AkiNik

Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

ISSN 2278-4136
ISSN 2349-8234
JPP 2014; 2 (5): 69-73

Received: 13-12-2013
Accepted: 20-12-2013

Sumitra Chanda
Phytochemical, Pharmacological and Microbiological Laboratory Department of Biosciences, Saurashtra University - Rajkot, 360 005, Gujarat, India.
Email: svchanda@gmail.com

Correspondence
Sumitra Chanda
Directorate of Research, Krishna Institute of Medical Sciences University, Karad-415110, Maharashtra, India,
Email: svchanda@gmail.com
Tel: 09426247896

Importance of pharmacognostic study of medicinal plants: An overview

Sumitra Chanda

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

2.1.1 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[2].

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% H_2SO_4, 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 1: List of medicinal plants, their family and part used for pharmacognostic study

S. N	Name of the plant	Family	Part used for pharmacognostic study	References
1	*Nelumbo nucifera* Gaertn	Nymphaeaceae	leaf	7
2	*Eucalyptus globulus*	Myrtaceae	leaf	8
3	*Cinnamomum verum* J.S. Presl	Lauraceae	leaf	9
4	*Asplenium affine* Swartz, *A. decrescens* Kunze , *A. zenkeranum* Kunze	Aspleniaceae	leaf	10
5	*Aeschynomene indica* Linn	Leguminosae	leaf	11
6	*Polygonum nepalense*	Polygonaceae	leaf	12
7	*Brunfelsia americana* L.	Solanaceae	leaf	13
8	*Barringtonia acutangula* Gaertn	Lecythidaceae	Leaf and bark	14
9	*Holoptelea integrifolia* (Roxb) Planch	Ulmaceae	leaf	15
10	*Melaleuca leucadendron*	Myrtaceae	leaf	16
11	*Cymbopogon citratus* (dc.) stapf	Poaceae	leaf	17
12	*Heterophragma quadriloculare* K. Schum	Bignoniaceae	leaf	18

13	*Manilkara hexandra* (Roxb.) Dubard	Sapotaceae	leaf	19
14	*Mangifera indica* L.	Anacardiaceae	leaf	20
15	*Punica granatum* L	Punicaceae	leaf	21
16	*Manilkara zapota* L.	Sapotaceae	leaf	22
17	*Psidium guajava* L	Mrytaceae	leaf	23
18	*Polyalthia longifolia* (Sonn.) Thw	Annonaceae	leaf	24
19	*Sida spinosa* Linn	Malvaceae	Leaf	25
20	*Diospyros melanoxylon* Roxb *Buchanania lanzan* spreng *Manilkara zapota* (Linn.)	Ebenaceae Anacardiaceae Sapotaceae	seed	26
21	*Abrus precatorius* Linn	Fabaceae	seed	27
22	*Syzygium cumini* Linn *Azadirachta indica* A. Juss	Myrtaceae Meliaceae	seed	28
23	*Cissus quadrangularis* L.	Vitaceae	stem	29
24	*Thespesia lampas* (Cav.) Dalz & Gibs	Malvaceae	stem	30
25	*Nyctanthes arbortristis* Linn	Oleaceae	Trunk bark	31
26	*Pongamia pinnata* (L.) Pierre	Fabaceae	Stem bark	32
27	*Terminalia Arjuna*	Combretaceae	Stem bark	33
28	*Oroxylum indicum* (L) Vent	Bignoniaceae	Stem	34
29	*Ficus racemosa, F. virens, F. religiosa* and *F. benghalensis*	Moraceae	Stem bark	35
30	*Combretum albidum* G.Don	-	Stem bark	36
31	*Holoptelea integrifolia* Roxb	Ulmaceae	Root bark	37
32	*Eriosema chinense* Vogel	Leguminosae	Root	38
33	*Nelsonia canescens*	Acanthaceae	Root	39
34	*Nardostachys jatamansi* DC.	Valerianaceae	rhizome	40
35	*Thespesia populnea* (L.) soland	Malvaceae	root	41
36	*Tagetes erecta*	Asteraceae	flower	42
37	*Acacia nilotica* (Linn)	Leguminosae (Mimosaceae)	flower	43
38	*Woodfordia fruticosa* Kurz	Lythraceae	flower	44
39	*Madhuca indica* (Gmel)	Sapotaceae	flower	45
40	*Tephrosia purpurea* (Linn.) Pers	Fabaceae	root	46
41	*Artemisia parviflora* Roxb	Asteraceae	Leaf, stem	47
42	*Antigonon leptopus* Hook and Arn	Polygonaceae	Whole plant	48
43	*Shorea tumbuggaia*	Dipterocarpaceae	Stem, stem bark, leaf	49
44	*Alternanthera sessilis* L.	Amaranthaceae	Stem, leaf	50
45	*Andrographis paniculata* Nees	Acanthaceae	Stem, root, leaf	51
46	*Ficus retusa*	Moraceae	Leaf, bark	52
47	*Garcinia indica*	Guttiferae	Fruit rind	53
48	*Citrus aurantifolia* (Christm) Swingle	Rutaceae	peel	54
49	*Careya arborea* Roxb	Lecthyidaceae	Leaf, stem	55
50	*Tephrosia jamnagarensis* Sant	Fabaceae	Root, stem, leaf	56
51	*Acacia leucophloea*	Fabaceae	root	57
52	*Gmelina arborea* Roxb.	Labiatae	root	58
53	*Lantana camara* Linn	Verbenaceae	root	59
54	*Peperomia pellucida* (L.) HBK	Piperaceae	root	60
55	*Eulophia herbacea* Lindl	Orchidacea	tuber	2

