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Pharmacognostical Characterization of *Ocimum* Spp.

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Nature has provided a complete storehouse of remedies to cure ailments of mankind. About 80% of the world's population depends wholly or partially on traditional medicine for its primary health care needs. Pharmacognosy is mainly concerned with naturally occurring substances having a medicinal action. Morphological and anatomical characters play a vital role in crude drug standardization. However, a proper documentation of medicinal plants of *Ocimum* spp is lacking and many times adulterants are passed as genuine drugs. In the present investigation *Ocimum tenuiflorum* and *Ocimum gratissimum* have been selected for the pharmacognostical studies due to its medicinal importance.

Keyword: Phamarcognostical studies, Tulasi, *Ocimum*, Tribal medicines.

1. Introduction

Several investigations on traditional Indian medicines have been carried out recently (Kumar, 2000: Sharma and Kumar, 2006; Kumar, 2008). studied traditional Indian Ayurvedic Medicines and some potential plants for bioenergy, medicine from India. Sharma *et al* (2003) characterized Medicinal plants for skin and hair care. Mahlawat and Kumar (2005) studied some traditional medicinal plants used by tribal people of Rajasthan in Human ailments. Sharma and Kumar, (2006, 2007), studied traditional medicinal practices of Rajasthan. Parveen et al., (2007) studied Traditional use of medicinal plants among the rural communities of Churu District in the Thar Desert, IndiaPlant based veterinary medicine from traditional knowledge of India has been recorded in Bulletin of Botanical Survey of India (Sharma, et al., 2005). Ethnobotanical survey of medicinal plants from Baran District (Meena and Kumar, 2012) has been carried out.

The word "Pharmacognosy" derives from the Greek words *pharmakon* (drug), and *gnosis* or knowledge. The term pharmacognosy was used for the first time by the Austrian physician Schmidt in 1811. A "crude drug" means a dried unprepared natural material of plant, animal or mineral origin, which is used for medicine. The term "Pharmakognosie" and it discipline developed in German speaking areas of Europe - where it is a synonym of "Drogenkunde" ("science of the crude drugs").

The different fields within today's pharmacognosy include: (i) Ethnobotany or ethnopharmacology; study of the traditional use of plants in the society. Ethnobotany refers to any use of the plants, whereas ethnopharmacology refers more specifically to the madical use of the plants. (ii) Phytochemistry, or natural product chemistry; a field closely related to organic

chemistry, studying the chemical composition of living organisms. It is also closely connected to the process of finding new drug candidates from natural sources. (iii) Phytotherapy study of crude drugs, i.e. extracts from natural sources in medical use.

Pharmacognosy is basically divided into conventional and modern pharmacognosy. Conventional pharmacognostical study is based on macroscopic, microscopic and quantitative microscopy. Macroscopic characters include shape, size, colour and texture of the drug in crude or powdered form. Microscopic characters include the anatomical details of drug producing plant as seen in transverse and longitudinal sections, maceration study and the size measurement of various type of cells. Quantitative microscopy includes the vein islet number, palisade ratio, stomatal number and stomatal indices and so restricted to leaf drug only. The modern pharmacognosy utilizes characteristics of analytical, phytochemical and certain physical constant values over the traditional science of taxonomy in plant systematics. Most of the botanical, chemical, physical and microbial techniques employed in pharmacognosy are applicable to the analysis of drugs and therefore, used by public analysts, forensic scientists and quality control chemists associated with industries.

It is estimated that roughly 1500 plant species in Ayurveda, 1200 plant species in Siddha have been used for drug preparation (Jain, 1987). Though the Indian traditional systems of medicine are time-tested and practiced successfully from time immemorial, there is lack of standardization with regard to identification of crude drugs, methods of preparation and quality of finished products. Tyler *et al.* (1981) defined that in a broad sense, pharmacognosy embraces knowledge of the history, distribution, cultivation, collection, selection, preparation, commerce, identification, evaluation, preservation and use of drugs and economic substances that affect the health of men and other animals.

Pharmacognosy includes the study of the proper horticulture, harvesting and uses of the raw medicinals found in nature. Its scope includes the identification or authentication of crude drugs (using macroscopical, microscopical, radiological or chemical methods), and their bio-pharmacological and clinical evaluations. During earlier investigations studies have been conducted on ethnobotanical and pharmacognostical characterization of medicinal plants (Kumar, 2000, Sharma, and Kumar, 2012). Although today pharmacognosy is still taught in a small number of university pharmacy schools in US and in the UK, this subject is still obligatory within the pharmacy curricula in all universities of continental Europe.

