EVALUATION OF PANCHSAKAR CHURNA FOR QUALITY CONTROL AND STANDARDISATION

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Summary

Standardisation of herbal formulation is essential in order to assess the quality of drugs, based on the concentration of their active principles. The present paper reports on standardisation of Panchsakar churna, a polyherbal ayurvedic medicine used as remedy for promoting the elimination of toxins, supporting intestinal immunity and balancing tridosha. It is a combination of simple and routine use herbs, even then their combined effect is great in managing constipation, haemorrhoids and pain in abdomen, flatulence, assimilatory disorder and rheumatic conditions. Panchsakar churna was prepared as per Ayurveda Sarsangrah. In-house preparation and three marketed preparations have been standardised on the basis of organoleptic, physical and physico-chemical characteristics. Fluorescence analysis, extractive values and ash values along with sodium content determination and bulk density, tap density, angle of repose, Hausner ratio and Carr's index were calculated. The parameters used to evaluate the churna can be used as reference standards for the quality assessment in laboratory.

Keywords: Panchsakar churna, physicochemical parameters, polyherbal formulation, standardization.

Introduction

Standardisation is the process of establishing a technical standard, which could be a standard specification, standard test method, standard definition, standard procedure (or practice), etc. It is an essential factor for polyherbal formulation to assess the quality of drugs based on the concentration of their active principle. It is very important to establish a system of standardisation for every plant medicine in the market, since the scope of variation in different batches of medicine is enormous. Plant material used in bulk quantity may vary in percentage of its chemical constituents and also in its therapeutic effect according to different batches of collection and from different sites, e.g. collection in different seasons and/or collection from sites with different environmental surrounding or geographical location.[1,2] *Panchsakar Churna,* an Ayurvedic polyherbomineral formulation consists of *Cassia angustifolia*, *Foeniculum vulgare*, *Terminalia chebula*, *Zingiber officinale* and Saindhava Lavana, traditionally used for managing constipation, haemorrhoids, pain in abdomen, flatulence, assimilatory disorder and rheumatic conditions, in managing all diseases of Kapha Dosha origin, improves digestion and ensures timely evacuation of faeces, improves functioning of liver, in hyperacidity, heart burn and acidic belching. It provides an antidote for pungent food and promotes the elimination of toxins, supports intestinal immunity and balances tridosha. This paper reports on the standardisation of Panchsakar churna based on organoleptic, physical and physico-chemical characteristics to confirm test for identity, potency, purity, safety and efficacy.[3]

Materials and methods

Plant material

Panchsakar churna consists of five major ingredients, viz., *Cassia angustifolia*, *Terminalia chebula*, *Zingiber officinale*, *Foeniculum vulgare* and *Sodii cloradum* (*Saindhava lavana*).All these ingredients were procured from the local market, Rohtak, India. The specimen of the samples were authenticated by Dr. J.P.Yadav, Department of Biosciences, Maharshi Dayanand University, where voucher specimen were placed.

Preparation of Panchsakar Churna

The churna was prepared as per the procedure given in various ayurveda books such as Rasa Bhaishajya Kalpana Vigyan, Ayurveda Sarsangrah and Abhinav Bhaishajya Kalpana Vigyan. All the ingredients, viz. *Cassia angustifolia*, *Terminalia chebula*, *Zingiber officinale*, *Foeniculum vulgare* and *Sodii cloradum* were powdered separately, passed through sieve no. 60 and a physical mixture was made to get uniformly blended churna.[4,5,6]

Marketed Samples

The marketed samples of various brands of Panchsakar churna, i.e. Baidyanath (B), Unjha Ayurvedic Pharmacy (U), and Bharat Ayurvedic Medicine (A) were purchased from the in-house preparation along with the three marketed brands (I) based on their organoleptic, physical and physico-chemical characteristics.