3. References

1. Dineshkumar C. Pharmacognosy can help minimize accidental misuse of herbal medicine. Curr Sci 2007; 3:1356-1358.
2. Tatiya A, Surana S, Bhavsar S, Patil D, Patil Y. Pharmacognostic and preliminary phytochemical investigation of *Eulophia herbacea* Lindl. Tubers (Orchidaceae). Asian Pac J Trop Disease 2012; 2(Suppl 1):S50-55.
3. Harborne JB. Phytochemical methods. Edn 2. London: Chapman & Hall, 1973.
4. Kokate CK. Practical Pharmacognosy, Edn 4, Vallabh Prakashan, Delhi, 107-111, 1997.
5. Kokoski J, Kokoski R, Salma FJ. Fluorescence of powdered vegetable drugs under ultraviolet radiation. J Am Pharm Ass 1958; 47:715-717.
6. Zhao Z, Liang Z, Guo P. Macroscopic identification of Chinese medicinal materials: Traditional experiences and modern understanding. J Ethnopharmacol 2011; 131:556-561.
7. Jain R, Rajput S. Development of pharmacognostical parameters and estimation of quercetin using HPTLC in leaves of *Nelumbo nucifera* Gaertn. Phcog J 2012; 4(34):31-37.
8. Shah G, Kaur M, Singh PS, Rahar S, Dhabliya F, Arya Y, Shri R. Pharmacognostic parameters of *Eucalyptus globulus* leaves. Phcog J 2012a; 4(34):38-43.
9. Kumar KNS, Billadi S, Maheshwari R, Basavaiah RRM, Betikeri Y. Chemoprofile of tvakpatra; leaves of *Cinnamomum verum* J.S. Presl. Phcog J 2012; 4(34):26-30.
10. Irudayaraj V, Johnson M. Pharmacognostical studies on three A*splenium* species. J Phytol 2011; 3(10):1-9.
11. Aron A, Mehalingam P. Pharmacognostic and preliminary phytochemical investigation on leaf of *Aeschynomene indica* L. J Biosci Res 2012; 3(1):100-105.
12. Garg RK, Kalra S, Mahadevan N, Shivali, Dhar VJ. Pharmacognostic investigation of *Polygonum nepalense*. Int J Recent Adv Pharmaceut Res 2011; 1:40-44.

