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An Updated Review on Taxonomy and Chemotaxonomy

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Abstract

Taxonomy is a discipline of study that deals with the identification, naming, and categorization of plants. The word taxonomy is derived from the Greek words taxis, which means arrangement, and nomos, which means law. The Convention on Biological Diversity's administration and implementation is supported by the taxonomy's identification and enumeration of its constituent parts. Chemotaxonomy, also known as chemosystematics, is the endeavour to categorise and identify organisms (initially plants) based on biochemical compositional differences and similarities. About 10-25% species of the total over 400,000 species present on the planet Earth are used for human welfare. Plants and their habitats are destroyed for human benefit, and thus, valuable diversity is lost without understanding the utility. The classification and identification of organisms based on verifiable differences and similarities in their biochemical compositions are known as chemotaxonomy, sometimes known as chemosystematics. There are several methods for taxonomizing organisms. Chemotaxonomy-based plant selection is a prerequisite for successful natural product research. The rise of chemotaxonomy is mainly due to the advancement in analytical techniques for chemical analysis that can detect even trace amounts of chemical compounds. The current methodology, particularly for plants, is chemotaxonomy. In a nutshell, the biochemical makeup of plants and animals is used to classify them biologically based on similarities and differences. In this brief overview, problems associated with biodiversity and the use of modern tools to resolve these issues are discussed. In this review, the various plant drugs are discussed related to their various morphology, phytogeography, chemotaxonomy and taxonomy.

Keywords: Chemotaxonomy, Crude Drug, Morphology, Plant Drug, Phytogeography, Taxonomy

1. Introduction

A diet high in plant-based foods can offer a range of phytochemicals and other plant compounds that have health-protective properties. Several phytochemicals are produced by various plants, including spices and herbs[1]. Understanding how NaOCl may produce toxicity is crucial for healthcare professionals, especially doctors[2].

Chemotaxonomy, also known as chemosystematics, is the endeavour to categorise and identify organisms (initially plants) based on biochemical compositional differences and similarities. Plant selection based on chemotaxonomy is required for effective natural product research. Molecular markers are frequently inapplicable for new extracts because of the difficulties of PCR amplification. More significantly, gene variants cannot indicate metabolite-level changes that are intimately connected to the taxane production process. As a result, novel classifications based on metabolic studies are greatly desired.

Chemotaxonomy is based on the empirical finding that creatures with similar evolutionary relationships have similar physiological and biochemical traits. This physiological/biochemical identity includes both the potential and actual production of secondary metabolites. Specific species will always have the ability to create such "marker" metabolites as some secondary metabolites are produced by inherent

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metabolic machinery. It is generally agreed upon that the pigments, poisons, and other secondary metabolites found in lichens, big, fleshy, or sclerotial fungi, and mushrooms (basidiomycetes), are credible identifiers for identification.

A strain's taxonomic classification can reveal if a marker metabolite is present, or conversely, a single metabolite or metabolite pattern may commonly identify a particular fungal taxon or group of taxa. A fungal screening programme can greatly benefit from this straightforward idea since it makes it possible to forecast the synthesis of secondary metabolites based on taxonomic data[3].

2. Material and Methods

2.1 Crude Drug

The phrase "crude drug" refers to items of plant and animal origin that are present in their natural state. The phrase "crude drug" was once used to describe medicinal compounds derived from the mineral kingdom.

- **Organized Drug**- Organized drugs are made up of anatomical characteristics that represent the cellular organization. The majority of them are plant-based crude medicines. Almost all morphological plant components, as well as the entire plant, may be classified as organized medicines. Cinchona bay, Sandalwood, Rauwolfia origins, and Nux Vomica seeds are among examples.
- **Unorganized Drug**- Unorganized medications are medicines that lack morphological or anatomical organization. These are products that are sold directly to consumers, yet their ultimate source is still plants, animals, or minerals. For such basic medicines, microscopical investigations are not necessary.

