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# MEDICINAL PLANT COLLECTION AND TAXONOMIC IDENTIFICATION

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**Abstract**

All the world over, plants and plant products have been used for the treatment of human sufferings and diseases. Problems involved at the level of collection, storage, over-exploitation, cultivation of medicinal plants by conventional methods and through in vitro cultures are discussed. The significance of the voucher specimens and above all the reliability of the identification of medicinal plants is pointed out.

Medicinal plants and plant-derived medicine are widely used in traditional cultures all over the world and they are becoming increasingly popular in modern society as natural alternatives to synthetic chemicals (Wyk & Wink, 2004). The historical development of medicinal plants is intimately interwoven with the migration of modern man (*Homo sapiens*) in various parts of the world. Thus he had an opportunity of discovering, through trial and error, the medicinal plants that he came across in different ecological regimes. As a logical consequence of this situation, many parts of the world developed their own systems: China Pharmacy, Inca Pharmacy, Ayurveda, Greek Medicine, Roman Pharmacy, Greeko-Arabian Medicine etc. In view of the epoch making achievements in natural product chemistry, synthetic chemistry, microbiology and biotechnology in Europe and areas occupied by European nations, tremendous developments have taken place in the treatment of human diseases. Nonetheless Western medicine treats a tiny proportion of all the people on earth. Eighty percent of the World's population relies entirely on local medicines made exclusively from plants. It is estimated that between 35,000 and 70,000 different species have been used as medicines by various peoples of the world as the western drugs continue to be unaffordable or in many cases inappropriate (Lewington, 1990).

The Unani, Ayurvedic and Homeopathic drugs are predominantly based on the medicinal properties of the plants. Furthermore, local communities in different areas have the knowledge of centuries old traditional uses of most of the plants of their area. This indigenous knowledge of plants is transferred from generation to generation, particularly in far off places in the Third World countries, where, many a times, the folk medicine is the only source of treatment.

**Medicinal plant collection:** According to Zaidi (2001) the following four systems for the collection of medicinal plants are in vogue in different forest areas of Pakistan:

i. Leasing-out the area for the collection of medicinal plants (Hazara Forest Circle).
ii Collection by traders through local people, paying a nominal royalty on the produce to the Forest Department (Malakand Circle)
iii. Collection of medicinal plants by the Forest Department through contractors, for subsequent sale to the industry (Baluchistan)
iv. Auction of the area for the collection of minor forest produce (Punjab Irrigated Plantations).

In Swat as in other parts of the country plant collectors are local villagers, collecting and selling medicinal plants as a part time activity and as an extra source of income. Women and children play a more active part in plant collection than men. It is estimated that 70% plant collectors are women. Many people are hired by local plant traders to collect particular species of plants, known to be in demand by big traders. (Khan & Humayun, 2003). About 5000 families residing in the remote hilly areas are involved in plant collection. According to a survey conducted by Pakistan Forest Institute, the total turn-over of crude drugs in the country is worth Rs.120 million (Zaidi, 2001).

**Losses:** However, large quantities of medicinal plants are wasted. A rough estimate of the wastage is given by the collectors as c. 15%. A number of reasons are advanced for the losses including (i) the use of unsuitable equipment for plant collection e.g., bags, shawls and cotton cloth and poorly crafted cutting and digging tools, (ii) Lack of awareness about the desired plant part is also an important factor, (iii) Poor drying facilities: Drying is done by women or by village grocers who may buy the fresh collections, by spreading the plants on the floor or on the cloth or plastic sheets in the sun for 2-4 days. It is obvious that the drying is very crude as dust and other foreign materials are likely to get mixed with plant parts (Khan & Humayun, 2003; Shinwari & Khan, 2001).

**Storage:** Most of the families which collect medicinal plants live in small houses barely meeting their daily needs. Sometimes the storage is done by the village grocers while drying. As the required hygienic conditions are not available, the crude drug often gets infected with insects and fungi. Storage places are generally dark and ventilation is extremely poor. This often results in the deterioration of dried herbal drugs (Shinwari & Khan 2001).

