



Ethnopharmacology – Study of Natural and Traditional Medicine.

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Abstract:-

‘Ethno’ means ‘race, culture’ from Greek and Pharmacology means group of medicine. Ethnopharmacology is the study of medicines derived from naturally occurring substances like plants and fungi that have been traditionally used by specific groups of people for medicinal purposes. Scientific study of material used by ethnic and cultural groups as medicine which is interdisciplinary scientific exploration of biologically active agents traditionally employed or observed by man. (1) Ethnopharmacology links natural sciences research on medicinal, aromatic and toxic plants with sociocultural studies and has often been associated with the development of new drugs. (2)

Keywords: Ethnopharmacology, Aromatic, Natural Medicinal Plant, Traditional

Introduction:-

The ethnopharmacology knowledge, its holistic and systems approach supported by experiential base can serve as an innovative and powerful discovery engine for newer, safer and affordable medicines. Ethnopharmacology can make very important contributions to science and is of interest in practically all countries of the world, especially to those undergoing a fast economic development and the associated cultural and social changes. Natural product have been the source of most active ingredient in western medicine. This is widely accepted to be true when applied to drug discovery. Ethnopharmacology is about linking local/traditional uses with biologic and biomedical studies. Therefore, it is crucial to base research on a very sound understanding of these uses and the importance of the plants in a community.(3)

Natural products research has its origins in ethnopharmacology and ethnoveterinary practice. Plants with medicinal properties have been used throughout history, and modern science has, in many cases, been able to isolate, identify, and elucidate the pharmacological mode of action (MOA) of the active agents.(4)Modern natural products research encompasses a range of approaches ranging from the holistic to the reductionist. Metabolomics offers the natural product chemist new ways to discover and validate bioactives. Modern natural products research has relied on the purification of individual components and verification of activity in specific bioassays. Bioassays have changed significantly over time.(5)

History of Ethnopharmacology

Ancient Indian Origins: Ethnopharmacology traces back to ancient civilizations, where indigenous communities relied on plant knowledge for medicinal purposes. Many cultures developed sophisticated herbal remedies based on generations of empirical knowledge. European colonialism often disrupted indigenous practices but also facilitated the exchange of knowledge, impacting ethnopharmacology. In the 20th century, ethnopharmacology gained academic recognition, blending traditional wisdom with scientific methodologies. The field emphasizes the significance of biodiversity, recognizing plants as a rich source of bioactive compounds.(6)

Ethnopharmacology contributes to contemporary drug discovery, with researchers exploring traditional remedies for potential pharmaceutical applications.

- Historically, ethnopharmacology was the origin of all medicines and natural products were the most important source of drugs
- Ethnopharmacology has provided some very notable past successes, including
- Morphine (isolated in 1804)
- Quinine (isolated in 1820)
- Digitoxin (isolated in 1841)
- Ephedrine (isolated in 1897)
- Tubocurarine (isolated in 1935) (7)

The commercially important drug morphine was isolated from the plant *Papaver somniferum* (opium poppy). Based on historical documents, the Sumerians and ancient Greeks used poppy extracts to treat diseases and relieve pain, while the Arabs described opium to be addictive. Aspirin was developed from the active agent known as salicin, which is found within willow bark. Willow bark was used as traditional medicine by ancient Sumerians and Egyptians for more than 3,500 years.(8)

