

THE PHARMA INNOVATION - JOURNAL

Standard Tools for Evaluation of Herbal Drugs: An Overview

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Evaluation of herbal drug is an important tool in the formulation of high quality herbal products. Quality of herb is depends upon on many factors like cultivation, collection, drying, storage, processing for market etc. Now a day's substitution and adulteration of herb is very common due to scarcity of drug and its high price prevailing in the market. Owing to medicinal properties attributed to an herb, it is necessary to maintain its quality and purity in the commercial market. A present overview covering various tool like morphological, microscopical, physical, chemical and biological employed for evaluation of herbal drugs.

Keyword: Herbs, Adulteration, Quality, Evaluation, Microscopy.

1. Introduction

In recent era, there has been great demand for plant derived products in developed countries. These products are increasingly being sought out as medicinal products, nutraceuticals and cosmetics ^[1]. During the first half of Nineteenth century the herbal drugs were given in form of Herbal tea mixtures, tinctures, Extracts and juices which in turn were employed in preparing medicinal drops, syrups, infusion, ointment etc. The second half of Nineteenth century brought with it a number of important discoveries in the field of chemistry and witnessed the rapid progressed of this science and because of that phytochemist succeeded in isolating pure active constituents, these active constituents replace the crude drug ^[2].

About 80% of world populations still relay a use the Herbal Drugs, for treatment of various diseases. The rising popularity of herbal products, both as food and feed supplements and as phyto-therapeutic drugs, has also given rise to many reports describing adverse health effects and

variable quality, efficacy and contents of herbal products ^[3]. Side effects of herbal products may consist of allergic reactions, interactions with conventional drugs or intrinsic toxicity. Other reasons are related to preparation and manufacturing of the herbs, such as misidentification of plants, lack of standardization, contamination, substitution and adulteration of plants, failure of good manufacturing practice, and incorrect preparations and/or dosages ^[4]. Herbs are produced in two main ways: collection from wild plants from their natural habitats and cultivation of herbs that are grown that the plant collected is the one that is desired and having uniform quality attributes while in wild-crafted herbs there is a chance that the wrong herb has been picked, which could lead to serious consequences. So Herbal drugs or it's standardize extracts or pure active compound needs Analytical techniques to confirm its identity, Quality, Purity, Potency, safety and efficacy of the plant ^[5].

Standardization is a system that ensures a predefined amount of quantity, quality & therapeutic effect of ingredients in each dose. Herbal product cannot be considered scientifically valid if the drug tested has not been authenticated and characterized in order to ensure reproducibility in the manufacturing of the product [6].

2. Evaluation Tools for Herbal Drugs [2, 7-13]

2.1 Authentication:

Authentication of plant before carrying out the evaluation is the most important step in development of standards for Herbal drug. Authentication of plant is done by evaluating following parameters,

- Parts of plants collect like leaf, flower, root, stolen
- Regional status
- Family
- Biological source
- Chemical constituents

Following are some basic methods most commonly used for evaluation of crude drugs.

2.2 Macroscopical (Organoleptic) Evaluation:

The term organoleptic evaluation refers to the sensory evaluation. The characteristics which are evaluated with a help of sense organ such as color, odour, taste, size, shape, texture etc. It is Qualitative Evaluation.

Examples:

- Colour:- (Cinnamon Bark -Brown)
- Odour:- (Jatamansi-Aromatic)
- Taste:- (Capsicum-Pungent)
- Size:- (Digitalis--10-30 cm long and 4-10 cm wide)
- Shape:- (Nux vomica-Disc shaped)
- Texture:- (Cascara barks- Fractured surface)

2.3 Microscopic Evaluation:

2.3.1. Qualitative Microscopy:

This method is used to identify organized drug by their known histological characters through Transverse section (T.S.) or Longitudinal Section (L.S.) or Radial Longitudinal Section (R.L.S.) or Tangential Longitudinal Section (T.L.S.). Microscopic Evaluations also covers study of different constituents by using staining Reagents which are given in Table 1.

Table 1: Qualitative microscopic test for detection of lignin and starch.

S. No.	Name of the constituent	Procedure for the Test	Result
1	Lignin	T.S. of Crude Drug + 1 drop of Phloroglucinol + dil. hydrochloric acid	Pink color
2	Starch	T.S. of Crude Drug + 1 drop of Iodine solution.	Blue color

It also deals with determination of different types of Trichomes and Stomata.

2.3.1.1 Stomata

There are several types of stomata, distinguished by the forms and arrangement of the Surrounding cells, e.g.