In traditional systems of medicine, different parts (leaves, stem, flower, root, seeds and even whole plant) of *O. sanctum* have been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhoea, dysentery, skin diseases, arthritis, chronic fever and insect bite (Prakash and Gupta, 2005). In traditional systems of medicine, different parts (leaves, stem, flower, root, seeds and even whole plant) of O. sanctum have been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhoea, dysentery, skin diseases, arthritis, chronic fever and insect bite (Prakash and Gupta, 2005) Scientifically, the Ocimum species have proved to possess various biological activities such as antibacterial (Obinna et al., 2009; Parag et al., 2010) antifungal (Bansod and Rai 2005; Singh, 2010) antioxidant (Ramesh and Satakopan 2010; Hanif et atl. 2011), and anti-diabetic (Chandra et al., 2008). The number of medicinal formulations developed by Vaidyas has a positive correlation with number of diseases to be tested and *Ocimum sanctum* is used in treating fourteen type of diseases (Kala, 2005). Ansari *et al.* (2006) have studied the behaviour of powdered drug of *O. tenuiflorum* with different chemical reagents and florescence characteristics of drug from four species of *Ocimum* with different chemical reagents under day light and UV light.

Standardization of herbal drugs is the most desirable at this time when worldwide interest on herbal medicine has gained momentum.

Morphological and anatomical characters play a vital role in crude drug standardization. Morphological characters involve size, arrangement, venation, texture, surface characters, markings and hardness of the plant materials.

In the present investigation *Ocimum tenuiflorum* and *Ocimum gratissimum* have been selected for the pharmacognostical studies due to their medicinal importance.

2. Material and Methods

2.1 Collection of Plant Materials

Plant parts of *Ocimum tenuiflorum* and *Ocimum gratissimum* were collected from University Campus, University of Rajasthan, Jaipur. Collected plant specimens were identified with the help of local floras and by comparing voucher specimens with identified herbarium collections in the Department of Botany, University of Rajasthan, Jaipur.

2.2 Anatomical Methods

Collected plant parts were fixed in formalin acetic acid alcohol (F.A.A.) fixative. The F.A.A. fixative was prepared as follows:

90% ethanol (v/v)	50 ml
Glacial acetic acid	5 ml
Formalin	5 ml
Distilled water	40 ml

Duration of fixation at room temperature 24 h

Fixed plant parts were dehydrated in tertiary butyl alcohol (TBA) series (Johansen, 1940).

2.3 Staining:

The dewaxed slides were stained in 2.25% w/v solution of safranin in 95% alcohol for sufficient time and washed in alcohol until the excess stain was removed then the slides were stained in 1% w/v solution of fast green in a mixture of clove oil and absolute alcohol (3:1) and differentiated in clove oil and alcohol. The slides were brought down to xylene and mounted in DPX.

3 Results and Discussion

3.1 Historical

Diseases are born with man and drugs came into existence since a very early period to remove the pain of diseases and to cure them. Thus, the story or history of drugs is as old as mankind.

Vegetable drugs are usually arranged for study in one of the following five ways:

1. ***Alphabetical***: The drugs are arranged in alphabetical order using either Latin or English names.
2. ***Taxonomic*:** The drugs are arranged according to the plant from which they are obtained in phyla, orders, families, genera and species.
3. ***Morphological*:** Drugs are divided into different groups such as organized drugs which include root, wood, bark, flowers, fruits and leaves and unorganized drugs such as oil, fats, extracts and gums.
4. ***Pharmacological or therapeutic*:** Classification of drugs is according to the pharmacological action of their most important constituent.
5. ***Chemical*:** Drugs are classified according to their most important constituent that is alkaloids, volatile oils etc.

Pharmacy starting from medicine, separated and materia medica the science of material medicines describing collection, preparation and compounding emerged.

Even up to the beginning of 20th century pharmacognosy was more a descriptive subject mainly of botanical science and consisted of identification of drugs both in entire and powdered condition and their history, commerce, collection, preparation and storage.

3.2 Period 1934-1960:

The development of modern pharmacognosy book place later during the period 1934-1960 by simultaneous application of disciplines like organic chemistry, biochemistry, biosynthesis, pharmacology and modern methods and techniques of analytic chemistry including paper, thin layer and gas chromatography and spectrophotometry.

The substances from the plants were isolated, their structure elucidated and pharmacologically

active constituents studied. The development was mainly due to following four events:

I. Isolation of penicillin in 1928 by Fleming and large scale production in 1941 by Florey and Chain.
II. Isolation of reserpine from Rauwolfia roots and confirming its hypotensive and tranquilizing properties.
III. Isolation of Vinca alkaloids especially vincristine and vinblastine. Vincristine was found useful in the treatment of leukemia. These alkaloids have also anticancer properties.
IV. Steroid hormones like progesterone were isolated by partial synthesis from diosgenin and other steroid saponins by Marker's method. From progesterone by microbial reactions, cortisone and hydrocortisone are obtained.

3.3 Progress from 1960 Onwards:

During this period only a few active constituents mainly antibiotics, hormones and antitumour drugs were isolated or new possibilities for their production were found. By applications of several disciplines pharmacognosy from a descriptive subject has developed into an integral, important discipline of pharmaceutical sciences.

From 6- amino penicillianic acid which has very little antibiotic action of its own but from which important broad spectrum semi-synthetic penicillins like ampicillin and amoxycillin were developed. Drugs used in medicine today are either obtained from nature or are of synthetic origin. Natural drugs are obtained from plants, animals or mineral kingdom.