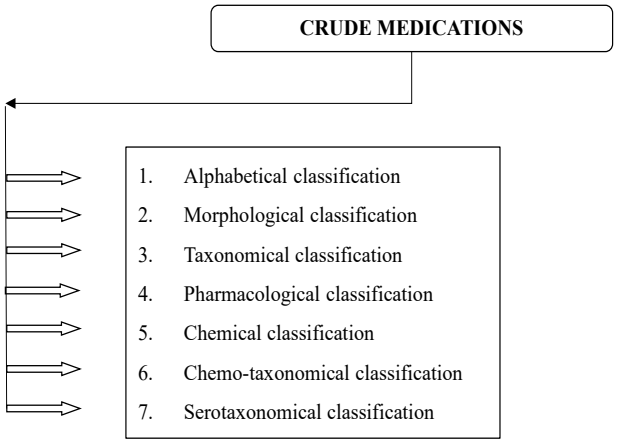
2.2 Classification of Crude Medications[4]

Although each system of classification has advantages and disadvantages, the drugs are categorized in the following ways for research:

2.3 Classification of Chemotaxonomy

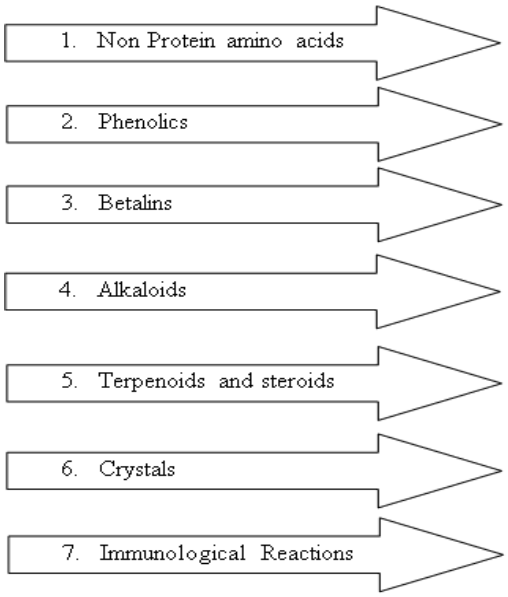
It is classified by its taxonomical and chemical nature.

- Taxonomic classification based on secondary metabolites and other products, sugar, and amino acids.
- Biosynthetic pathway-based descriptive taxonomy.
- Serotaxonomy: Based on the amino acid sequences and pathways of particular proteins.



2.4 Plants are classified based on Chemical indication

- **Non-protein amino acids:** Food as well as silage plants contain more than 300 non-protein amino acids. Protects plants against predators, diseases, and competing plant species. They are useful for categorising and identifying taxa from one another.
- **Phenolics:** Phenolic compounds and their derivatives are the phenolic chemicals found in plants which are useful for classifying them. Herbaceous plants have flavonols and methoxy cinnamic acid. Ellagic acid is found in the *Rosaceae* tribe *Kerrieae*.
- **Betalins:** Betalains are bioactive pigments that are violet or yellow and are only found in the *Caryophyllales* family of plants[3]. Betalains have replaced anthocyanins in plants on many occasions,

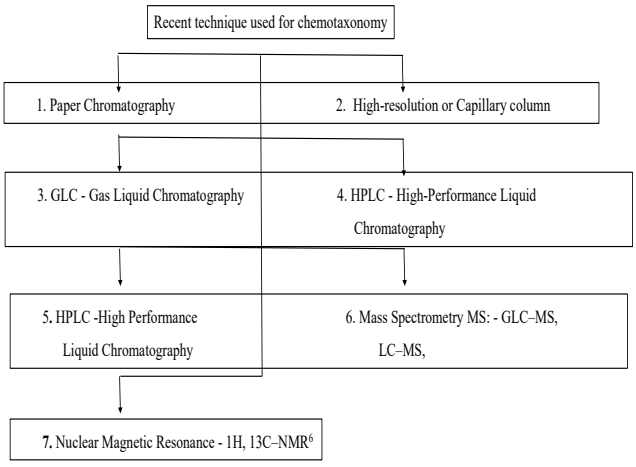


yet it is still impossible to justify the preponderance of one pigment family over another solely on physicochemical characteristics[5].