Plant Selection and Drug Development

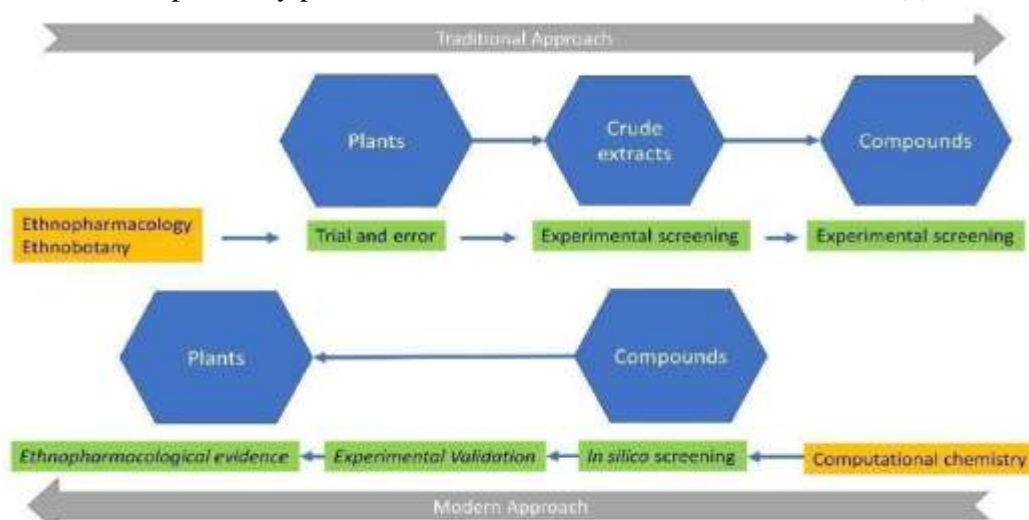
1. Plant Selection

Involves the decision on which material to collect and on what basis. May be based upon:

- Folkloric Information
- Presence of phytochemical constituents
- Random selection

Priority should be given to plants that already have evidence of safety and efficacy based on local use or published data. Molecules further explored through clinical trials, pharmacological studies, herbal therapeutics, pharmacokinetics and herbal pharmacovigilance.

Advances in chemistry, molecular biology, genomics, spectroscopy, chromatography and crystallography have enabled generation of therapeutically potent lead molecules from traditional medicine.(9)



2. Importance Of Plant Based Research

To isolate bioactive compounds for direct use as drugs, eg, Digoxin, digitoxin, morphine, reserpine, taxol, vinblastine, vincristine.

To produce bioactive compounds of novel or known structures as lead compounds to produce patentable entities of higher activity and/or lower toxicity, eg., Metformin, oxycodon, teniposide, verapamil, and which are based on galegine, morphine, podophyllotoxin, khellin respectively.

To use agents as pharmacologic tools, eg., Lysergic acid diethylamide, mescaline, yohimbine.

To use whole plant or part of it as a herbal remedy, eg., Cranberry, garlic, ginkgo biloba, St. John's Wort.(10)

3. Plant collection and processing

After plant selection, botanical identity must be established and site for their procurement located Specimen must be collected at the appropriate time and season as chemical constituents of plants vary from season to season or at different times of the day. Collection must be done carefully to minimise adulteration.(11)

4. Development

Ethnopharmacological approach is based on botany, chemistry and pharmacology (observation, identification, description and experimental investigation) . Process of drug development typically begins with a botanist, Ethenopharmacologists, ethnobotanist or plant ecologist, who collects and identifies plant(s) of interest.

Ethnobotanists perform research on uses and concepts of plants in cultures and societies (popular knowledge). Ethenopharmacologists research the medicinal uses of plants and their properties from popular culture data. Combinatorial sciences, and high throughput screening help in generation of structure-activity libraries, leading to identification of active molecules.(12)

A role for physicians in ethnopharmacology:-

Physicians can play multiple roles in the ethnopharmacological studies to facilitate drug discovery as well as to rescue authentic traditional knowledge of use of medicinal plants. These include:

- (1) Ethnopharmacological field work which involves interviewing healers, interpreting traditional terminologies into their modern counterparts, examining patients consuming herbal remedies and identifying the disease for which an herbal remedy is used.
- (2) Interpretation of signs and symptoms mentioned in ancient texts and suggesting proper use of old traditional remedies in the light of modern medicine.
- (3) Clinical studies on herbs and their interaction with modern medicines.
- (4) Advising pharmacologists to carryout laboratory studies on herbs observed during field studies.
- (5) Work in collaboration with local healers to strengthen traditional system of medicine in a community.

In conclusion, physician's involvement in ethnopharmacological studies will lead to more reliable information on traditional use of medicinal plants both from field and ancient texts, more focused and cheaper natural product based drug discovery, as well as bridge the gap between traditional and modern medicine.(13)

Ethnopharmacology in Cancer Treatment

Indices of Fidelity Level (FL), Use Value (UV), and Relative Frequency of Citation (RFC) were calculated to identify the most effective plants used for cancer treatment. Eight species were specified including *Aristolochia baetica*, *Aristolochia paucinervis*, *Bryonia dioica*, *Aquilaria malaccensis*, *Marrubium vulgare*, *Lavandula maroccana*, *Ephedra alata*, and *Euphorbia resinifera* belonging to 7 families. *Aristolochiaceae*, *Aquilariaceae*, and *Cucurbitaceae* were the most useful families in cancer treatment with high significant indices of UV, FL, and RFC with values of 1, 100%, and 1, respectively. Roots and leaves were the most commonly used plant parts. Decoction and powder mixed with honey were the frequently used method for remedies preparation(14)

