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Physio-chemical analysis of Praval Bhasam - Prepared by using Praval Mool as raw material

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Abstract

Physico-chemical analysis provides the objective parameters to fix up the standards for quality of raw drugs as well as finished products. In the present study,Praval Mool is used as a Raw material to form Praval Bhasma. Praval (Coral) is the calcareous skeleton of the minute marine organism called Anthezoa polypus and belongs to phylum coelenterate.It is a natural source of rich calcium widely used in Amlapitta, Yakshma,Kasa, Netra Roga and Hridaya Roga and Ca deficiency diseases etc. it is administered in the form of Bhasma and Pisti. Moreover, in the market, it is available in two forms viz. Pravala shakha and Pravala moola. As in the market, moola is cheaper than shakha and has higher % of Calcium, shakha can be replaced by moola. Both are used for medicinal purposes. Shodhan of Praval is done in Sarjka kshara.The Pravala bhasma is prepared by triturating it with Godugdha and subjected to puta. The analytical procedures is carried out vide infra in two major headings incorporating physico-chemical tests like Total Ash, Acid Insoluble Ash, Loss on Drying, Particle Size, and advanced instrumental technics like XRD and XRF.

Keywords *Pravala, Pisti, Bhasma, Shodan, Mool, Puta.*

1.Introduction

The Ayurveda drugs are obtained from natural source only i.e. from plants, animals or from minerals. Rasashastra is a branch of Ayurveda pharmaceutics, specially dealing with the mercury, minerals, metals and animal origin drugs having therapeutic and alchemical importance. Praval is a calcium compound categorized under the name "*Sudha Vargiya Dravyas (calcium group drugs)"* first named by Vaidya Yadavji Trikamji Acharya (1). *Pravala* (Coral) is the calcareous skeleton of the minute marine organism and belongs to phylum coelenterate. The skeleton is in the form of minute irregular deposits, called spicules which contain mainly calcium carbonate, the skeleton of coral is believed to possess a special affinity for iron which combines with a calcium organic complex to give colour pigments. Moreover, in the market, it is available in two forms viz. Pravala shakha and Pravala moola. As in the market, moola is cheaper than shakha and has higher % of Calcium, and better efficacy drug (2). *Praval* is widely indicated in the form of bhasma for several ailments *Timira, Yakshma, Kasa* etc (3) and for Rasayana purpose also (4) . The word 'Bhasma'is formed from the words ' Bhas'which means shine or luster. The suffix 'Sma' indicates past tense .So the entire term 'Bhasma ' means ' shining in the past ' or 'one which has lost the luster'. Prawal bhasma (PB) is used for treatment of inflammation,cough due to phthisis, excessive sweating, cardiac fibrillation, osteoporosis, dysureia and ligourea (5) . In Ayurvedic system of medicine, the variation in collection process, timing and procedure may yield same bhasma with different quality aspects. In many

cases, wrong manufacturing and marketing process may lead to production of inferior-quality products, which reduces efficacy of products as well as safety parameters. In order to minimize variability and to strengthen the quality of Ayurvedic products, standardization of a bhasma is essential (6,7). The advantages of these preparations over plant preparation are their stability, lower dose and easy availability (8). Due to enriched geography in case of herb collection, process-related variables and variation in methodology adopted to formulate an Ayurvedic drug is chief causative agent for non-uniform quality aspects of Ayurvedic formulations. To ensure the quality as well as to establish the standard parameters for future study of this important formulation, the physicochemical characterization of PB was performed. Very few reports are available where attempts have been made to understand the physico-chemical properties of *bhasma*. Considering all these facts, it was found worthwhile to carry out a systematic and scientific study of physico-chemical properties and toxicity of Prawal Bhasam.

2. MATERIALS AND METHODS

2.1 Raw materials- Pravala was procured from a local market of Gadag (Karnataka), India (Figure1). *Sarjika* kshara which is also called Sajjikhar (sodium bicarbonate) was purchased from Karantaka .

2.2 Prepapration of Praval Bhsama

2.2.1. Cleaning (Sodhana) - Praval was purified according to sodhana process described in Rasa Tarangini (9). During Sodhana (purification) process Pravala was kept in a clot and pottali was prepared. This pottali was hung in pot, containing Sarjika Kshar Jala with the help of glass rod and heat was given continuously for 3 hours. Later the pottali was removed from the pot and Praval was washed and dried.and powdering of Shoudhit praval was done. This process is an intermediate process between Shodhana & Marana.