- (a) Anomocytic (Ranunculaceous) irregular-celled: Digitalis
- (b) Anisocytic (Cruciferous) unequal – celled: Datura
- (c) Diacytic (Caryophyllaceous) cross – celled: Mentha
- (d) Paracytic (Rubiaceous) parallel celled: Senna

2.3.1.2 Trichomes:

Trichomes are divided and subdivided as follows-

(i) Covering Trichomes

- (a) Unicellular Trichomes: Nux vomica, Canabis
- (b) Uniseriate Multicellular Unbranched Trichomes: Datura
- (c) Biseriate Multicellular unbranched Trichomes: *Calendula officinalis*
- (d) Multiseriate Multicellular unbranched Trichomes: Male fern
- (e) Multicellular branched Trichomes: Verbascum Thapsus

(ii) Glandular Trichomes

- (a) Unicellular Glandular Trichomes: Vasaka

(b) Multicellular Glandular Trichomes: *Digitalis purpurea* 1.6-2.7 to 4.0 (Upper Surface) to 19.2- 25.2 (lower Surface).

(iii) **Hydathode Trichomes:** *Piper betal*

2.3.2. Quantitative Microscopy: It involves different parameters like

2.3.2.1 Palisade Ratio: It is defined as average number of palisade cells beneath each epidermal cell. e.g. *Atropa belladonna* (6-10), *Digitalis Lanata* (2.5-6.5)

2.3.2.2. Stomatal No: It is defined as average number of stomata per square millimeter area of epidermis.

e.g.: *Atropa belladonna*: {6.0 to 14-37.5 (Upper Surface), 62.5 to 93-174 (lower Surface)}

(a) Stomatal Index: It is the percentage which the number of stomata forms to the total number of epidermal cells. It is calculated by,

$$S.I. = \frac{S \times 100}{(E + S)}$$

Where, S.I. = Stomatal Index; S= Number of stomata per unit area;

E= Number of Epidermal cells in the same unit area.

e.g. *Atropa belladonna*:-

-2.3-3.9 to 10.5 (Upper Surface),
20.2 to 21.7- 23.0 (Lower Surface)

(b) Vein Islet Number:

It is defined as average number of Vein Islet per square millimeter of the leaf surface midway between midrib and the margin.

- i. *Digitalis Lanata* — 2.0-8.0
- ii. *Digitalis Purpure* — 2.0-5.5

(c) Vein Termination Number:

It is defined as average number of Vein terminations per square millimeter of the leaf surface midway between midrib and the margin.

- iii. *Atropa belladonna* — 6.3-10.3
- iv. *Atropa acuminata* — 1.4-3.5

2.4 Chemical Evaluation:

Chemical nature of the constituents can be used as tool to devise a method for the analysis of the constituents. It involves chemical tests, chemical assay and also the phytochemical investigation of the crude drugs.

2.4.1. Chemical Assays

Specific assays for different active principles e.g. total alkaloids, glycosides, resins, tannins, volatile oil, saponins etc. is carried out by different chemical tests.

2.4.2. Chemical Test

Chemical tests are used for determination of specific chemical constituents which may be present in any drug to which its therapeutic activity is attributed.

Table 2: Some important chemical test used in chemical analysis

S. No.	Chemical Test	Chemical Group	Result
1	Dragendorff's Test	Alkaloids	Yellow orange precipitate
2	Borntrager's Test	Anthraquinone Glycosides	Pink Ammonical layer
3	Ferric Chloride Test	Tannins	Blue colour
4	Shinoda Test	Flavonoids	Pink colour
5	Molisch's tests	Carbohydrates	Purple to violet colour rings
6	Millon's tests	Amino acids	White precipitate

