Importance of pharmacognostic study of medicinal plants: An overview

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ABSTRACT

The present review discusses the need and emphasizes the importance of pharmacognostic study of medicinal plants. This study is important and lays down parameters for standardization and authentication of medicinal plants with the help of which adulteration and substitution can be prevented. All the parameters to be evaluated in pharmacognostic study such as organoleptic characters, macroscopic study, microscopic study, powder study, physico chemical analysis (moisture content, loss on drying, ash values, extractive values), phytochemical analysis, fluorescence analysis are enlisted along with their importance. In the end 55 plants whose pharmacognostic studies have been done are listed along with their family and part evaluated for pharmacognostic study.

Keywords: Pharmacognostic, Organoleptic, Phytochemical, Physicochemical, Fluorescence analysis, Adulteration, Standardization, Medicinal plants

1. Introduction

Now-a-days there is a renewed interest in drugs of natural origin simply because they are considered as green medicine and green medicine is always supposed to be safe. Another factor which emphasizes this attention is the incidences of harmful nature of synthetic drugs which are regarded as harmful to human beings and environment. The advantage of natural drugs is their easy availability, economic and less or no side effects but the disadvantage is that they are the victims of adulteration. The more effective the natural drug more is its demand and the chances of non-availability increases. To meet the growing demand, the natural drug is easily adulterated with low grade material.

Adulteration or substitution is nothing but replacement of original plant with another plant material or intentionally adding any foreign substance to increase the weight or potency of the product or to decrease its cost. Therapeutic efficacy of medicinal plants depends upon the quality and quantity of chemical constituents. The misuse of herbal medicine or natural products starts with wrong identification. The most common error is one common vernacular name is given to two or more entirely different species[1]. All these problems can be solved by pharmacognostic studies of medicinal plants. It is very important and in fact essential to lay down pharmacognostic specifications of medicinal plants which are used in various drugs.

Pharmacognosy is the study of medicines derived from natural sources, mainly from plants. It basically deals with standardization, authentication and study of natural drugs. Most of the research in pharmacognosy has been done in identifying controversial species of plants, authentication of commonly used traditional medicinal plants through morphological, phytochemical and physicochemical analysis. The importance of pharmacognosy has been widely felt in recent times. Unlike taxonomic identification, pharmacognostic study includes parameters which help in identifying adulteration in dry powder form also. This is again necessary because once the plant is dried and made into powder form, it loses its morphological identity and easily prone to adulteration. Pharmacognostic studies ensures plant identity, lays down standardization parameters which will help and prevents adulterations. Such studies will help in authentication of the plants and ensures reproducible quality of herbal products which will lead to safety and efficacy of natural products. The pharmacognostic standardization parameters which are generally done are described below.
2. Standardization parameters

2.1 Organoleptic characters

Organoleptic evaluation can be done by means of sense organs, which provide the simplest as well as quickest means to establish the identity and purity to ensure quality of a particular drug. Organoleptic characters such as shape, size, colour, odour, taste and fracture of stem bark, leaf structure like margin, apex, base surface, venation and inflorescence, etc are evaluated.

2.1.2 Macroscopic study

The macroscopic study is the morphological description of the plant parts which are seen by naked eye or magnifying lens.

2.1.3 Microscopic study

The microscopic study is the anatomical study which is done by taking appropriate section of the plant parts under study. Each distinguishing character can be noted down, some of which are retained in the powder study also. Some of the chemicals which are used in obtaining clear sections are phloroglucinol, chloral hydrate, safranine, methyl orange, etc.

2.2 Powder study

Powder study is similar to microscopic study except here dried powder is taken instead of section of the plant. All the reagents used are also same like above.

2.3 Physico-chemical analysis

The parameters which are studied are moisture content, loss on drying, total ash, acid-insoluble ash, alcohol and water-soluble extractive values, petroleum ether soluble extractive value, ethyl acetate soluble extractive value, acetone soluble extractive value, etc.

Ash values are used to determine quality and purity of crude drug. It indicates presence of various impurities like carbonate, oxalate and silicate. The water soluble ash is used to estimate the amount of inorganic compound present in drugs. The acid insoluble ash consist mainly silica and indicate contamination with earthy material. Moisture content of drugs should be at minimal level to discourage the growth of bacteria, yeast or fungi during storage.

