. from the result obtained it is concluded that the F4 batch is best among all the batches prepared, and can be used in the treatment of iron deficiency Anemia.

REFERENCES

1. Sharma RK, Dash B, editors. Caraka Samhita. Vol. III. 4th Ed. Varanasi: Chowkhamba Sanskrit Series OfÞ ce; 2000.
2. Shastri KN, editor. Rasatarangini. 11th ed. Varanasi: Motilal Banarasi Das; 2000.
3. Soundarya N., A review on anemia – types, causes, symptoms and their treatments. Journal of science and technology investigation -ISSN: 2456-8082, may 2015.
4. Dr. þratibha M. Patil A comparative pharmaceutico-analytical study of Mandur Bhasma W.S.R. to 2 specific shodhna product. 2012.
5. G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney. Vogeles Textbook of Quantitative Analysis 1989; 5th Edition: Pg. No. 690.
6. Patil DN, Kulakarni AR, Hatapakki BC, Patil BS. Preparation and Evaluation of Aegle marmelos Gum as a Tablet Binder. International Journal of Pharma and Bio Sciences 2010; 1(8):1-5. .
7. Bankar GS, Anderson NR. Tablets. In: Lachman L, Lieberman HA, Kanig JL. Theory and Practice of Industrial Pharmacy. Varghese Publisher, Mumbai, 3rd ed., 1987: 297-321.
8. Indian Pharmacopoeia: Ministry of Health and Family Welfare, Govt. of India, Controller of Publications, New Delhi 1996:Vol.II, A100 - A111.
9. Kulkarni GT, Suresh B. Evaluation of Binding Properties of Plantago ovate and Trigonella gaecum Mucilages. Indian Drugs 2002; 39(8): 422-425.