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Dr. Ashok Bishnoi
Assistant Professor, Sri Dhanwantry Ayurveda College, Chandigarh, India

Mahesh K Vyas
Professor and HOD Department of Basic Principles, AIIA, Delhi, India

Correspondence
Dr. Ashok Bishnoi
Assistant Professor, Sri Dhanwantry Ayurveda College, Chandigarh, India

Formulation and standardization of Saraswata *Churna*: Quality control studies for polyherbal ayurvedic formulation

Ashok Bishnoi and Mahesh K Vyas

Abstract
Ayurvedic formulations are highly effective and known to have minimal side effects, but due to lack of validation parameters for identification and quality control, there is a lacuna in demand of Ayurvedic formulations at international level. Saraswata *Churna* is an classical Ayurvedic formulation used in the treatment of psychosomatic disorders, loss of memory etc. The objective of the work is to formulate and standardize the Saraswata *Churna* according to World Health Organization (WHO), GMP guidelines which are the first available report so far. The formulation was prepared in the pharmacy of IPGT& RA, Jamnagar and evaluated for organoleptic characters, powder drug studies, physicochemical parameters (Loss in drying, ash value, acid soluble extract, water soluble extract, pH value), High Performance Thin Layer Chromatography. The results of different standardization parameters revealed satisfactory and sufficient data to evaluate the in- house formulation and can be utilized as reference standards in various quality control aspects of the formulation, powder drug analysis revealed specific identities for crude raw drug which are useful as marker in the preparation and identification of components of the formulation.

Keywords: Chromatography, Saraswata churna, physico-chemical, Pharmacognostical, pharmaceutical

Introduction
Saraswata Churna, an Ayurvedic polyherbal formulation, consists of parts of different species *viz* Kushta (*Saussurea lappa*), Ashwagandha (*Withania somnifera*), Saindhava lavana (Rock salt), Ajamoda (*Apium graveolens*), Sweta jeeraka (*Cuminum cyminum*), Krishna jeeraka (*Carum carvi*), Shunthi (*Zingiber officinale*), Maricha (*Piper nigrum*), Pippali (*Piper longum*), Patha (*Cissampelos pareira*), Shankhapushpi (*Convolvulus pluricaulis*), Vacha (*Acorus calamus*) and Brahmi (*Bacopa monnieri*) swarasa (juice) for Bhavana (tirturation). Saraswata choorna is mentioned in Bhaishajya Ratnavali text in 'Unmada Chikitsa. The churna is helpful in managing psychotic disorders like *Unmada*. Regular consumption of Saraswata churna improves Buddhi (higher mental functions), Medha (intellect), dhriti (control over mind), Smriti (memory power) and Kavita Shakti (poetic talent) [1]. Even though it is the most commonly used formulation in Ayurvedic practice, till date limited works has been conducted on Saraswata churna regarding to its standardization. Majority of Ayurvedic formulations use whole plants either alone or in combinations therefore the efficacy of the Ayurvedic formulation may vary with the use of the adulterants in the formulations. It is therefore important to establish characteristics of the raw material and finished Ayurvedic products with the help of physical and chemical methods. Now a day, majority of the world population is turning toward the alternative system of medicine because of complexity and associated adverse effects with the usage of allopathic medicines. According to *Bhaishajaya Ratnavali* [2], *Saraswata Churna* is composed of ten herbs, but there is not even a single standard mentioned for ensuring the identity, potency, purity, safety and efficacy of the *Saraswata Churna*.
The paper deals with the formulation and quality control evaluation of the important Ayurvedic formulation. The study is an attempt to evaluate the organoleptic characters, powder drug analysis, physicochemical parameters and phytochemical evaluation as per the Ayurvedic Pharmacopoeia of India and WHO guidelines for ensuring the identity, potency, purity, safety and efficacy of the *Saraswata Churna*. After an extensive literature search it was found to the best of our knowledge that this is the first report revealing the formulation and evaluation of this important Ayurvedic preparation.