2.4.3. Phytochemical Screening

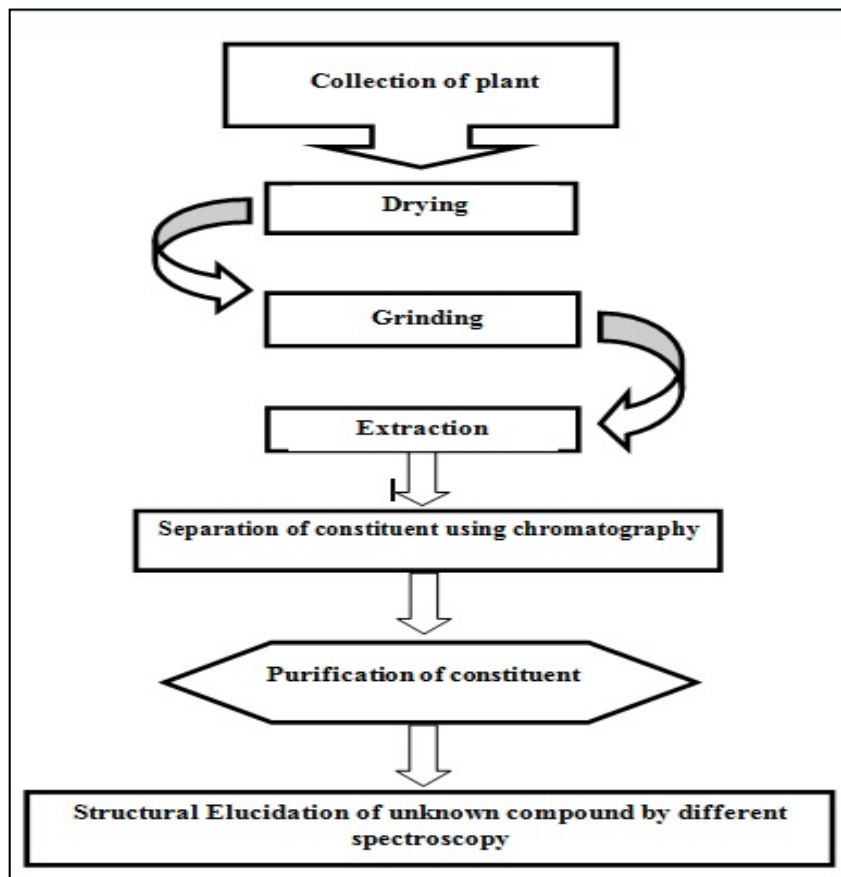


Fig 1: Steps involved in Phytochemical screening Herbal Drug

2.5. Physical Evaluation

In this Method Herbal drugs are evaluated on the basis of some important physical properties of active constituents.

2.6. Biological Evaluation

It includes determination of therapeutic activity of herbal drugs by using biological models of intact animals, animal preparation, isolated living tissue or micro-organisms.

2.6.1. Bioassay: Assay of pharmacologically active substance by using biological animal models. e.g.: Cardiac activity of Digitalis in pigeons, Hypoglycemic activity of insulin in Rabbits.

2.6.2. Microbial Assay: It is type of biological assay specially performed with micro-organism

like bacteria and fungi. e.g.: It is used in evaluation of potency of Antibiotics, Antimicrobial and Antifungal Drugs.

3. Conclusion

Today herbal medicine can stand in commercial market only if they are evaluated according to modern science. Evaluation of herb involves confirmation of its identity and determination of its quality and purity and detection of nature of adulteration. There is no any legal control over the quality control of herbal drugs. In future there is need to develop advanced technique for the evaluation of herbal drugs. The advancement of analytical techniques will serve as a rapid and specific tool in the herbal research, thereby, allowing the manufacturers to set quality standards and specifications so as to seek marketing approval from regulatory authorities

for therapeutic efficacy, safety and shelf life of herbal drugs.

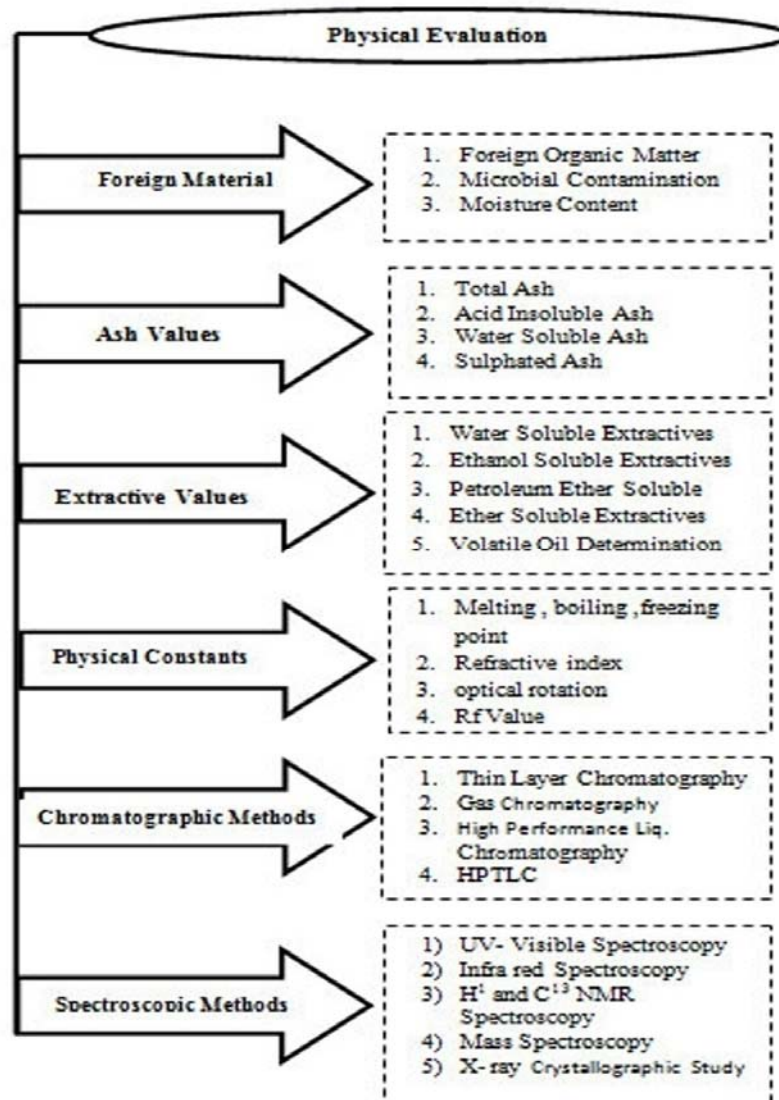


Fig 2: Physical Evaluation

4. Acknowledgement

We would like to thank School of Pharmacy, S.R.T.M. University, Nanded for providing necessary facilities.

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