Preliminary Physico-Chemical Evaluation of *Sunun Poste Mughilan*

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Abstract

Standardization is an important step towards the establishment of a consistent chemical profile and biological activity. It is a quality assurance program for production and manufacturing of herbal drugs. Herbal medicines are gaining more and more attention all over the world due to their long historical clinical practice and less side effects. The need of hour is to evolve a systemic approach and develop well accepted methodologies for the standardization of herbal formulations. *Sunun Poste Mughilan* is mentioned in Hamdard Pharmacopoeia of Eastern Medicine for dental ailments. The physico-chemical standardization of this formulation was carried out according to the parameters laid down by CCRUM, New Delhi. This evaluation included determination of organoleptic properties alcohol soluble matter, water soluble matter, successive extractive values, pH value, bulk density, tapped density, moisture content, loss of weight on drying, ash value, crude fiber content and volatile oil. The findings of this study may be helpful to evaluate the *Sunun Poste Mughilan* produced by different manufacturers.

Keywords: Dental ailments, *Sunun Poste Mughilan*, Standardization.

Introduction

In Unani system of medicine, toothpowders are commonly known as Sunun. They contain finely powdered drugs. Medicinal plants have been used since ancient time to treat dental problems and discussed from time to time by many researchers. The use of Satyanasi (*Argemone mexicana*), Neem (*Azadirachta indica*) and Rehan (*Ocimum sanctum*) in dental health care has recently been reported (Sharma and Joshi, 2007). In Unani system of medicine, there are many single drugs which are used in the treatment of dental diseases. Such drugs include Anar (*Punica granatum*), Chobchini (*Smilax china*), Haldi (*Curcuma longa*), Aqarqarha (*Anacyclus pyrethrum*), Tambaku (*Nicotiana tabacum*), Suddab (*Ruta graveolens*) (Said, 1997). The compound drugs include Sununе Zard, Sununе Mulook, Sununе Mustahkam Dandaan and Sununе Mujalli. Traditional systems of medicine are considered effective. However, the data regarding their drug standardization is meagre. Central Council for Research in Unani Medicine, New Delhi has given guidelines for standardizing conventionally used Unani Formulation formulations.

Lack of proper quality standards in manufacturing and testing of Unani drugs are the main challenges. The application of GMP in the manufacturing of Unani medicines is an essential tool to assure quality. Standard Operating procedure

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(SOP) is an authorized written procedure giving instructions for performing operations not necessarily specific to a given product or material (e.g. equipment operation, maintenance and cleaning; cleaning of premises and environmental control; sampling and inspection). Certain SOPs may be used to supplement product-specific matter and batch production documentation (Anonymous, 2007). Most of the operations in the pharmaceutical companies are performed on the basis of specific written procedures. The introduction of SOPs in the community pharmacies will bring many benefits and provide an opportunity to demonstrate professionalism and responsibilities. (Anonymous, 2007).

An attempt has been made to standardize the Unani formulation Sunun Poste Mughilan. This formulation is used to strengthen the dental roots and a gum tonic as well as imparter of sparkle to the teeth (Kabiruddin, YNM and Said, 1997).

Materials and Methods

Preparation of Sunun

The method mentioned in Hamdard Pharmacopeia was followed for the preparation of Sunun Post Mughilan (Table 1). The ingredients except the bark of *Acacia arabica* were procured from the local crude drug supplier(s) in Bangalore. Bark of *Acacia arabica* was collected from the campus of NIUM, Bangalore. All the plant drugs were identified and authenticated by Dr. R. Sumathi, Research Officer, Foundation for Revitalisation of Local Health Tradition-Institute of Ayurveda and Integrative Medicine (FRLHT-IAM), Bangalore. The voucher specimens have been deposited in the museum of Institute of Ayurveda and Integrative Medicine, Bangalore.

The physical impurities present in the crude drugs were removed before drying the drugs. The dried drugs were grounded with an electric grinder, sieved through Mesh # 100 and the resultant powder (named as sufuf) was preserved in an airtight jar (Figure 1) (Said, 1997).