- **Alkaloids:** Nitrogen-containing molecules with a heterocyclic ring generally known as alkaloids (Mostly contain basic nitrogen atoms). Angiosperms contain about 5000 different alkaloids. Plants categorization is done using them as a resource. e.g., Caffeine, Piperine, Nicotine, Morphine.
- **Terpenoids and Steroids:** Terpenoids include isoprene-derived hydrocarbons that contain. Carotenoids and iridoids are two examples.
- **Crystals:** Raphides crystals might be located in various regions of the body of certain plants (typically occur in aerial organs, especially the leaves). Raphides contain needle-shaped calcium oxalate crystals.
- **Immunological reactions:** The loading protein otherwise pollen protein is inserted since the herbal frame to a trial animal typically a mouse or rabbit.

3. Recent Technique used for Chemotaxonomy

Quick progress throughout 1970-1980 in methods of phytochemistry i.e.:



3.1 Taxonomy

The term taxonomy originated from two Greek words, Taxis-arrangement and nomos-laws. Taxonomy is known as systematic botany or systematic contracts through the identification, classification, explanation and identification of plants.

3.2 Evolution of Assortment

Plant diversity evolution in a global setting is a complicated phenomenon. Plants respond to changing environmental conditions by incorporating new characteristics into their DNA through sexual reproduction or hybridization. As an inherent defensive component, about 2500 plant species possess glycosides or cyano lipids. Well over 21,000 alkaloids, 20,000 terpenes, 10,000 phenolics (e.g., flavonoids found in mosses, ferns, gymnosperms, and angiosperms), 750 polyketides, 700 non-protein amino acids (mostly in *Fabaceae*), 1500 polyacetylenes and fatty acids, 200 carbohydrates, and 200 cyanogenic glycosides have been identified by plant study. Chemotaxonomy, often known as chemical-based taxonomy, is the arrangement or categorization of plants based on their chemical components. It is beneficial in the development of industrial plant applications and strategic planning.

3.3 Application of Modern Tools in Taxonomy

Plant taxonomy and the study of secondary metabolites are two different fields of plant science. Systematics requires strong botanical knowledge; whereas the study of secondary metabolites not only requires a strong knowledge of organic chemistry but also elaborates equipment to isolate and identify the compound and determine their complete structure. Study and quantification of secondary metabolites require sensitive and rapid methods of analysis like Thin-Layer Chromatography (TLC), High-Performance TLC (HPTLC), High-Performance/Pressure Liquid Chromatography (HPLC), Gas-Liquid Chromatography (GLC) and use of (NMR) Nuclear Magnetic Resonance and Mass Spectroscopy (MS) for identification of compounds. Alkaloids were found in 37 per cent of the plants (4267 out of 11,551), with a high percentage displaying cytotoxic and neurotoxic properties, which are necessary for defence in a harsh alpine climate. HPLC, GC, and TLC are sensitive and fast analytical tools used in labs based on the sorts of compounds (chemical nature, non-fluorescent nature and fluorescent nature, volatile nature) and the number of compounds to be separated or present in the sample (mixture of compounds). Gas is utilized as a carrier medium in GLC (because of the volatile nature of the chemicals), whereas liquid solvents are used in HPLC and TLC (soluble nature of compounds). TLC cannot separate and quantify overlapping bands (closely related substances), but HPLC can accomplish

unambiguous separation and is a very sensitive technique to identify microgram quantities[7].

3.3.1 Chemotaxonomy

An Approach for Conservation and Exploration of Industrially Potential Medicinal Plants. The use of medicinal plants for the benefit of mankind is timeless and is undoubtedly increasing day by day and there their taxonomic categorization is essential for a better understanding of plant communities, their origin and their association with each other. The chemotaxonomy emerged from; chemo+taxonomy, which itself explains as "the classification of plant species on basis of their chemical constituents. The concept of chemotaxonomy has existed in past centuries and evidence of variation in metabolic profile was utilized for classification purposes by folk taxonomist[8].