Aims and Objectives

- Pharmacognostical study of ingredients of Saraswata churna
- Physico-chemical analysis of Saraswata churna

Methodology

Procurement of plant material

Kushta (*Saussurea lappa*), Ashwagandha (*Withania somnifera*), Saindhava lavana (Rock salt), Ajamoda (*Apium graveolens*), Sweta jeeraka (*Cuminum cyminum*), Krishna jeeraka (*Carum carvi*), Shunthi (*Zingiber officinale*), Maricha (*Piper nigrum*), Pippali (*Piper longum*), Patha (*Cissampelos pareira*), Shankhapushpi (*Convolvulus pluricaulis*), Vacha (*Acorus calamus*) and Brahmi (*Bacopa monnieri*) swarasa (juice) from the pharmacy, Institute for Post Graduate Teaching and Research in Ayurveda (I.P.G.T and R.A), Gujarat Ayurved University (G.A.U), Jamnagar.

All the ingredients were macroscopically identified by Pharmacognosy section of the Institute and organoleptic evaluation was made for identification of sensory characteristics like colour, odour, taste, size, texture and fracture) All of the ingredients (Plate 1, Figure 1 Plate 2, Figure 2) were collected, cleaned. They were powdered in a pulverizer separately. All of the eleven ingredients except vacha, were weighed separately and mixed together in equal parts. Then eleven parts of powdered vacha added to this. *Brhami swarasa* was collected from fresh Brahmi whole plant (Plate 2, Figure 2). The powder was kept in fresh Brahmi swarasa and it was subjected to three bhavana's. After bhavana, the powder was dried in a shade. Then again it was powdered and passed through sieve number 80 to obtain a homogeneous blend [3-5]. It was packed in air tight containers to protect from light and moisture. Saraswata choorna was prepared at pharmacy of I.P.G.T and R.A, GAU, Jamnagar, India.

Quantitative analysis and storage

Quantitative analysis of the raw material was done for standardization parameters including foreign organic matter, water soluble extractive, methanol soluble extractive total ash and acid insoluble ash. The approved raw material was packed in sterilized airtight polybags with proper labelling and stored in cool place [6-8].

Pharmacognostical study

Microscopic study of the powders of the ingredients of Saraswata churna was done at Dept. of Pharmacognosy, I.P.G.T and R.A, GAU, Jamnagar, India.

Physico-chemical study

Saraswata Chuorna was analyzed on various parameters like, loss on drying, ash value, water soluble extract, methanol soluble extract, pH value, volatile oil content and particle consistency at pharmaceutical chemistry laboratory of I.P.G.T and R.A, GAU, Jamnagar, India.

Results and Discussion

Organoleptic evaluation

Fine powder of *Saraswata churna* is greenish brown in colour, having pleasant odour and salty in taste and contains a fibrous texture, which resembles the appropriate and good quality of formulated churna [9, 10].

Microscopic observation

The microscopical studies in different mounts of *Shatsakar churna* formulation revealed the presence of different specific cellular structures *viz* Plate No. 1, Fig.1.1–Powder sample, Fig. 1.2– Simple starch grains of sunthi, Fig.1.3–Simple and compound starch grains of ashwagandha, Fig.1.4–Prismatic crystal of patha, Fig. 1.5– Starch grain with hilum vacha, Fig. 1.6–Group of sclereids of patha, Fig. 1.7– Black debris of maricha, Fig. 1.8–Trichome of sankhpushpi, Fig. 1.9– Group of stone cell of patha, Fig. 1.10– Group of fibers of sunthi, Fig. 1.11–Epicarp cells of ajmoda, Fig. 1.12– Oil globules of ashwagandha, Fig. 1.13–Scleriform vessel of kustha, Fig. 1.14–Bottle neck shaped stone cell of pippali, Fig.1.15–Stratited fibroids of ajmoda, Fig. 1.16–Sclereids of patha, Fig. 1.17–Epicarp cells of jeera, Fig. 1.18– Oleoresin contains with epidermis cells of pippali, Fig. 1.19– Group of fiber brahmi, Fig. 1.20– Trichome of patha. Plate No. 2- Fig.2.1–Oil globules of Krishna Jeerak, Fig.2.2– Bordered pitted vessels of patha, Fig. 2.3– Lignified stone cell of pippali, Fig. 2.4– Lignified stone cell of patha, Fig. 2.5– Lignified stratified fibroids of ajmoda with oil globules, Fig. 2.6–Lignified scleriform vessel of kustha.