Organoleptic Evaluation

Organoleptic evaluation refers to macroscopic identity of medicinal plant materials is based on shape, size, colour, surface characteristics, texture, fracture characteristics and appearance of the cut surface. However, since these characteristic are judged subjectively and substitutes or adulterants may closely resemble the genuine material, it is often necessary to substantiate the findings by microscopy and /or physicochemical analysis. The organoleptic characters of the samples were carried out and has been tabulated in Table 4 as per Pharmacopoeial Analytical Standards.[7,8]

Fluorescence Analysis

The powdered samples were exposed to ultraviolet light at wavelengths of 254 nm and 366 nm.[1] One milligram of powdered drug was placed on a micro slide and observed under UV 366, UV 254 and in day light to observe the fluorescent characteristics of powder, if any. One milligram of powdered drug was placed on a micro slide and treated with 1 mL 1 N HCl and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL 1 N NaOH in 1 mL methanol and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL 50% KOH and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 50% H_2SO_4 and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of concentrated H_2SO_4 and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of 50% HNO_3 and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of concentrated HNO_3 and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of acetic acid and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of acetic acid and observed under UV 366, UV 254 and in day light while wet. One milligram of powdered drug was placed on a micro slide and treated with 1 mL of iodine and observed under UV 366, UV 254 and in day light while wet.[1]

Physicochemical Investigation

Physicochemical investigation of formulations was carried out including determination of extractive values and ash values were determined as per the methods mentioned in WHO guidelines and Indian Pharmacopoeia.[7,9]

Estimation of Sodium Content

Sodium content was estimated by using a flame photometer. A stock solution of NaCl (100 µg/ml) was prepared in distilled water and further dilutions were made to get the concentration of 10, 20, 30, 40 and 50 µg/ml, for preparing the standard graph as shown in the table. Sodium content of the formulations was estimated by flame photometric method based on the measurement of emission intensity in nanometer.[10, 11]

Determination of physical characteristics of powder formulation

Physical characteristics such as bulk density, tap density, angle of repose, Hausner ratio and Carr's index were determined for different formulations. Bulk density is the parameter used to indicate a packing of particles or granules. The bulk density (D_b) is determined by the equation $D_b = M/V_b$, with M being the mass of particles and V_b the total volume of packing. Ten grams of formulation was taken and carefully introduced into a 100 ml graduated cylinder with the aid of a funnel. The cylinder was dropped at 2 s interval onto a hard wood surface 3 times from a height of 1 inch on rubber pad. The initial volume gave the bulk density value and after tapping the volume is decreased, giving the value of tapped density. The tapped density (D_f) is determined by $D_f = M/V_f$, where M is the mass of particles and V_f is the total volume of packing after tappings. [12]

Angle of repose is used to quantify powder flowability because of its relationship with interparticle cohesion. The fixed funnel and the free standing cone method employ a process that is secured with its tip at a given height (H), above the glass paper that is placed on a flat horizontal surface. Powder or granules were carefully poured through the funnel until the apex of the conical pile just touched the tip of funnel. Thus, with R being the radius of the conical pile $\tan \alpha = H/R$ or $\alpha = \arctan (H/R)$, where α is the angle of repose.[12]

Hausner's ratio is related to interparticle friction and as such can be used to predict the powder flow properties. The Hausner ratio is measured by the equation D_f/D_b, where D_f is the tapped density and D_b is the bulk density.

Carr's index is another indirect method to measure the powder flow from bulk density. Carr's index (CI) is measured by [12, 13]

$$CI = \frac{(D_f - D_b)}{D_b} \times 100.$$

Results and discussion

In-house formulation was prepared in accordance with the Ayurveda Sarsangrah.[5] Ash values are presented (total ash and acid insoluble ash) in Table 1 and water soluble and alcohol soluble extractive values are given in Table 2. The ash values of the samples were carried out based on the method as described by the World Health Organisation (WHO) guidelines for medicinal plant materials. The physicochemical organoleptic comparisons between 3 marketed formulations and in-house formulation are given in Table 3. Estimation of sodium content shows that the sodium content in various formulations was also comparable. The standard plot for sodium content is given in Table 5 and the sodium content was found to be highest in Unjha Ayurvedic Pharmacy Formulation.