3.3.2 Chemo Taxonomical Studies of Some Important Monocotyledons

Plants produce a vast variety of chemical molecules that are retained in primary and secondary metabolites based on their biochemical category and metabolic source. Secondary metabolites do not seem to be vital to the immediate survival of the organism that produces them and is not an essential part of the process of building and maintaining living cells with the development of natural product chemistry, the potential of chemotaxonomy is now becoming increasing obviously[9].

4. Rules of Plant Nomenclature and Modern Trends in Taxonomy

Taxonomy is the skill of classifying organisms based on their physical characteristics. This categorization or grouping must be founded on homology, which means that individuals within a similar collection must-have features congenital to a mutual forebear.

4.1 Theory of Evolution

Before Charles Darwin's theory of evolution, a geologist named Charles Lyell presented the geological gradualism idea, which states that "slow, continuous modifications generated traits we see today". As a result, Darwin believed that the planet was considerably older than 6000 years and that evolutionary change must have proceeded gradually through time. He presented solid proof that living forms had evolved, and he advocated natural selection as the driving force behind these changes. Alfred Wallace proposed a very similar evolutionary hypothesis around the same period, and both were presented at the London Linnaean Society meetings.

4.2 Modern Trends in Plant Taxonomy

Plant taxonomists have been looking for more accurate ways to explain the relationship between genera and families over the past fifty years. Many issues have arisen, such as which is more advanced and which is less. What's the story behind these plants? Which are more closely connected, and which must be kept separate? And there is a slew of other issues to consider[10].

4.3 Morphology in Taxonomy

Morphology is the get detail of plant shape and form, generally focusing on the organism and its component organs. Morphological data are often easy to see and collect and hence are the most commonly employed in taxonomic investigations.

Examples of morphological characters in taxonomy:

Growth habit – Herb, Shrub and Tree:

Hutchinson classified dicotyledons into two broad groups based on their woody or herbaceous habit*: Lignosae* and *Herbaceae*. The *Lignosae* are primarily woody plants, with some herbs developed from woody plants, whereas the *Herbaceae* are predominantly herbaceous plants, with a few shrubby species derived from herbaceous plants. Members of the *Ochidaceae* family are herbaceous, while members of the *Fagaceae* family are woody.

5. Anatomy in Relation to Taxonomy

It is thought that interior plant structure might give more information than outward appearance. Anatomical studies of flowering plant organs are useful to help with taxonomy.

5.1 Vegetative Anatomy

Stomata: The study of stomata is particularly important in taxonomy. Stomata are categorised based on the location of subsidiary cells and guard cells concerning the aperture.

They are as follows;

- Anomocytic or ranunculaceous: This type is distinguished by the presence of additional or lesser cells that are identical to the residual cells; the addition or lesser cells may number four or five in number. Most of the time, these subsidiary cells are identical to the additional epidermal cells.
- Anisocytic or cruciferous (Anisocytic = uneven celled): Cruciferae (Brassicaceae) and several solanaceae genera have this kind of stomata. Each stoma of this kind is surrounded by three subsidiary cells, one of which is noticeably smaller than the other two.
- ***Rubiaceous (paracytic = parallel celled)*** or ***paracytic (rubiaceous = parallel celled):*** The stoma is still flanked by two subsidiary or auxiliary cells that run parallel to the pore's long axis, as well as guard cells, in this form. Rubiaceae and related groups have this sort of stomata.
- Caryophyllaceous or diacytic (Diacytic = cross celled): Each stoma is surrounded by the a pair of subsidiary or auxiliary cells with a shared wall that is at right angles to the guard cells of this kind. Caryophyllaceae and related families have this form of stomata.
- Gramineous type*:* Guard cells in the gramineous stoma have centre sections that are significantly thinner than the ends, giving the cells a dump-bell appearance in surface view. Gramineae (Poaceae) and Cyperaceae monocotyledons are often seen with them.
- Crystal: Calcium oxalate crystals may be discovered in the Apocynaceae, Begoniaceae, Cactaceae, Caricaceae, and Euphorbiaceae families. Sphaeraphides are prevalent in several families.