Physico-Chemical Studies

The Physico-Chemical studies were carried out on Sunun Post Mughilan in the Dept of Ilmul Saidla, NIUM, Bangalore. The studies included the determination of organoleptic properties, (appearance, colour, odour and taste), alcohol soluble matter, water soluble matter, successive extractive values, pH values,

bulk density, tapped density, moisture content, loss of weight on drying at 105°C, ash values, crude fibers content and volatile oil.

Determination of Alcohol and Water Soluble Matter

Cold Maceration method

Five grams of Sunun (powder) were placed in a glass- stopper conical flask and macerated with 100 ml water for 6 hours with frequent shaking and then allowed to stand for next 18 hours. Filtrate was then collected rapidly through dry filter. 25 ml of the filtrate was transferred to a previously weighed and tarred flat-bottom petridish and evaporated to dryness on a water bath. The residual material was dried at 105^0C for 6 hours and cooled in a desiccator for 30 minutes before weighing. The percentage of water soluble matter was calculated with reference to the amount of Sunun. The percentage of alcohol soluble content was determined as mentioned above by using alcohol in place of water (Anonymous, 2011).

Successive Extractive Value

The successive extraction of Sunun in three different solvents viz. petroleum ether (40-60^0C), chloroform and alcohol were carried out by Soxhlet apparatus for six hours on a water bath. The extracts were filtered using filter paper. After evaporation of the solvents on water bath, the extracts values were determined with reference to the weight of drug (% w/w). The procedure was repeated three times and the mean value for each extract was calculated (Anonymous, 1991).

The pH value of 1% solution

One gram of Sunun was mixed in accurately measured 100 ml of distilled water, filtered and pH measured with a pH digital meter. This procedure was repeated three times. The mean value and standard error were calculated (Anonymous, 1991).

The pH value of 10% solution

Ten grams of Sunun was mixed in accurately measured 100 ml of distilled water, filtered and pH measured with a pH digital meter. This procedure was repeated three times. The mean value and standard error were calculated (Anonymous, 1991).

Bulk density

Accurately weighed 20grams of Sunun was poured through a funnel into a tarred graduated cylinder. The cylinder was then lightly tapped twice to collect all the powder sticking on the wall of the cylinder. The initial volume was noted and the sample was then tapped until no further reduction in volume was observed. The volume was then read directly from the cylinder and used to calculate the bulk density; results are expressed in (g/ml). The bulk and tapped densities were calculated by the formula (Chaturvedi *et al.*, 2012; Lachman *et al.*, 1987; Kumar *et al.*, 2011).

$$\text{Bulk Density (BD)} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Tapped Density} = \frac{\text{Mass}}{\text{Tapped Volume}}$$

Hausner's Ratio

Hausner's ratio is related to interparticle friction and as such can be used to predict the powder flow properties. The Hausner's ratio can be expressed as follows:

$$\text{Hausner's ratio} = \frac{Df}{Do}$$

Where Df = Tapped density and Do = Bulk density.

Hausner's ratio for Sunun was calculated by using above given formula (Kumar *et al.*, 2011; Lachman *et al.*, 1987; Chaturvedi *et al.*, 2012; Abdulsamad *et al.*, 2009).

Compressibility Index

It is a method to evaluate the flowability of the powder and the rate at which it packed down. It is also known as Carr's index. Compressibility Index of Sunun was calculated by using following formula (Abdulsamad *et al.*, 2009; Chaturvedi *et al.*, 2012).

$$\text{Carr's index (\%)} = \frac{[(\text{Tapped Density} - \text{Bulk Density}) \times 100]}{\text{Tapped Density}}$$

Moisture Content

The moisture content of the Sunun was determined by Toluene Distillation method. 10grams of Sunun was taken in a flask and 75 ml of distilled toluene

was added to it. Distillation was carried out for 5 hours. The volume of water collected in receiver tube (graduated in ml) was noted and the percentage of moisture calculated with reference to the weight of the air-dried drug taken (Jenkins *et al.*, 2008; Afaq *et al.*, 1994; Anonymous, 1991; Anonymous, 2011).

Loss of Weight on Drying at 105°C

Two grams of Sunun was taken, spread uniformly and thinly in a shallow petridish. It was heated at a regulated temperature of 105°C, cooled in a desiccator and weighed. The process was repeated many times till two consecutive weights were constant. The percent loss in weight was calculated with respect to initial weight (Anonymous, 2011; Afaq *et al.*, 1994; Anonymous, 1991; Upendra *et al.*, 2010).