**Over-exploitation:** Due to lack of knowledge about conservation measures, like controlled grazing, proper harvesting and harvesting at the proper time, some medicinal plants like *Bergenia ciliata* (Buch.-Ham.) Sternb., *Paeonia emodi* Wall. ex Royle, *Nepeta cataria* L., *Primula* sp., *Ferula narthex* Boiss., *Juniperus excelsa* M. Bieb. and *Inula racemose* Hook. f. are endangered as a result of over-exploitation of the medicinal plants in Chitral (Ahmad & Sher, 2001). In Azad Kashmir, *Saussurea costus* (Falc.) Lipsch. (Kuth) is also over-collected (Zaidi, 2001). Gilani & Khan, 2003) have stated that in Swat 24.5% and in Chitral

22.14% medicinal plants are threatened. Similar examples from other areas may also be given. It is therefore necessary to adopt remedial measures and explore the possibility of cultivation of those medicinal plants which are in greater demand.

As the amount of drug extracted from the medicinal plant is directly proportional to the plant part(s) harvested, conservation by controlled harvesting may not be beneficial. It has therefore been suggested that cultivation of more important plants may be a better solution of the problem.

**Cultivation of medicinal plants:** Many countries of the world, have a tradition of Botanical Gardens devoted entirely to medicinal plants. In China, for instance we have several such botanical gardens and some 5000 plants are used regularly by 800 million people (Lewington, 1990). Further, medicinal plants are grown in China on farms covering an area of about 600 acres, besides a number of small gardens, attached to hospitals and health care centers. The central Indian Medicinal Plant Organization in Lucknow has set up centers for medicinal plants and other important plants worth Rs. 60 million per year. Likewise it is estimated that Russia, which continues to rely on plants for most of its cures, harvests 20,000 tons of cultivated medicinal plants (Khan & Humayun, 2003).

As a result of efforts made by Pakistan Forest Institute, Peshawar through the dissemination of packages containing information about cultivation practices, fourteen medicinal and aromatic plants are presently cultivated by enlightened farmers in different provinces. For further details regarding the names of the plants, places of cultivation in different provinces and the annual productivity reference may be made to Zaidi (2001).

Rizvi *et al*., (2007) have given information about the sources of procuring the material, soil and climate, propagation, planting, spacing, watering, harvesting, production and storage requirements of each plant for 61 plants. Usmanghani et al. (2007) have discussed cultivation details and propogation of 278 plants. Though the approaches of these authors are different nonetheless, it is encouraging to note that greater attention is being paid to the cultivation of medicinal plants.

The existing medicinal plant resources may be classified into two broad categories: (i) Plants requiring long period of growth (3-8 years) to reach maturity at higher elevations and (ii) Plants which require short duration and can be cultivated as short duration crops on foot-hills and plains. Experiments conducted on 44 species (22 in each group) have lead Khan & Zaidi (1994) to conclude that Group A plants may not be cultivated on commercial scale but should be conserved in their natural habitats. Plants belonging to Group B may be easily cultivated on foothills and plains and can give better economic returns than traditional crops of the area. Some of the crops like *Cymbopogon citrates* (DC.) Stapf, *C. martini* (Roxb.) Wats., *Bunium persicum* (Boiss.) Fedtsch., *Pimpinella anisum* L., *Matricaria recutita* L. *(Matricaria chamomilla* L.) and *Fagopyrum esculentum* Moench, according to them have good potential to become industrial crops.

***In vitro* cultures:** The natural habitats for medicinal and aromatic wild plants are disappearing fast and together with environmental and geopolitical disturbances, it is increasingly difficult to acquire land for plant-derived compounds. Hence the scientists as well as the industries have explored the possibilities of *in vitro* cultures as an alternative to conventional methodologies for agriculture and for production of secondary metabolites. Considerable amount of literature has accumulated which has been reviewed by Haq, N. (2001).

**Reliability of the identification of medicinal plants sold in the local markets:** The names used by the Pansara market for the medicinal plants, may sometimes be unreliable. For instance, Shinwari & Khan (2001) found that two different species of *Solanum, S. americanum* Miller and *S. villosum* (L.) Moench. are sold in mixed form under the name of *'makoi'*. For *Matricaria recutita* L. (*Matricaria chamomilla* L.), the Unani name "*babuna*" is used. However, Khan et al. (1996) reported that samples of "*babuna*" were obtained from ten local shops in Rawalpindi and Islamabad, but actually it was *Cotula* spp. in 4 shops, an unidentified plant in one shop, *Inula vestita* Wall. ex DC. in one shop and only four shops had real *Matricaria recutita* L. (*M. chamomila* L.). Dey & Das (1995) found that often the seeds of *Argemone mexicana* L. are mixed with *Nigella sativa* L. *Allium cepa* L. seeds are also confused with *Nigella sativa* L. seeds.