Types of vascular bundles

- Scattered vascular bundles*:* Vascular bundles are distributed throughout monocot stems.
- Vascular bundles in the ring: This is a Dicot stem anatomical feature.
- Internal phloem: It may be discovered in Thymelaeaceae, Asclepiadaceae, Convolvulaceae, Apocynaceae, Cucurbitaceae, Onagraceae Melastomaceae, and Myrtaceae. Etc.
- Interxylary Phloem – Forminate *Type:* Salvadoraceae, Salvadoraceae, Apocynaceae (Lysonia), etc.
- Interxylary Phloem-Concentric Type: Papilionaceae, Onagraceae, Chenopodiaceae Menispermaceae, Icacinaceae, Loranthaceae Menispermaceae, Onagraceae. Amarantaceae, Chenopodiaceae, Menispermaceae, and Nyctaginaceae are the cambium rings in order.
- Hard bast: The pericycle opposing the vascular bundles is prepared by sclerenchyma fibres, although it can also be parenchymatous throughout, as seen in several Ranunculaceae species.
- Wood Anatomy: Wood cell type, size, form, patterns, stellar patterns, wood cell wall sculpture, xylem maturation types, vascular bundle kinds; ground tissue parenchyma epidermis, mesophyll, stomata, sclereids, trichomes, crystals, nodes, petiole vasculation, venation, phloem cells, etc. are all visible.
- Floral Anatomy: Floral anatomy is employed to distinguish species in the Asclepiadaceae, Opuntia, Cuscuta, and Evolvulus families.

5.2 Embryology

Because of the time and effort required to acquire embryological data, awareness of the significance of Embryology in taxonomy was delayed. *Trapaceae and Onagraceae:* All members are of Onagraceae which have a monosporic tetranucleate embryo-sac, that is not present in any additional angiosperm family.

5.2.1 In Relation to Taxonomy, Palynology

Characters in pollen

The science of pollen and spores, as well as their uses, is known as polynology. It comes from the Greek term palynein, which means "to disperse." In the previous three epochs, scientists have realised the importance of pollen characteristics in taxonomy.

6. NPC System

The pollen classification system is based on the NPC system (number-position character analysis). The number of openings is generally just one in implications of various gymnosperms, but the position is distal in the latter or intermediate in the latter, as well as the openings are non-trichotomous or trichotomous. Pollen-grain apertural conditions have been regarded as important characteristics in resolving taxonomic issues. Taxa with NPC formula should be placed together, while those having aberrant NPC should be separated. The pollen categorization is based on the NPC system (number-position character analysis).

6.1 Cytology in Relation to Taxonomy

Various characteristics of chromosomes, including quantity, shape, size, behaviour in crosses, and aberrations in reproduction, are all relevant when using cytological data to solve taxonomic problems.

6.2 Ecology in Relation to Taxonomy

The pollen categorization is based on the NPC system (number-position character analysis). When grains are aperturate in cryptogams and gymnosperms, the number of apertures is usually only one, but the location is distal in the latter and proximal in the former, and the apertures are non-trichotomous (e.g., monolete) or trichotomous (e.g., trilete). Pollen-grain apertural conditions have been regarded as important characteristics in resolving taxonomic issues[11].

6.3 Species Concepts in Wild Plants

The discussion of species concepts has become a cottage industry. Not only do the number of pages and full-length books devoted to the topic continue to grow, but new concepts of species proliferate at an extraordinary rate.