Estimation of extractive values determines the amount of the active constituents in a given amount of plant material when extracted with a particular solvent. The extractions of any crude drug with a particular solvent yield a solution containing different phytoconstituents. The compositions of these phytoconstituents depend upon the nature of the drug and the solvent used. It also gives an indication whether the crude drug is exhausted or not.[3]

2.4 Phytochemical analysis

The crude powder and/or crude drugs extracted in different solvents are tested for various phytoconstituents present in them by standard procedures[3, 4]. They are generally tested for the presence of alkaloids, flavonoids, tannins, phenols, cardiac glycosides, triterpenes, steroids and saponins.

2.5 Fluorescence analysis

A small quantity of dry plant powder is placed on grease free clean microscopic slide and 1-2 drops of freshly prepared reagent solution is added, mixed by gentle tilting the slide and wait for few minutes. Then the slide is placed inside the UV chamber and observe the colour in visible light, short (254 nm) and long (365 nm) ultra violet radiations. The colour observed by application of different reagents in different radiations is recorded[5]. Generally the colour change is noted in reagents like Powder + 1 N NaOH (aq), Powder + 1 N NaOH (alc), Powder + Ammonia, Powder + Picric acid, Powder + Petroleum ether, Powder + 50% HCl, Powder + 50% H2SO4, Powder + Ethyl acetate, Powder + Ethyl alcohol, Powder + Methanol, etc.

Some constituents show fluorescence in the visible range in daylight. The ultra violet light produces fluorescence in many natural products which do not visibly fluoresce in daylight. If substance themselves are not fluorescent, they may often be converted into fluorescent derivatives or decomposition products by applying different reagents. Hence crude drugs are often assessed qualitatively in this way and it is an important parameter for pharmacognostic evaluation of crude drugs[6]. Thus the process of standardization can be achieved by stepwise pharmacognostic studies as stated above. These studies help in identification and authentication of the plant material. Such information can act as reference information for correct identification of particular plant and also will be useful in making a monograph of the plant. Further, it will act as a tool to detect adulterants and substituent and will help in maintaining the quality, reproducibility and efficacy of natural drugs.

A list of 55 medicinal plants, their family and part used for pharmacognostic study is shown in Table 1. These 55 plants belong to 39 different families and each one of them is medicinally important and many of them are traditionally used in one form or another. The therapeutic part of the plant may be any part of the plant i.e. leaf, seed, stem, stem bark, root, root bark, flower, rhizome, peel or fruit rind, tuber, etc.

<table>
<thead>
<tr>
<th>S. N</th>
<th>Name of the plant</th>
<th>Family</th>
<th>Part used for pharmacognostic study</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Nelumbo nucifera</em> Gaertn</td>
<td>Nymphaeaceae</td>
<td>leaf</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td><em>Eucalyptus globulus</em></td>
<td>Myrtaceae</td>
<td>leaf</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td><em>Cinnamomum verum</em> J.S. Presl</td>
<td>Lauraceae</td>
<td>leaf</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td><em>Asplenium apline Swartz,</em></td>
<td>Aspleniaceae</td>
<td>leaf</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td><em>Asplenium apline Swartz,</em></td>
<td>Aspleniaceae</td>
<td>leaf</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>*A. decrescens Kunze , A.</td>
<td>Aspleniaceae</td>
<td>leaf</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>*A. decrescens Kunze , A.</td>
<td>Aspleniaceae</td>
<td>leaf</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>*A. decrescens Kunze , A.</td>
<td>Aspleniaceae</td>
<td>leaf</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td><em>Barringtonia acutangula</em></td>
<td>Lecythidaceae</td>
<td>Leaf and bark</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td><em>Holoptelea integrifolia</em> (Roxb) Planch</td>
<td>Ulmaceae</td>
<td>leaf</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td><em>Melaleuca leucadendron</em></td>
<td>Myrtaceae</td>
<td>leaf</td>
<td>16</td>
</tr>
<tr>
<td>11</td>
<td><em>Cymbopogon citratus</em> (dc.)</td>
<td>Poaceae</td>
<td>leaf</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td><em>Heterophragma quadriloculare</em></td>
<td>Bigmoniaceae</td>
<td>leaf</td>
<td>18</td>
</tr>
</tbody>
</table>
3. References


46. Shah R, Shah R, Chanda S. Pharmacognostical and preliminary phytochemical investigation of *Tephrosia*