2.2.2. Calcination (Marana) - After sodhana process the shodhit Praval was subjected to marana (incineration) process. Bhavana of godugdha was given to powder to make a semi-solid paste and the circular cakrikas of 2-3cm in diameter were prepared.

2.3 Cakrikas (pellets)

The *Cakrikas* (round and flat pellets) were air-dried in shade and kept in a *Sarava samputa* (earthen vessels).The joint of both vessels was sealed with the help of mud,kapad mitti (a ribbon of fine cotton cloth smeared with fuller's earth) seven times and dried in sun light. Finally the sealed vessel was subjected to *Gajaputa* .The temperature reached to the maximum of 824˚C during the process.After once ignition of cow dungs, it was allowed to quench itself. Total time taken in ignition and quenching was 9 h and 35 min. The *Sarava samputa* was removed from *Gajaputa* assembly, opened and the *Cakrikas* were again triturated with *Godugdha*.. Again the flat thin *Cakrikas* (pellets) were prepared, air-dried in shade and kept in *Sarava samputa* (earthen vessels) and finally subjected to *Gajaputa*. The process was repeated in triplicate. This process produced the PB.

2.4 .Physiochemical property analysis

2.4.1) Physiochemical properties were analyzed using API (formulation) at Ozone Pharmaceutical Ltd. analytical lab, Bahadurgarh, Haryana and Particle size analysis by TEM and quantitative test using XRD, XRF was done at Punjab university,Chandigarh.

2.4.2) Organoleptic characters of Praval bhasam

The final bhasma was analyzed for quality control as described in Ayurvedic text (10). Nischandratva, Rekhapurnatvam Varitaramtavm Amla pariksha .

3. RESULTS AND DISUSSION

Physico-chemical analysis provides the objective parameters to fix up the standards for quality of raw drugs as well as finished products. Bhasma is analysed on parameters like organoleptic, physical, chemical which include loss on drying, total ash, acid insoluble ash, water soluble ash,specific gravity and qualitative and quantitative tests (Table1,2). Shodhana is an essential procedure before the preparation of Bhasma. Pravala is found in shallow waters of the sea, to remove the toxic impurities from them and to reduce the kshariyata and hardness of Pravala Shodhana is required. After shodhana weight loss was 160 gms in Pravala which might be due to the removal of external impurities. Sarjikakshara jal is kshariya in nature; Shodhana might reduce the alkalinity of the drug. After shodhana , it lost shining , became dull, clear and brittle. By this it can be inferred that the shodhana medias would have helped in removing external blemishes of these drugs. Corrosive effect of the shodhana medias might have turned all the drugs in to more fragile and soft. Pravala became more dull , may be due to the chedana bhedana property of sarjika kshara and tikshna guna made it more clean and clear.

Table 1: Pharmaceutical preparation of *Praval bhasma*

S.No.	Procedures		Praval Bhasma
1.	Quantity of Praval		500gms
2.	Shodhita Praval	Before	500gms
		After	340gms
		Loss	160gms
3.	Powdering of Praval	Before	340gms
		After	338gms
		Loss	2gms
4.	Bhavana	Before	338gms
		After	349gms
		gain	11gms
5.	Marana (1st puta)	Before	349gms
		After	259gms
		Loss	90gms
6.	Marana (2nd puta)	Before	270gms
		After	225gms
		Loss	45gms
7.	Marana (3rd puta)	Before	236gms
		After	205gms
		Loss	31gms

Godugdha being Atyanta Sheeta Veerya drvya, prevents unwanted effects of heat on Praval . By mardana, it reduces the particle size and makes finer by further processings. Milk has a potent antiulcer activity that may be attributable to its phospholipid constituents. It also contains Calcium, Enzyme inhibitors, Vit C and B12, Lactoferrin, Xanthine, Oxidase, Lactoperoxidase, Lysozymes and Niacin. These might increase the therapeutic action of the drug. At the same time liquid media used for the process of bhavana with its active chemical constituents, helps in the formation of an organo-metallic complex with the main drug thus increasing the bioassimilative power and therapeutic effect. The color of bhasma after first puta was grey which reduced in subsequent putas. This color might be due to the organic matters present in Godugdha. Mardana

Table.No.2 Organoleptic and Physico-Chemical characters of Pravala

Parameters	Pravala Bhasma
Color	Off White
Taste	Tasteless
Odor	Odorless
Touch	Soft.smooth
Appearance	Amorphous powder
Acid insoluble ash, w/w	0.28%
Total Ash, w/w	99.92%
Water soluble ash, w/w	9.06%
Water Insoluble ash, w/w	90.25%
Loss on drying, w/w	0.29%
Specific gravity	1.0046
Calcium (AAS method)	38.25%w/w
Calcium % (XRF method)	38.69%