Drugs made from micro-organisms like antibiotics were not known in the early period. Synthetic drugs (or syntheticals) like aspirin, sulpha drugs, some vitamins and some antibiotics are synthesized in laboratories from simple chemical (or chemicals) through various chemical reactions.

Natural drugs obtained from plants and animals are called drugs of biological origin and are produced in the living cells of plants or animals.

Each drug is always obtained from the same plant or animal. The Latin name of the plant or animal is called its botanical or zoological source. The family to which this plant or animal belongs is also mentioned, e.g. Vasaka leaves are obtained from *Adhatoda vasica* plant; family Acanthaceae. Vasaka leaves are included in the Indian pharmacopoeia and are called official leaves. Their botanical source is called official source. Geographical source or habitat gives us information about the country or place where the drug is produced. Ginger is produced in Jamaica and nux vomica and ispaghula in India. In some cases the original native place of a drug is not the same as the present geographical source, e.g. cinchona is a native of South America and is at present cultivated in Indonesia, m is very interesting. Politics play its part in the drugs also. Thus there is restriction on the import of buchu leaves growing in South Africa because of our political relations with that country.

Sometimes crude drugs are adulterated. An adulterant is the drug resembling the original or authentic drug but usually quite different or inferior, less effective, containing less percentage of active constituents and sometimes containing more extraneous matter than permitted.. Nature of adulteration can be determined by the study of pharmacognosy.

In chemical classification as the medicinal action of the drug is due to active chemical constituents, drugs are classified according to the chemical nature of active constituents. Thus alkaloid containing drugs like opium or solanaceous drugs or rauwolfia are arranged under alkaloidal drugs and even according to the chemical nature of alkaloids.

3.4 Pharmacognostical Studies on Ocimum Spp:

3.4.1 Anatomy of Stem:

The young stem is quandrangular in outline. Outermost layer is epidermis composed of tangentially elongated isodiametric cells and covered by their cuticle. There are two types of hairs – one uniseriate purilocular trichomes and second secretory hairs, unicellular or bicellular. Hypodermis is slightly collenchymatous. Cortex

is parenchymatous with air spaces. Stele has four vascular bundles in each corner and four very small bundles between them. In the early stage they contain only phloem tissue. Vascular bundles are collateral and open.

Secondary thickening develops from cambial activity producing thin phloem ring towards the exterior and thicker xylem ring on the interior. Xylem is without fibre tracheid with libriform fibres. Vessels end wall simple, with vestured pits (rarely) or without vestured pits. Large bundles have radial lignious vessels separated by uniseriate and pluriseriate parenchymatous medullary rays. Cork cambium produces single layered cork and one to two celled thick secondary cortex. Pith in the center consists of lignified parenchymatous cells.

3.4.2 Leaf Anatomy:

Lamina is amphistomatic with small dyactic stomata situation on top of epidermis. The middle nerve is prominant on the adaxial side and has single vascular bundle embedded in the parenchymatous tissue. Short, uniseriate and pluricellular trichomes are found on the middle nerve. These are two types of secretary hairs: one located in a very small depression of the upper epidermis, and second located in a very large excavation.

4. Discussion

Pharmacognosy has been generally pursued for utilitarian ends and may thus be called an applied science. It has played an important role in the development of the pure sciences, e.g. in descriptive botany, plant classification (taxonomy) and plant chemistry (phytochemistry). Chemical plant taxonomy, genetical studies, involving secondary metabolites is now attracting the attention of more and more botanist and chemists.

The genus *Ocimum* L. (Lamiaceae) is found in tropical and subtropical regions. They are rich in essential oils and have been the subject of numerous chemical studies. Many species have been grown by local people as medicinal plants, culinary herbs and insect-controlling agents, e.g. *O, americanum* L. (*O. canum* Sims), *O. gratissimum* L., *O. tenuiflorum* L. (*O. sanctum* L.) and *O. basilicum* L. The last plant, sweet basil, is also a major essential oil crop, estimated to produce annually 42.5 tonnes of oil worldwide. Plants of *O. basilicum* typically have an aniseed-like aroma and sweet taste; the essential oil responsible for these features is methyl chavicol (=estragole). However, wild populations differ in essential oil composition, and over the years many different chemocultivars varying in their aroma have been selected or bred by crossing with other cultivars or closely related species.

5. Conclusion

Rajasthan is rich in vegetation and pharmcognostical studies provide valuable insight into identification and characterization of some of the plants of semi-arid and arid regions.

Pharmacognostical studies are essential for correct identification of crude drug and its derivatives. Subjecting this plant to pharmacological studies could result in a higher hit rate for promising phytochemical compounds and would at the same time advance our knowledge about such elements of the indigenous ethnopharmacopoeias and their pharmacological effects. Therefore the documentation of the traditional therapeutic know-how could lead to the discovery of new drugs as well as contribute to the conservation, sustainable management and use of plant resources.

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