Ash Values

Total Ash

Two grams of air dried Sunun was incinerated in a silica dish at a temperature not exceeding 450°C until free from carbon, cooled and weighed and the percentage was calculated with reference to air dried Sunun (Anonymous, 2011; Afaq *et al.*, 1994).

Acid Insoluble Ash

Total ash obtained in the previous experiment was boiled with 25ml of dilute hydrochloric acid for 5 minutes. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited at a temperature not exceeding 450°C and weighed after cooling. The percentage of acid insoluble ash was calculated with reference to the air dried Sunun (Anonymous, 2011; Afaq *et al.*, 1994).

Water Soluble Ash

Total ash obtained was boiled with 25 ml of distilled water for 5 minutes. The insoluble matter was collected on an ash less filter paper, washed with hot water and ignited. The weight of insoluble ash was subtracted from the weight of the total ash, giving the weight of the water soluble ash. The percentage of water soluble ash was calculated with reference to air dried Sunun (Anonymous, 2011; Afaq *et al.*, 1994).

Determination of Crude Fibers

Fifteen grams of Sunun was exhausted first in 50 ml of diethyl ether by boiling for 30 minutes on water bath to remove fats and waxes. 200 ml of boiling sulphuric acid were added to the ether-exhausted Sunun in a 500 ml flask and flask was connected with a reflux condenser. The mixture was heated to boil for 30 minutes. Then it was filtered through filter paper and the residue washed on the filter with boiling water till filtrate lost acidic character. The residue was rinsed back into the flask with 200 ml boiling sodium hydroxide solution and allowed to boil for 30 minutes. After boiling, the mixture was filtered through a tared filter and the residue was washed with boiling water till it was neutral. The filtrate was dried at 110^0 C until the constant weight(X). The dried residue was incinerated and the ash was weighed(Y).

Hence, the crude fiber content (X-Y) was obtained (Jenkins *et al*, 2008; Anonymous, 1991).

Determination of Volatile Content

Fifty grams of Sunun was mixed with 30 ml of glycerol and 300 ml of water in the distillation flask. Few pieces of earthenware were added in the distillation flask. The Clavenger's apparatus was attached to the flask. The flask was heated with frequent agitation. The flask was rotated occasionally to wash down any material adhering to the upper part of the walls. After distilling for about five hours, heating was stopped and least five minutes later, volume of oil in graduated portion of the tube was read.

After this, distillation continued for a period of one hour and the volume of oil was noted. Distillation continues until successive readings of the volume of oil were same. The measured yield of volatile oil was taken to be the content of volatile oil in the Sunun (Anonymous, 1991; Afaq *et al.*, 1994).

Table 1 : Ingredients of Sunun Poste Mughilan

S. No.	Unani Name	Scientific Name	Part Used	Quantity
1	Post Kikar	*Acacia arabica*	Bark	400 g
2	Burnt Supari	*Areca catechu*	Nut	100 g
3	Sange Jarahat	Silicate of magnesia	Stone	100 g
4	Kath Safaid	*Acacia catechu*	Extract	100 g
5	Zanjabeel	*Zingiber officinalis*	Dried Rhizome	10 g
6	Filfil Siyah	*Piper nigrum*	Seed	10 g

Table 2 : The physicochemical data of Sunun Poste Mughilan

Sl. No.	Parameters		Mean ± SEM
1.	Appearance		Powder
2.	Colour		Brown
3.	Smell		Dull Smell
4.	Taste		Astringent
5.	Alcohol soluble matter (%)		17.10 ± 0.12
6.	Water soluble matter (%)		12.48 ± 0.24
7.	Successive Extractive Values	Petroleum ether (%)	3.74 ± 0.02
		Chloroform (%)	1.52 ± 0.12
		Ethyl alcohol (%)	16.64 ± 0.33
		Aqueous (%)	13.41 ± 1.16
8	pH (1% solution)		6.33 ± 0.12
9.	pH (10% solution)		5.64 ± 0.17
10.	Bulk Density (gm/ml)		0.48 ± 0.03
11.	Tapped Density (gm/ml)		0.82 ± 0.01
12.	Hausner's Ratio (HR)		1.75 ± 0.10
13.	Compressibility Index (%)		42.45 ± 3.41
14.	Moisture content (%)		7.33 ± 0.33
15.	Loss of weight on drying (%)		8.59 ± 0.03
16.	Total ash (%)		20.07 ± 0.01
17.	Acid insoluble ash (%)		18.87 ± 0.10
18.	Water soluble ash (%)		2.9 ± 0.35
19.	Crude fibers Content (%)		8.41± 0.16
20.	Volatile content (%)		0.57 ± 0.03