PREPARATION OF PRAVAL BHASMA

a)Raw Praval b) Sarjishara c) Shodhan of Praval d) Powdered Praval e) Godugdha f) Bhawna given to Praval in godugdha g) Chakrika preparation of Praval for 1st puta h) Chakrika in sarava samputa

also helps in loosening the molecular cohesiveness and helps drugs to break into fine particles during the subsequent processing.and helps to reduce the number of Putas. Praval is in aragonite form, when heated it is converted into calcite form and this calcite is more stable than aragonite and Marana helps in reducing the particle size and to get homogenized, stable, bioassimilable precipitated complex molecule (Fig.1,2).

PREPARATION OF PRAVAL BHASMA

i)Gajput ignited to Praval j) Praval Bhasma after 1st puta k) Chakrika for 2nd puta l) Bhasma after 2nd puta m) Chakrika for 3rd puta n) Final Praval Bhasma

Total Ash Value: (11,12)

It is a physical method useful in drug standardization. Ashing involves an oxidation of the components of the product. It gives a percentage of inorganic constituents of the sample. It also helps in judging, identification of sample or purity of the drug. Ash value of Praval Bhasma was found to be 99.92% w/w.

Acid Insoluble Ash: (11,12)

Acid insoluble ash of the Praval was 0.28%w/w. The acid insoluble ash is a part of the total ash that is insoluble in dilute hydrochloric acid. Test for acid insoluble ash was carried out to evaluate the percentage of insoluble inorganic content of the samples in dilute HCl acid. Since a drug must first pass into solution before it can be absorbed, so the acid insoluble ash test for drug is therapeutically very important. It is intended to provide a step towards the evaluation of the physiological availability of the Drug.

Water soluble Ash: (12)

Praval Bhasma was estimated for water soluble ash was 9.06%w/w and it denotes that water is not a soluble media for it. The salivary secretions, gastric enzymes may play an important role in the efficacy of Bhasma.

Loss on drying at 110^0 C: (13)

It is a physical test to detect the percentage of moisture content and hence the shelf life of the sample. In the present study, LOD of Praval Bhasma was found to possess 0.29%w/w. Hence it can be stated that it possess least moisture content and very rare chance of bacterial and fungal growth and makes it better drug.

Specific gravity : (14)

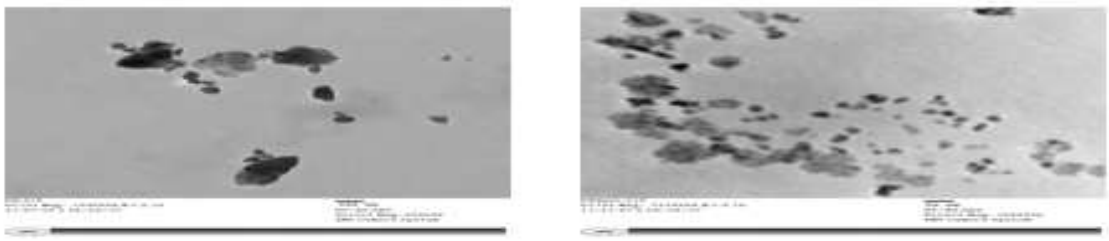
The Specific gravity of a Praval is 1.0046.The Specific gravity of a Praval is indication of its density. The greater a specific gravity, heavier it will feel.

Calcium percentage:

The Calcium percentage of Praval Bhasma was 38.25 %w/w (by AAS method) and 38.69% by XRF Method.

Particle Size Analysis (By TEM Method):(15)

Particle size is one of the factors which will affect dissolution and absorption of drug. Particle size and surface area are inversely proportional to each other, as particle size decreases surface area increases. This leads to increase in dissolution of drug and rapid absorption. The TEM photomicrograph of Praval showed 20-100nm particles in the samples. So it can be said that Praval has good dissolution rate and smaller particle size make the drug in bioassimiable form so
it is easily and readily absorb in body.

