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Review Article

Importance of herbaria in herbal drug discovery

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ABSTRACT

The conservation of traditional medicinal knowledge opens the door towards modern aspects of herbal drug discovery. It was started from knowledge exchange through ethnic groups by oral tradition and then in the documented form. Herbaria conserving identified and authenticated plants for future correspondence play an important role in this regard. In presenting review, authors have declared different auxiliary aspects of herbaria for phytomedicinal research.

Keywords: Herbaria, drug discovery, herbal drug.

INTRODUCTION

Management of ethnopharmacological data is much essential component of herbal drug discovery from the treasure house of ancient wisdom. For this purpose, oral and written, documented information exchange and understanding about traditional knowledge of indigenous peoples regarding discovery of useful therapeutic agents and exploring their toxic potential to form a foundational base for herbal drug discovery. Botanical knowledge and Herbaria play an important role in conservation of medicinal plants in the future of ethnopharmacological research. It depends upon three closely interwoven expertise, i.e. inventories, identification and documentation. Interwoven in the sense that without safe identification, inventories have no sense and proper documentation is necessary for correct identification. A herbarium is a collection of dried plant specimens, kept as reference standard for future scientific studies. It serves elementary need of identification for basic and applied research in aerobiology, agriculture, biology, biotechnology, botany, genetics and Pharmacognosy[1]. Luca Ghini the sole initiator of the art of herbarium-making and this art was disseminated over Europe by his student. Gherardo Cibo, began collecting and preserving specimens as early as 1532[2]. The herbarium belonging to Sir Joseph Banks, at his house in central London (1525–1621) comprised of 170 specimen volume collected by the herbalist Ferrante Imperato[3]. The Naturkunde museum im Ottoneum Kassel, Germany (1569), at the Universities of Bologna (1570), Basel (1588) and Oxford (1621) are considered as the earliest herbaria[4]. These all specimens were in the form of pressed plants mounted on sheets of paper, which were bound into books. Binding specimens into books remained standard practice until the herbarium of Sir Hans Sloane (1660–1753), now housed at the Natural History Museum in London, comprises 260 bound volumes. Increasingly, herbaria were housed in institutions rather than the homes of wealthy collectors such as Sloane and Sir Joseph Banks[3]. Herbarium contains voucher specimens of dried and pressed plants in the form of sheets to compare unknown newly collected plants. Voucher specimen provides a permanent record for a species occurring at a particular time and place. Voucher specimen form the basis of reliable distribution, habit and habitat information, act as the reference point for the application of the scientific names, provide the basic biological material for taxonomists, ecologists and other researchers and serve as vouchers for seed collections, toxicological cases, biochemical analyses and bio discovery[5]. Table-1 showing largest herbaria of the world on the basis of number of specimens.

The ideal infrastructure of the herbarium for plant related projects and satisfactory organization of ethnopharmacological research declares. 1) Herbarium should be well equipped for naming and keeping the voucher specimen for a long period of time. 2) Well trained staff must be the part of herbarium to handle the collections and make them

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safe against physical and mechanical damage. 3) Taxonomist capable of naming and checking of synonyms. 4) Sufficient floras and literatures must be available to help taxonomist for naming the specimen belongs to unfamiliar families. 5) It also acts as a warehouse of information for the evolutionary history of plants; mapping current and past ecological and geographic distribution of plants; existing and changing nature of plant communities and their habitats; identification, classification and naming of plants; distribution of rare and endangered species. Management of inventories is the team work of three different expertise botanist, ethnopharmacologists and traditional healers. Involvement of local traditional healers makes the investigation of plants against the targeted disease very easy to find out bioactive substances rather than random collection. After each collection, common, Latin and vernacular names of plants locality from where the sample has been collected, part(s) of plant use, preparation and administration of that plant part against suggested disease filled in standardized form. After drying, pressing and toxication process the pasted plant sample on a sheet is known as voucher specimen and the sheet as herbarium sheet. Then the sheet is placed in an institute for safe identification and future reference. The field work in the form of recorded information is essential for further phytochemical and pharmacological research[1]. The voucher specimen collection is very important for correct identification and for comparing the collected plant with reference standard for future re-examination. After inventory completion the most important task is the identification of collecting specimens. Currently accepted nomenclature and its publication is necessary to provide right channel for researchers to find associated data. The scientific names follow the Latin binomial system and comprised of the genus started with a capital letter and species always in small alphabet, sometimes subspecies and/or varieties are cited in italics. The name of the original author of a plant name is placed after the species for clarification. Since 1906, the botanical names of plants have been governed by the International Code of Botanical Nomenclature (ICBN). Names that are found to be in contravention of the code must be changed. A species previously placed in one genus may be moved to another, because of new evidence or a different scientific opinion that shows it to be more closely related to the other species in the second genus or even family. When this occurs, the generic name and, sometimes, the specific epithet will change. The citrus fruit (lime) was known as *Limonia aurantiifolia* Christm. up to 1913, when Swingle placed it in the genus Citrus: since then it has been known as *Citrus aurantiifolia* Swingle. The selected databases for accepting plant names are as follows[6].