13. Nisha RRS, Radhamany PM. Pharmacognostic and physicochemical analysis on the leaves of *Brunfelsia americana* L. Asian Pac J Trop Biomed 2012; S305-307.
14. Daniel M, Robin EM. Phytochemical and pharmacognostic studies on the bark and leaves of *Barringtonia acutangula* gaertn. Int J Pharma Biosci 2011; 2(1):B128-B134.
15. Mahmud S, Shareef H, Ahmad M, Gouhar S, Rizwani G. Pharmacognostic studies on fresh mature leaves of *Holoptelea integrifolia* (ROXB) PLANCH. Pak J Bot 2010; 42(6):3705-3708.
16. Shah G, Chawla A, Baghel U, Rahar S, Singh PS and Dhawan RK. Pharmacognostic standardization of leaves of *Melaleuca leucadendron*. Phcog J 2013; 5(4):143-148.
17. Shah G, Kaur M, Dhabiliya F, Shri R. Pharmacognostic standardization of *Cymbopogon citratus* (dc.) Stapf leaves. Phcog J 2012b; 4(29):19-25.
18. Satani BKH, Mishra SH. Pharmacognostic investigations on the leaves of *Heterophragma quadriloculare* K. Schum. Asian Pac J Trop Biomed 2012; S270-275.
19. Chanda S, Nagani K, Parekh J. Assessment of quality of *Manilkara hexandra* (Roxb) Dubard leaf (Sapotaceae): pharmacognostical and physicochemical profile. Phcog J 2010; 2(13):520-524.
20. Rakholiya K, Chanda S. Pharmacognostic, physicochemical and phytochemical investigation of *Mangifera indica* L. var. Kesar leaf. Asian Pac J Trop Biomed 2012; S680-684.
21. Bapodara M, Nagani K, Chanda S. Pharmacognostic and physicochemical study of *Punica granatum* L. leaf. Phcog J 2011; 3(21):29-32.
22. Nagani K, Kaneria M, Chanda S. Pharmacognostic studies on the leaves of *Manilkara zapota* L. (Sapotaceae). Phcog J 2012; 4(27):38-41.
23. Kaneria M, Chanda S. Phytochemical and pharmacognostic evaluation of leaves of *Psidium guajava* L. (Myrtaceae). Phcog J 2011; 3(23):41-45.
24. Dave R, Nagani K, Chanda S. Pharmacognostic studies and physicochemical properties of the *Polyalthia longifolia* var. pendula leaf. Phcog J 2010; 2(13):572-576.
25. Selvadurai S, Senthamarai R, Kirubha TSV, Nishanthi M, Vijayakumar B. Pharmacognostic evaluation of whole plant of *Sida spinosa* linn. (Malvaceae). Int J Novel Trends Pharmaceutic Sci 2012; 2(1):42-46.
26. Bothara SB, Singh S. Pharmacognostical studies of seeds on some plants belonging Chhattisgarh. Phcog J 2012; 4(28):24-30.
27. Prathyusha P, Subramanian S, Sivakumar R. Pharmacognostical studies on white and red forms of s*Abrus precatorius* Linn. Indian J Nat Prod Res 2010; 1(4):476-480.
28. Bigoniya P, Singh CS, Srivastava B. Pharmacognostical and physico-chemical standardization of *Syzygium cumini* and *Azadirachta indica* seed. Asian Pac J Trop Biomed 2012; S290-295.
29. Nagani KV, Kevalia J, Chanda S. Pharmacognostical and phytochemical evaluation of stem of *Cissus quadrangularis* L. Int J Pharmaceutic Sci Res 2011; 2(11):2856-2862.
30. Chumbhale DS, Upasani CD. Pharmacognostic standardization of stems of *Thespesia lampas* (Cav.) Dalz & Gibs. Asian Pac J Trop Biomed 2012; 357-363.
31. Nirmal SA, Pal SC, Mandal SC. Pharmacognostic evaluation of *Nyctanthes arbortristis* bark. Asian Pac J Trop Biomed 2012; S494-S500.
32. Kumar D, Kumar A, Prakash O. Pharmacognostic evaluation of stem bark of *Pongamia pinnata* (L.) Pierre. Asian Pac J Trop Biomed 2012a; S543-546.
33. Dhingra V, Dhingra S, Singla A. Forensic and pharmacognostic studies of the *Terminalia arjuna* Bark. Egypt J Forens Sci 2013; 3(1):15-19.
34. Aparna S, Srilatha S, Labhane NM. Pharmacognostic studies and HPTLC fingerprint profile of stem of *Oroxylum indicum* (L) Vent: A threatened and vulnerable medicinal plant. Res J Pharmaceut Biol Chem Sci 2013; 4(3):1078-1084.
35. Babu K, Shankar SG, Rai S. Comparative pharmacognostic studies on the barks of four *Ficus* species. Turk J Biol 2010; 34:215-224.
36. Sreedhar S, Prakash KU, Rema SAB. Pharmacognostic Analysis of Stem Bark of *Combretum albidum* G. Don; An Unexplored Medicinal Plant Phcog J 2012; 4(28):13-18.
37. Kumar D, Kumar K, Kumar S, Kumar T, Kumar A and Prakash O. Pharmacognostic evaluation of leaf and root bark of *Holoptelea integrifolia* Roxb. Asian Pacific J Trop Biomed 2012b; 169-175.
38. Prasad SK, Laloo D, Kumar M, Hemlatha S. Quality control standardization and antioxidant activity of roots from *Eriosema chinense*. Phcog J 2013; 5(4):149–155.
39. Acharya RN, Padiya RH, Patel ED, Harisha CR, Shukla VJ and Chauhan M. Pharmacognostic evaluation of *Nelsonia canescens*. (Lam) Spreng. (Acanthaceae) Root. 2012; Phcog J 4(28):45-48.
40. Jha SV, Bhagwat AM, Pandita NS. Pharmacognostic and phytochemical studies on the rhizome of *Nardostachys jatamansi* DC. using different extracts. Phcog J 2012; 4(33):16-22.
41. Patil PS, Venkatanarayanan R, Argade PD, Shinde PR. Assessment of pharmacognostic and phytochemical standards of *Thespesia populnea* (L.) root. Asian Pac J Trop Biomed 2012; S1212-1216.
42. Kadam PV, Bhingare CL, Balasaheb SR, Yuvraj NR and Janardhan PM. Pharmacognostic, physicochemical and phytochemical investigation of *Tagetes erecta* flowers (Asteraceae). J Biol Sci Opin 2013; 1(1):21-24.
43. Leela V, Saraswathy A. Pharmacognostic studies on the flowers of *Acacia nilotica* Linn. Phcog J 2012; 4(28):35-39.
44. Baravalia Y, Nagani K, Chanda S. Evaluation of pharmacognostic and physicochemical parameters of *Woodfordia fruticosa* Kurz. Flowers. Phcog J 2011; 2:13-18.
45. Katiyar S, Tandon M, Chandekar A, Upmanyu N. Pharmacognotic standardization, phytochemical investigation and antihelmintic evaluation of *Madhuca indica* J.F. (GMEL) flowers. Pharmacologyonline 2011; 3:892-903.
46. Shah R, Shah R, Chanda S. Pharmacognostical and preliminary phytochemical investigation of *Tephrosia*