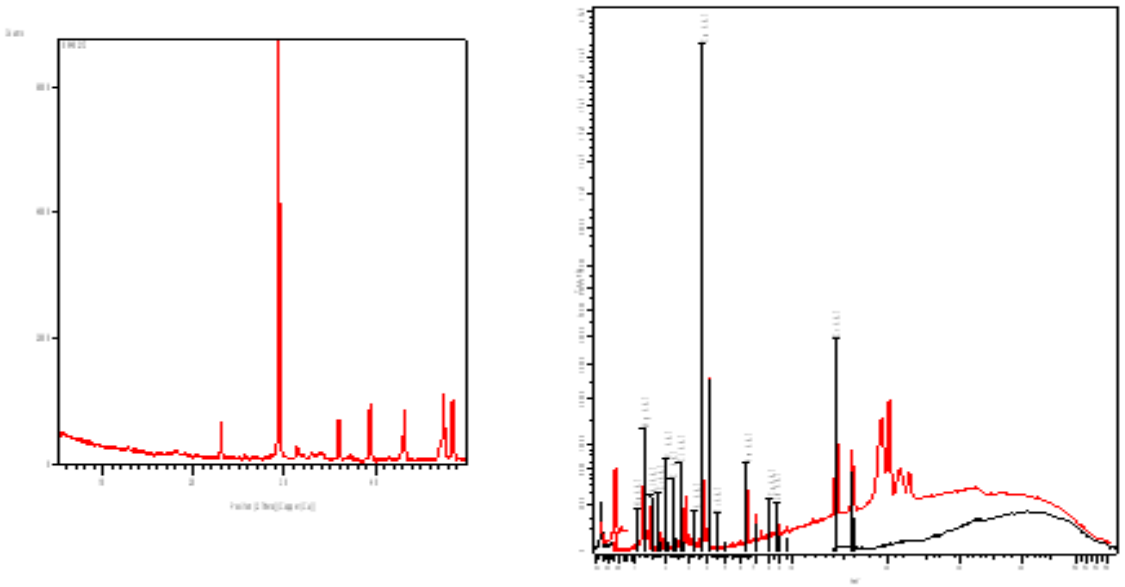


PARTICAL SIZE OF PRAVAL BHASMA BY TEM METHOD

XRD study (16,17)

The X-ray Diffraction study was done to crackdown the structure and chemical composition of the samples. The X-ray Diffraction study was done to crackdown the structure and chemical composition of the samples. In XRD OF Praval Bhasma Peaks at d =3.04 A^0 (2 θ =29.3560),d= 2.289 A^0 (2 θ =39.3656),d=1.19 A^0 (2 θ =47.4345),d=1.87 A^0 (2 θ =48.4554) confirm the presence of calcite as the major crystalline phase in sample and Bhasma contains calcite form of calcium carbonate.Low Intensity lines indicate presence of Calcium hydroxide, d =2.623 A^0 (2 θ =34.1785), d =4.93 A^0 (2 θ =17.9689),), d =1.916 A^0 (2 θ =47.4345).This may be attributed to hydrolysis of Calcium oxide formed due to partial decomposition of Calcite during calcinations cycles.

XRD GRAPH OF PRAVAL BHASMA



X-Ray Fluorescence Spectrometer: (18,19)

XRF is a physical method of analysis which directly analyses almost all chemical elements of the

periodic system in the sample. It helps in detection of major, minor as well as trace elements which are present in the drug. Elements present in Praval Bhasma are Ca(38.69%), O(40.66), C(12.70%),Mg(4.61%),Si(0.88),S(0.45%),Fe(0.37%),Na(0.36%),Al(0.36%),Sr(0.27%),P(0.18%),Cl(0.17%) ,K(0.15%),Cu(0.05%),Ti(0.04%),Zn(0.03%)Cr,Zr,Ni,Mn,As,Mo are in traces. The XRF analysis of Praval showed, Calcium as the major element, Magnesium, Silicon, Phosphorous, Manganese and Iron are the minor elements; Aluminum, Sulfur, Potassium, Strontium are the trace elements. These elements might have got imparted due to the various processes like Shodhan, Godugdha Bhavana, and Marana. The additional elements are in trace level i.e, below permissible limits. Hence, drug can be considered as safe.

Conclusions

The above analytical study reveals that sample lie within the standard limits as mentioned in Pharmacoepial Standards for Ayurvedic formulations. Praval bhasma is a natural calcium preparations that is more effective than synthetic calcium due to reason that,they contain easily absorbable and assimilable form of oxide and they contain other trace elements such as magnesium, copper ,zinc etc. Godugha might increase the therapeutic action of the drug.Godugdha being Atyanta Sheeta Veerya drvya, prevents unwanted effects of heat on Praval. So it can effectively use in Amlapitta, Yakshma,Kasa, Netra Roga and Hridaya Roga and Ca deficiency diseases etc.. The overall results inferred that moola is having similar properties like shakha and hence, both can be used for medicinal purposes. As in the market, moola is cheaper than shakha and has higher % of Calcium ; shakha can be replaced by moola .

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