Provides the knowledge about anticancer medicinal plants of local and foreign origin, which are used by the people all over the Palestinian area in addition to their method of preparation. Many of the used plants have been approved scientifically to have some anticancer activity.(15)

The current state of ethnopharmacology in drug discovery

Ethnopharmacology is a field of study that seeks to find new pharmaceutical leads from the medicines of Indigenous peoples. The transition from traditional ethnopharmacology to drug discovery has been aided by the development of isolation and characterization methods, increased computational power, and the development of specific chemoinformatic methods. Ethnopharmacology has been highly successful and has resulted in such compounds as:

1. Aspirin from willow bark (*Salix*)
2. The anticancer alkaloid vincristine from Madagascar

In the present study, ethnopharmacological aspects of herbal medicine and plant-based drug discovery process will be emphasized and important issues in their use as complementary medicine will be mentioned.(16)

Ethnopharmacology, through the description of the beneficial effects of plants, has provided an early framework for the therapeutic use of natural compounds. Natural products, either in their native form or after crude extraction of their active ingredients, have long been used by different populations and explored as invaluable sources for drug design. The transition from traditional ethnopharmacology to drug discovery has followed a straightforward path, assisted by the evolution of isolation and characterization methods, the increase in computational power, and the development of specific chemoinformatic methods. We further stress the potential pitfalls of recent *in silico* methods and discuss the absolute need for *in vitro* and *in vivo* validation as an absolute requirement. Finally, we present our contribution to natural products' drug discovery by discussing specific examples, applying the whole continuum of this rapidly evolving field. In detail, we report the isolation of novel antiviral compounds, based on natural products active against influenza and SARS-CoV-2 and novel substances active on a specific GPCR, OXER1(17)

Emerging opportunities in ethnopharmacology

Phytochemical techniques are developing fast and we now have tools available which allow us to analyse complex mixtures in novel ways. The 'omics' (r)evolution allows a systematic investigation of such complex mixtures and specifically to link phytochemical analysis with other strategies (such as *in vitro* or *in vivo* screening for biological activity or toxicity, morphological plant diversity and ecological parameters). Specifically as it relates to the study of medicinal and food plants, the main challenge is to understand the complex effects of such extracts. Since most of these research activities are linked to plants used in traditional and local cultures, this requires an ethnopharmaceutical approach. The potential of such an approach and its potential benefits for phytochemically oriented research are discussed.(18)

Combined use of vaccines and immunostimulants is emerging as one of innovative approaches in adjuvant development. However, medicinal plants used to treat gout and related inflammatory conditions are much more common, especially in the western literature. Although most have not been investigated for specific blood uric

acid-lowering effects, anti-inflammatory effects are important in treating all bone and joint diseases to relieve pain and swelling, and many more plants than those discussed here are used in this type of disorder.(19)

1. Bioprospecting and Drug Discovery is traditional medicine for lead compounds using advanced screening techniques. Emphasize the potential of natural products as sources for novel drugs(20)

2. Pain-killing drugs like morphine and aspirin.

3. Digitalis, which comes from the foxglove plant in the genus Digitalis.

Medicinal plants played an important role in traditional medicine for the treatment of diseases since antiquities. The aim of the study is to carry out an ethnobotanical survey on medicinal plants used traditionally in cancer treatment in the region of Greater Casablanca-Morocco, and to enhance the traditional herbal medicine knowledge.(21) (22)

Conclusion:-

Research into ethnopharmacology as well as medical nutritional therapy has come a long way. Yet, it is neither assessed in clinical practice in terms of therapeutic monitoring by laboratory methods, nor are there public health policies or procedures to enable guided adoption by medical practitioners during treatment. In MetS and its components as well as other metabolic diseases that are on the increase, there is implication for the role of antioxidants as alternative diagnostic and therapeutic tools. A major importance of this chapter is the clinical point of view that monitoring by laboratory methods that are readily applicable and available in clinical practice should be part of validation studies to drive policy development.

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