- Morphological Species Concepts-Morphological species concepts define types completely on anatomical or morphological characters.
- Interbreeding Species Concepts- The reproducing class ideas emphasise nearly completely the aptitude of the class to conversation genetic factors obviously before insincerely, as measured by false journey packages, education of devices to ease genetic factor movement, and organic dividing devices.
- Ecological Species Concepts- Confused by the confusing collection of differences in oaks. Oaks make unquestionable approximately sympatric circles of actual alike class, frequently crossbreeding amongst all further, which he called multispecies.

7. Study of Important Families of Medical and Phytogenic Importance

Plants have been utilized for therapeutic purposes for more than 60,000 years, according to scholarly research. Millions of people throughout the world still rely on medicinal plants for their health. Medicinal herbs are commonly utilized daily in rural communities in the tropics when medicines are difficult to come by or even unavailable. In contrast, medicinal plants are generally utilized as an alternative or complement to prescription medication in westernized civilizations[12,13].

Turmeric powder has recently been used for traditional medication for gastrointestinal conditions, particularly biliary and hepatic disorders, diabetic sores, rheumatism, inflammation, sinusitis, anorexia, coryza, and cough. Turmeric has anti-cancer, anti-diabetic, antioxidant, hypolipidemic, anti-inflammatory, antibacterial, anti-fertility, anti-venom, hepatoprotective, nephroprotective, anticoagulant, and anti-HIV action, making it useful for the treatment in the AIDS[14].

7.1 Example for Taxonomical Classification

- Kingdom: Plantae.
- Subkingdom: Tracheobionta.
- Superdivision: Spermatophyta.
- Division: Magnoliophyta.
- Subclass: Zingiberidae.
- Order: Zingiberales.
- Family: *Zingiberaceae*.
- Genus: Curcuma.
- Species: longa.
- Scientific name: *Curcuma longa*.

7.2 Description

Herb with no stems and rootstock. The leaves are widely lanceolate or oblong and have a rich ferruginous purple colour. The petiole and sheath are the same lengths as the blade. The spike appears before the leaves.

7.3 Medicinal Uses

Rhizome: Purifies blood, acts as a brain and heart tonic, and is used to treat leucoderma, piles, bronchitis, asthma, tumours, tuberculous glands on the neck, and spleen enlargement. Phytogenics contain a variety of physiologically active characteristics that are useful in contemporary livestock production, such as antioxidative, anti-inflammatory, antimicrobial, and digestion-enhancing benefits. Phenols like thymol, carvacrol, and eugenol are examples[15]. Phytogeography and Phytogeographical Distribution of Medicinal Plants with Special Reference to India[16].

As a result, plant species whose functions are known to humans in an applied sense for the welfare of humanity as well as domestic animals are referred to as helpful plant species - in his knowledge. As a result, one can see how Multi-purpose Medicinal Plant Species (MPMPS), such as

With aniasomnifera, have a wide range of applications in the action of many ailments for the benefit of humans, implying that MPMPS is indeed the "Medicinal Plant Wealth" of Shekhawati Region, Rajasthan[17].

8. Phytogeography[18]

Botanical geography, or phytogeography (from Greek phytón = "plant" and geographa = "geography" meaning also distribution), is a branch of biogeography concerned with the global distribution of herbal class as well as results on the earth's surface. India's Phytogeography, Climate, Vegetation, and Botanic Zones The fundamental subject of plant geography, according to Campbell (1926), is to identify the similarities and differences in contemporary and previous plants and floras found in widely distant areas of the globe. Phytogeography, according to Wulff (1943), is the training of the circulation of plant species in their environments, as well as the clarification of the genesis and history of flora development.

The numerous taxa are classified based on the area of the earth's surface inhabited by plants, as follows:

Wides
Endangered species
Discontinuous Species.

- **Wides:** Wides are plants that are extensively spread across the globe in distinct climatic zones and across continents.
- **Endemics:** An endemic taxon is one whose circulation stays restricted towards a certain geographic region.
- **Discontinuous Distribution:** When plants are found in two or more locations throughout the world separated by hundreds or thousands of kilometres of land or water. Discontinuous distribution is the name given to such a distribution.