Table 1. Ash values of individual ingredients present in Panchsakar churna (w/w)

Samples	**Total ash Mean (*n* = 3) ± SD**	**Acid insoluble ash Mean (*n* = 3) ± SD**
Cassia angustifolia	150.060±0.061	20.003±0.093
Terminalia chebula	45.108±0.017	35.021±0.027
Zingiber officinale	320.004±0.069	100.017±0.031
Foeniculum vulgare	90.400±0.213	5.001±0.113
Sodii clorandum	960.002±0.001	0.000

Table 2. Extractive values of individual ingredients present in Panchsakar Churna

Samples	**Water soluble (%) Mean (*n* = 3) ± SD**	**Alcohol soluble (%) Mean (*n* = 3) ± SD**
Cassia angustifolia	5.003±0.011	3.003±0.003
Terminalia chebula	18.001±0.000	20.043±0.051
Zingiber officinale	5.004±0.005	2.940±0.024
Foeniculum vulgare	19.014±0.004	1.001±0.001
Sodii clorandum	105.333±1.154	3.001±0.011

Table 3. Physicochemical characteristics of Panchsakar Churna formulations

Parameter	**In-house Formulation Mean (*n* = 3) ± SD**	**Baidyanath Mean (*n* = 3) ± SD**	**Unjha Mean (*n* = 3) ± SD**	**Bharat Mean (*n* = 3) ± SD**
Water soluble extractive	30.364±0.552	16.002±0.002	18.015±0.015	28.361±0.309
Alcohol soluble extractive	11.003±0.005	12.009±0.001	10.000±0.000	7.023±0.025
Total ash values	270±0.834	280±0.516	255±2.014	275±1.001
Acid insoluble ash	85±1.004	80±0.254	90±0.667	75±1.458

Table 4. Organoleptic properties of different Panchsakar churna

Name of formulation	**Appearance**	**Colour**	**Taste**	**Odour**
In-house	Powder	Green	Salty	Aromatic
Baidyanath	Powder	Light green	Salty	Sour
Unjha Ayurvedic Pharmacy	Powder	Light green	Salty	Salty
Bharat Ayurvedic Medicine	Powder	Greenish Brown	Salty	Salty

Table 5. Standard graph of sodium by flame photometry method

Concentration (µg/mL)	**Sodium content (ppm)**
10	52
20	60
30	75
40	78
50	104

Table 6. Sodium content in different Panchsakar churna

Different Formulations	Concentration of sample (µg/mL)	Sodium content (ppm)
In-house	25	33
Baidyanath	25	27
Unjha Ayurvedic Pharmacy	25	38
Bharat Ayurvedic Medicine	25	37

Table 7. Powder fluorescence test of different Panchsakar churna formulations

Material	IN-HOUSE			BAIDYANATH			UNJHA			BHARAT		
	254 nm	366 nm	VIS	254 nm	366 nm	VIS	254 nm	366 nm	VIS	254 nm	366 nm	VIS
Powder as such	B	DB	GF	B	DB	GF	B	DB	DB	B	DB	DB
P+ Iodine water	B	B	GF	B	B	YB	B	B	DB	B	B	DB
P+ conc. H_2SO_4	DB	Y	DB	DB	Y	DB	DB	Y	DB	DB	Y	DB
P + 1N HCl	B	GB	GB	B	GB	GB	B	GB	PL	B	GB	Y
P + Acetic acid	B	Y	Y	B	Y	O	B	Y	O	B	Y	PL
P + 50% KOH	DB	OB	O	DB	DB	OB	DB	OB	O	DB	OB	O
P + 50% H_2SO_4	DB	Y	GY	DB	Y	GY	DB	Y	GY	DB	Y	GY
P + 50% HNO_3	DB	DB	OB	DB	D	OB	DB	DB	OB	DB	DB	OB
P + conc.HNO_3	B	B	OB	B	B	OB	B	B	OB	B	B	OB
P + 1 N NaOH	B	DB	O	B	DB	O	B	DB	O	B	DB	O
P + 1 N methanolic NaOH	B	DB	O	B	DB	O	B	DB	O	B	DB	O

P: Powder, B: Black, DB: Dark brown , GF: Green fluorescence ,Y: Yellow , O: orange , OB : Orangish brown , YB :Yellowish brown ,
GB: Greenish brown , PL :Pale yellow , GY :Greenish yellow

Conclusion

The results obtained with the market formulations revealed that oragnoleptic, physical and physicochemical properties were variable as compared with in-house formulation which indicates the ingredients used in different formulations obtained from different sources result in variable properties which in turn affects the therapeutic efficacy of the drug. Need thus arises that cultivation of these drugs must be promoted for smooth and constant supply of raw materials which will result in similar physical and chemical properties.

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