In this context, reference may also be made to 'adulteration' the non-professional approach. Practically the phenomenon of adulteration indicates the admission of impurities or removal of all or part of valuable portion of the drug, or it may be an addition of low grade or spoiled drug with the genuine one. For further details reference may be made to Saeed & Usmanghani (2000) where the issue is discussed in greater detail giving different types of examples.

**ii. Taxonomic Identification:** For any scientific investigation, the correct identity of the plant is very important. Proper training as a taxonomist is the minimum requirement, in order to enable the person to consult available literature and resources. Nonetheless, like other branches of science, considerable familiarity with the recent trends and developments is necessary. For instance the family Liliaceae (s. l.) was accepted to contain c. 288 genera and c. 5000 species, some years back, but these taxa are now accommodated in 40 different families (Kubitzki, 1998). Whereas the generic concept of the genus *Moraea* P. Miller (Iridaceae) has been revised and six genera earlier kept separate have been merged together (Goldblatt, 1998; Kubitzki, 1998). These conclusions are based on DNA sequence data and morphological cladistic analysis.

**Literature for identification of flowering plants:** Though the Flora of Pakistan Project is nearing completion (Nasir & Ali, 1970-89; Ali & Y. J. Nasir, 1990-91 and Ali & Qaiser, 1993-2007), there are very few floras at the district level, as exemplified by Kashyap (1936), Ahmad, S. (1954), Jafri (1966); Chaudhary (1969) etc.. For more information on Regional Floras, Lists of Plants etc. reference may be made to Ali (1978) and Ali et al. (2001). The identification of plants is comparatively easier in those districts which have a regional flora. For other areas, Flora of Pakistan is certainly the best available publication. However, it may facilitate matters greatly if a younger taxonomist is persuaded to prepare a book to facilitate the identification of medicinal plants of

Pakistan. The longest list of medicinal plants given by Usmanghani (2000) contains only 422 species.

**Voucher specimens:** In order to confirm the identify of the medicinal plant for all times to come, one or more herbairum specimens, representative of the medicinal plant under investigation should be stored in the herbarium. It is almost impossible to do so in case the material is being purchased from Pansara market. Knowledgeable plant collectors employed by the research organizations, should invariably be instructed to spare the material for the voucher specimens as well. Further, the voucher specimen should be as complete as possible, containing all the stages of life.

While going through the non-botanical journals, sometimes one does notice some obvious mistakes, which may certainly be avoided, so far as the plant names are concerned. Every plant name has three parts (i) Generic name (ii) Specific name and (iii) the authority – the name or names of persons who have given the specific name is also stated in an abbreviated form. Generally there is no conflict about the generic name, which, as per rules is always written with a capital letter, as per Article 20 McNeill et al. (2006). It is recommended that all specific epithets should be written with an initial lower-case letter although authors desiring to use initial capital letters may do so when the epithets are directly derived from the names of the persons or are vernacular (or non-Latin) names or are formal generic names. (Recommendation 60F, Int. Code l.c.). So far as the abbreviated names of the authors are concerned, Brummitt & Powell (1992) have published a list of 'Authors of Plant Names', which may be followed for abbreviating the names of the authors of the specific epithets. Generally the names are abbreviated after a consonant and before a vowel. However, in view of long usage there are some honourable exceptions also: L. for Linnaeus (and not Linn. which was also used earlier), DC. for Augustin-Pyramus de Candolle etc. Sometimes one comes across cases of the use of brackets in the author citations e.g. *Vigna mungo* (L.) Hepper or *Alysicarpus heterophyllus* (Baker) Jafri & Ali etc. The use of brackets in author citation is confined to two situations: (a) Transference of the specific epithet from one genus to the other or (b) from one rank (specific or infra specific) to the other.

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