Quantitative analysis

The ash values are useful to determine the quality and purity of the crude drug. Ash contains inorganic radicals like phosphate, carbonates and silicates of sodium, potassium, magnesium, calcium etc. Extractive values are useful for evaluation of crude drugs. It gives an idea about the nature of the chemical constituents present in the crude drug [11]. Analytical results showed that total ash value of formulation was 10.4%. The water-soluble extractive value indicates the presence of sugar, acids and inorganic compounds. The water soluble extractive value in the *Saraswata churna* was found 23% indicated the higher water soluble components in the formulation. The alcohol soluble extractive value indicates the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids and secondary metabolites present in the plant sample. The alcohol soluble extractive value in the *Saraswata churna* was 19.14%. pH value of sample was 6.5. The results of detail analyses are shown in table 2.

High performance thin layer chromatography

Method of preparation of methanolic extract

A solution was prepared by mixing 2.5 gm of powder of *Sarswata Churna* and 50 ml of 70% methanol and the solution was kept in a clean and dry place for 24 hr with intermittent shaking. Then extract was collected and filtered through Whatman no. 1 filter paper. From the above solution, 20ml was taken and heated on thermostatic water bath till a dark brownish residue was obtained which yielded 15% w/w.

HPTLC

Methanolic extract of *Sarswata Churna* was spotted on pre-coated silica gel GF 60254 aluminium plate by V sample applicator fitted with a 100 µl Hamilton syringe. Toluene (7ml) and ethyl acetate (2 ml) and acetic acid (1 ml) were used as the mobile phase. The resulting HPTLC pattern was viewed under short-wave ultraviolet light at 254 nm and long wave ultraviolet at 366 nm. (Shown in table no. 3 and figure no. 3)

Table 1: Ingredients of *Saraswat Churna*

S.no.	Drug name	Latin name	Useful Part	Proportion
1.	*Kushtha*	*Saussurea lappa* C.B. Clarke	Root	1part
2.	*Ashwagandha*	*Withania somnifera* (L.) Dunal	Root	1part
3.	*Saindhava Lavana*	*Sodium chloride*	-	1part
4.	*Ajamoda*	*Apium graveolens*-semen	Fruit	1part
5.	*Shweta Jeeraka*	*Cuminum* cyminum Linn.	Fruit	1part
6.	*Krishna Jeeraka*	*Carum carvi* Linn.	Fruit	1part
7.	*Sunthi*	*Zingiber officinale* Roscoe	Rhizome	1part
8.	*Maricha*	*Piper nigrum* Linn.	Fruit	1part
9.	*Pippali*	*Piper longum* Linn.	Fruit	1part
10.	*Patha*	*Cissampelos pareira* Linn.	Root	1part
11.	*Shankhpushpi*	*Convolvulus pluricaulis* Forsk.	Whole plant	1part
12.	*Vacha*	*Acorus calamus* Linn.	Rhizome	11 parts
13.	*Brahmi*	*Bacopa monnieri*(Linn) pennell	Whole plant	Q.S. for *Bhavna*

Table 2: Quantitative Analysis

No.	Physico-chemical parameter	Result
1	Loss in drying	9.18 % w/w
2	Ash value	10.4 % w/w
3	Water soluble extract	23% w/w
4	Methanol soluble extract	19.14% w/w
5	pH value	6.5