- African Flowering Plant database, URL: www.ville-ge.ch/cjb/bd/africa
- Flora of Tropical East Africa
- Flora of West Tropical Africa
- Flora Zambesiaca, URLwww.kew.org/efloras/
- Germplasm Resources Information Network, URL:www.ars-grin.gov/cgi-bin/npgs/html/index.pl
- International Legume Database & Information Service, URL: www.ildis.org
- Mansfeld's World Database of Agricultural & Horticultural Crops
  URL: mansfeld.ipk-gatersleben.de/
- The Plant List, URL: http://www.theplantlist.org/
- World Checklist of Selected Plant Families, URL: www.kew.org/wcsp/
- World Checklist of Monocotyledons, URL: www.kew.org/wcsp/monocots

Different taxonomists describe widespread of botanical species by giving them different names. This happened at that time because the plant material wants to work up was without specific contact between taxonomists from different countries. Thus the number of synonyms is present in many species. The handling synonym list is very much time consuming, but is essential to avoid unnecessary repetition of tests and analysis, which have already been subjected to detailed investigations[1]. Latin names consider essential for such purpose. Because sometimes same vernacular names applied to different species and different vernacular names for the same species[7]. Such facts are untraceable and causes considerable confusion if a voucher specimen is not present. Traditionally used organoleptic evaluation of medicinal species provides basic, simple and rapid way to identify crude drugs. In this modern era, the use of organoleptic technique for crude drug evaluation shows its importance in identification / standardization of drugs[8]. The other method which is generally used is Taxonomic method**.** The botanical origin of the drug is identified and its scientific Latin binomial (i.e. genus, species) name is determined based on this method. It is the first step for authentication. Information such as botanical name, vernacular names, site of collection of plant material, details of collector, habitat, season of collection, altitude and part collected etc. are the essential prerequisites even before authentication[9]. The good ethnopharmacological research is based on properly and carefully identified specimens. Each specimen is deposited in the herbarium and has a code number for future reference. A good quality research required voucher specimen number of the plant on which

research is carried out. The screening of therapeutically active compounds on the basis of traditionally reported biological activity leads to the discovery of drug molecule[10]. The name of the collector, site of collection, season of collection (date, month and year) should properly be documented with the reference to herbaria where the voucher is deposited[1]. The publication of species *Plantarum* by Carl Linnaeus in 1753 provided a global system for the classification of organisms [4]. Documentation is a very necessary tool. Investigations carrying out on improperly identified and non-documented material give no sense of research because it is impossible for knowing the correct source of chemical compound. A published paper of the year 1975 in a reputable chemical journal reported newly isolated chemical compound recognized as **"Probably belongs to Menispermaceae".** Farnsworth and Bingel (1977) performed a literature survey about newly isolated phytochemicals covered the year 1975. In that survey they concluded that out of 2399 reported novel chemical compounds only 160 indicated the available voucher specimen for future reference[1]. By the revolution of information technology, the day to day increasing data is now being stored electronically. The prominent example is NAPRALERT (**NA**tural **PR**oduct **ALERT**) the largest database of world bibliographic and factual data on taxonomic distribution, chemistry, biological activity and pharmacology of natural sources (animals, marine, microbes, plant) and their secondary metabolites. The NAPRALERT files contain records from 1650 to present[4].

CONCLUSION

Herbaria and digital databases play a basic and meaningful role as a first strong pillar to conserve ethno-ecology, -botanical, -pharmacological, -medicinal knowledge, applying this precious knowledge in herbal drug discoveries and shaping these into herbal modern medicine.

Table-1: Largest herbaria of the World [11].

Herbarium Name (Institute)	Code	Number of specimens	Location
National Museum of Natural History, France	P	8 000 000	Paris
The New York Botanical Garden, U.S.A.	NY	7 800 000	New York. Bronx
Naturhistorisches Museum Wein, Austria	W	5 500 000	Wien
Natural History Museum, Italy	FI	5 000 000	Florence
Naturalis, Netherlands	L		RA. Leiden
Claude Bernard University, France	LY	4 400 000	Lyon
Botanic Garden Meise, Belgium	BR	4 000 000	Meise
Berlin-Dahlem Botanical Garden and Botanical Museum, Germany	B	3 800 000	Berlin
Copenhagen, Denmark	C	2 707 000	Copenhagen
Botanical Survey of India, India	CAL	2 000 000	West Bengal, Howrah
Research Centre for Biology, Indonesia	BO		Cibinong
Botanical Museum, Norway	O	1 800 000	Oslo
University of Tokyo, Japan	TI	1 700 000	Tokyo

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