purpurea (Linn.) Pers. root from Gujarat region. Int J Pharmaceutic Res 2011; 3(2):49-52.
47. Joghee S, Ahuja J, Paramakrishnan N. Pharmacognostical investigation of *Artemisia parviflora* Roxb. Asian Pac J Trop Biomed 2012; S532-535.
48. Sati S, Habibur RC. Pharmacognostic and anatomical studies of *Antigonan leptopus* Hook and Arn a promising medicinal climber. Int J Res Ayur Pharma 2013; 4(2):186-191.
49. Ankanna S, Savitramma N. Pharmacognostic studies of *Shorea tumbuggaia* roxb. - A globally threatened species. Phcog J 2012; 4(34):52-56.
50. Anitha R, Konimozho S. Pharmacognostic evaluation of *Alternanthera sessilis* (L.) R.Br.ex.DC. Phcog J 2012; 4(28):31-34.
51. Sudhakaran MV. Botanical pharmacognosy of *Andrographis paniculata* (Burm. F.) Wall. Ex. Nees. Phcog J 2012; 4(32):1-10.
52. Semwai A, Kumar R, Teotia UVS, Singh R. Pharmacognostical evaluation of medicinally important *Ficus retusa* (Leaves and bark). J Acute Disease 2013; 2(4):300-303.
53. Kadam PV, Yadav KN, Patel AN, Navsare VS, Bhilwade SK and Patil MJ. Phytopharmacopoeial specifications of *Garcinia indica* fruit rinds. Phcog J 2012; 4(31):23-28.
54. Apraj V, Thakur ND, Bhagwat A, Mallya R, Sawant L, Pandita N. Pharmacognostic and Phytochemical evaluation of *Citrus aurantifolia* (Christm) Swingle peel. Phcog J 2011; 3(26):70-76.
55. Gupta PC, Sharma N, Rao Ch V. Pharmacognostic studies of the leaves and stem of *Careya arborea* Roxb. Asian Pac J Trop Biomed 2012; 404-408.
56. Bhambra GK, Daniel M, Nagar PS. Pharmacognostic studies on *Tephrosia jamnagarensis* Sant.-An endemic species of India. Phcog J 2012; 4(32):11-14.
57. Jhade D, Jain S, Jain A, Sharma P. Pharmacognostic screening, phytochemical evaluation and *in vitro* free radical scavenging activity of *Acacia leucophloea* Root. Asian Pac J Trop Biomed 2012; 2(2):Suppl S501-505.
58. Acharya NS, Acharya SR, Shah MB, Santani DD. Development of Pharmacognostical parameters and estimation of β-sitosterol using HPTLC in roots of *Gmelina arborea* Roxb. Phcog J 2012; 4(30):1-9.
59. Kumar D, Kumar A, Prakash O. Pharmacognostic study of *Lantana camara* Linn. root. Asian Pac J Trop Disease 2012c; 2(1):S42-S45.
60. Majumder P. Evaluation of pharmacognostic phytochemical profile along with quantitative physicochemical standards on the root of the medicinal herb *Peperomia pellucid* (L.) HBK. J Pharmaceutic Biomed Sci 2011; 10(10):1-4.