Fig. 1 : Laboratory Sample of Sunun Poste Mughilan

Results and Discussion

The physicochemical data of Sunun Poste Mughilan is presented in Table 2. The organoleptic studies indicated that the Sunun had powdery appearance and brown in colour. The smell was dull and taste astringent. The amount of drug soluble in a given solvent is an index of its purity (Jenkins *et al.*, 2008). The mean percentage of alcohol and water soluble content were found to be 17.10 ± 0.12 and 12.48 ± 0.24 respectively. Extractive value in different solvents is also an important parameter to check the quality of the drug and any variation in the chemical constituents leads to the change in the extractive values. It helps in determination of the adulteration and also an index of the purity of the drug. The mean percentage of Extractive values were determined in petroleum ether (40-60°C), chloroform, ethyl alcohol and water using Soxhlet's Apparatus and found to be 3.74, 1.52, 16.64 and 13.41 respectively (Jahan *et al.*, 2008). pH of 1% and 10% was 6.33 and 5.64 respectively. Bulk density is one of the measures of packing properties, compressibility and flow properties. It is used to determine the bulk densities of powdered drugs under loose and packed conditions respectively. The tapped density is an increased bulk density attained after mechanically tapping a graduated measuring cylinder or vessel containing the powder sample. The mean value of bulk density and tapped density of Sunun Poste Mughilan were found to 0.48 and 0.82 ml respectively. Compressibility Index and the Hausner's

ratio are the simple, fast and popular methods of predicting powder flow characteristics. The compressibility index has been proposed as an indirect measure of bulk density, size and shape, surface area, moisture content and cohesiveness of materials (Anonymous, 2006). The mean value of Hausner's Ratio and Compressibility Index were found to be 1.75 and 42.45 respectively. The moisture content and Loss of weight on drying are good parameters for detecting the quality of the drugs. Low or high moisture levels affect the quality of the drug and hence, its efficacy (Jahan *et al.*, 2008). The excessive moisture content becomes an ideal medium for the growth of the different types of bacteria as well as fungi which subsequently spoil the drug. The mean percentage of the moisture content and loss of weight on drying were found to be 7.33 and 8.59% respectively. Ash values of the drug are an important parameter for the detection of impurities and adulteration. It usually represents the inorganic salts naturally occurring in the drug and adhering to it but it may also include inorganic matter added for the purpose of adulteration. An ash determination furnishes a basis of judging the identity and cleanliness of the drug and gives information related to its adulteration with inorganic matter (Jenkins *et al.*, 2008). A high ash value is indicative of contamination, substitution, adulteration or carelessness in preparing the formulation for marketing. The mean percentage values of the total ash, acid insoluble ash and water soluble ash were found to be 20.07, 18.87 and 2.9 respectively. The determination of crude fibres is of considerable importance for examining the certain drugs and particularly of spices which are adulterated with the waste or refused material of the same drugs and spices. The mean percentage value of crude fibers value was found to be 8.67%. The light and atmospheric oxygen appears to have an adverse effect on most volatile oils which decompose on boiling with water. The excess heat may cause charing of the material resulting in the decomposition of the constituents of the oil. The wrong method of distillation and storage may damage the quality of the oil which can be judged to some extent by their appearance, odour and colour. (Afaq *et al.*, 1994). The mean percentage value of volatile oil content value was found to be 0.057%.

Conclusion

The preliminary physicochemical constants for *Sunun Poste Mughilan* have been determined. They may be taken as standard reference for manufacturing this important Unani formulation. However, the detailed chemical and biological evaluation can help establish the exact parameters for standardised *Sunun Poste Mughilan*.

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