Table 3: HPTLC

Spot	Rf value at 254 nm	Rf value at 366 nm
1	0.02	0.02
2	0.18	0.17
3	0.66	-

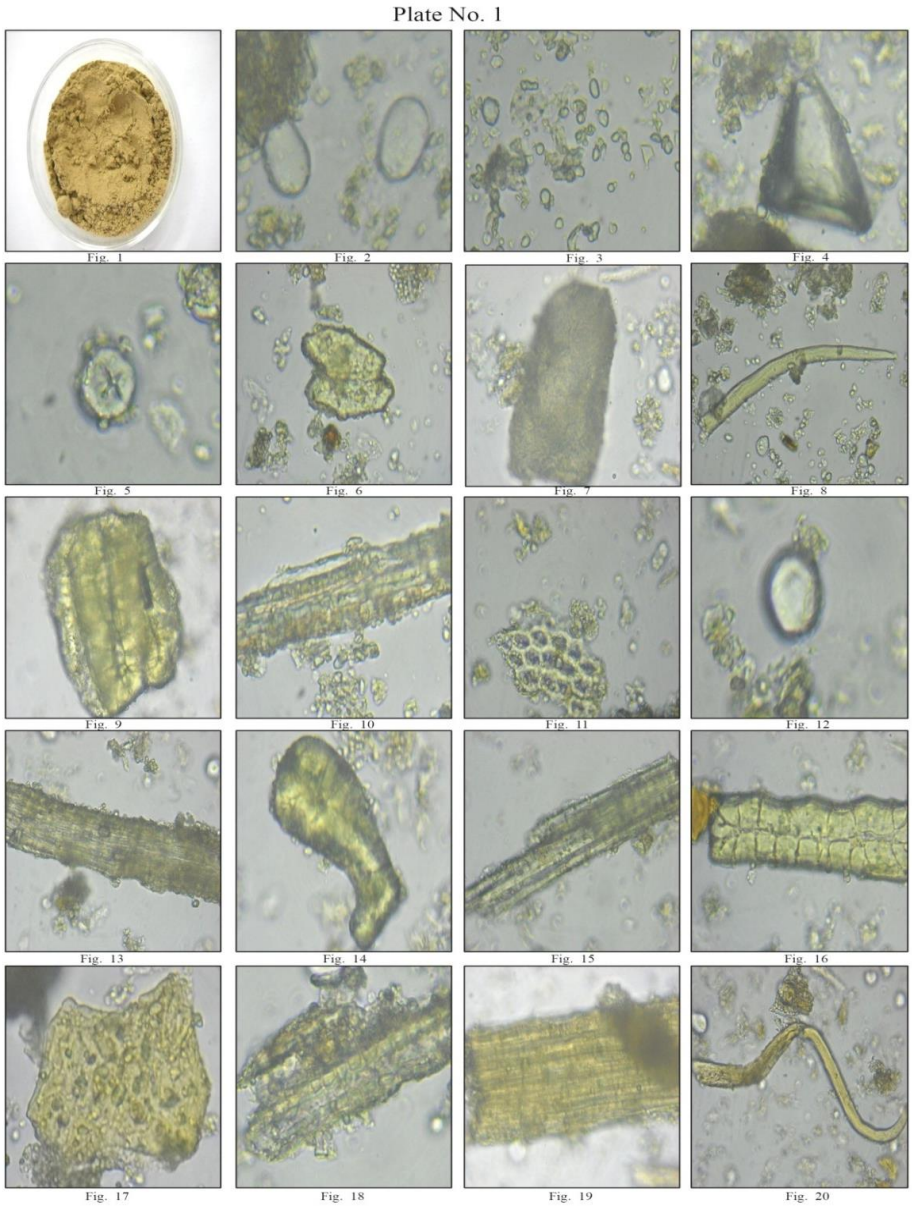

Fig 1: Microscopic observation

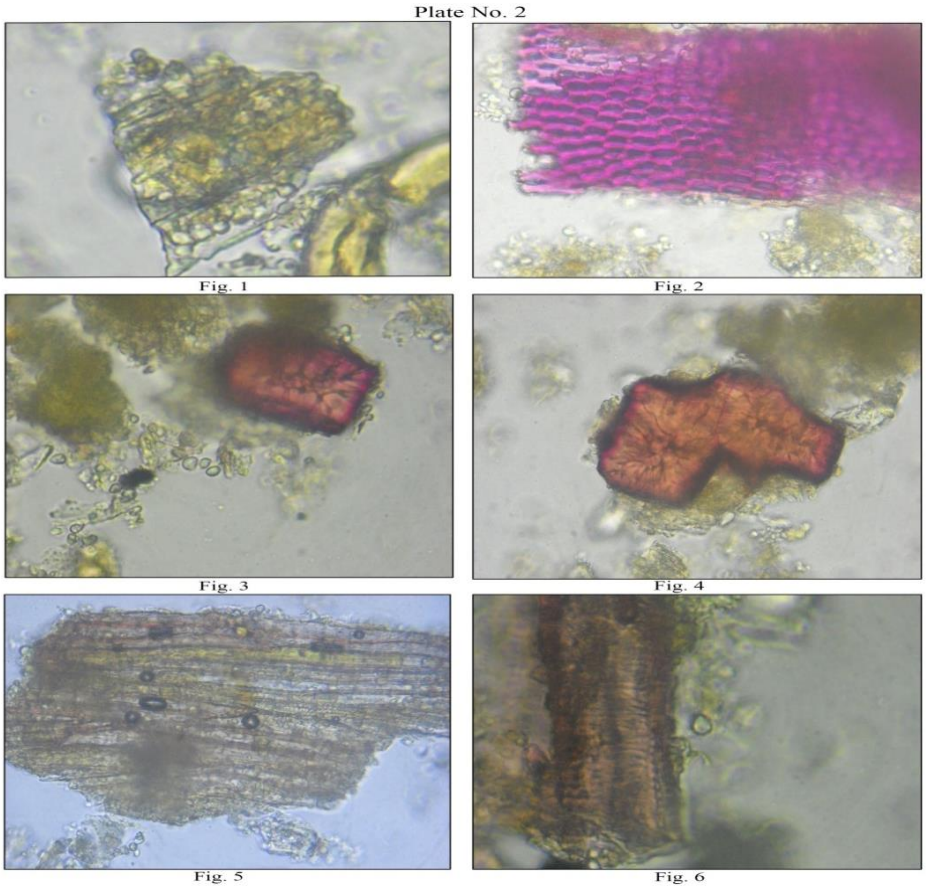

Fig 2: Microscopic observation

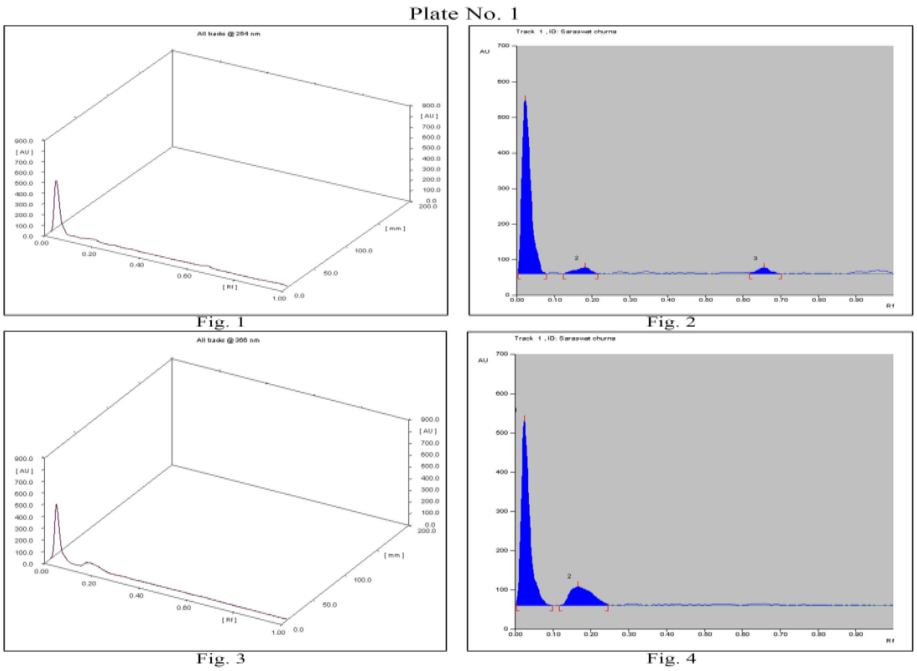

Fig 3: HPTLC

Discussion

A therapeutically important Ayurvedic preparation was formulated evaluated and resembles different characteristic features. The organoleptic characters showed the good quality of the formulation with the appropriate appearance and pleasant odour. The histological evaluation clearly displayed the presence of specific cellular characters which can be served as reference identification feature of the formulation. Various physicochemical parameters were evaluated and it was found that higher ash values are present due to the presence of mineral salt in the formulation. As part of standardization procedure and guidelines of WHO, the finished product of *Saraswata churna* were tested for relevant Organoleptic evaluation, Powder drug analysis, Physicochemical Parameters (Loss on drying, total ash, water soluble extractive value, ethanol soluble extractive value), Phytochemical evaluation and HPTLC.

Conclusion

The results of powder drug analysis revealed specific identities for crude raw drug which will be useful in preparation and identification of the formulation. The method of preparation of *Saraswata churna* and analytical data mentioned in Table No. 1-3 are important findings for evaluation of quality control parameters for Polyherbal Ayurvedic formulations.

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