8.1 Factors Affecting the Distribution of Species

The topographical circulation of plant species is known to be influenced by several variables, including the following:

Geological history and distribution
Migration
Ecological amplitude is the three-factor to consider.

- **Geological history and distribution:** A species' centre of origin is the location where it first appeared. Species evolution is a gradual but continual process. Some of the species in today's flora are extremely old, but the vast majority are relatively new.
- **Migration:** The newly developed species begin to migrate to new places while also undergoing evolutionary modifications. Several factors influence the spread of germules and propagules, including wind, water, glaciers, insects, animals, and even humans.
- **Ecological amplitudes and distribution:** Plant life and development are influenced by environmental circumstances, which also impact the presence or absence, vigour or weakness, and relative success or failure of diverse plants in a given habitat.

8.2 Botanical Zones of India

- **Western Himalayas:** Our country's northern area is bordered by the Himalayan Mountain ranges and one is the world's most significant botanical region, with climate and vegetation varying from fully tropical near low elevations to temperate arctic kinds at high altitudes. The northern mountain division may be split into three phytogeography zones: western, central, and eastern.
  - » The submontane zone or lower area, as well as the steamy subtropical belts (up to about 1500 metres altitude from the sea level)
  - » Temperate zone (between 1500 and 3500 meters above sea level);
  - » Alpine zone (above 3500 meters and up to the line of perpetual snow).
- **Eastern Himalayas:** From Sikkim to upper Assam, Darjeeling, and NEFA, the Eastern Himalayas stretch. This region's vegetation is distinct from that of the western Himalayas. Changed climatic conditions such as strong monsoon rains, decreased snowfall, and high warmth and humidity are the main variations.
- **Indus Plains:** Parts of Punjab, Rajasthan, Cutch, Delhi, and Gujarat are included. Pakistan presently owns a portion of this plain. This zone's climate is defined by dry, scorching summers and dry, cold winters. Rainfall is generally less than 70 cm, although it may be as low as 10-15 cm in some areas. Except for farmed areas, the soil is salty across a large region. Due to the extreme dryness, most of the area has turned desert.
- **Gangetic Plains:** This is one of India's most diverse vegetation zones. This zone includes a portion of

Delhi, the whole state of Uttar Pradesh, Bihar, and West Bengal, as well as a portion of Orissa. Rainfall ranges from 50 to 150 cm in this zone.

- **Central India:** Madhya Pradesh, a portion of Orissa (now Odisha), Gujarat, and Vindhya are all in Central India. The terrain is hilly. The annual rainfall may range from 100 to 170 cm. Some of the locations are 500-700 meters overhead marine side. The entire forest vegetation of central India may be divided into
  - » Sal forests
  - » Mixed deciduous forests
  - » Thorny forests.
- **Deccan:** This region encompasses the whole southern peninsula of India, including Satpura and the Godawari River's southern reaches. In this area, the average annual rainfall is around 100 cm. It may be broken down into the following two sections: The Deccan plateau I and the Coromandel Coast.
- **Western Coast of Malabar:** This is a tiny botanical province that stretches from Cape Comorin to Gujarat and includes the Western Ghats. This is a rainy-season area.
- There are four types of forests found in this zone:
  - » Tropical forests (occur at 700 m altitude).
  - » Mixed deciduous forests (found at an altitude up to 1600 m).
  - » Temperate evergreen forests (occur above 1200 m altitude), and
  - » Mangrove vegetation.
- **Assam:** This botanical region, which includes the Brahmaputra Valley, the Naga Hills, and Manipur, is particularly rich in vegetation. This is the wettest part of the country. Cherapunji is the only wettest place on the planet, with annual rainfall exceeding 1000 cm regularly.
- **Bay Islands of Andaman and Nicobar (India)**
- The Andaman and Nicobar Islands in the east and the Lakshadweep islands in the west are examples of islands. The Andaman and Nicobar Islands are a collection of over 300 islands that are home to a diverse range of flora and animals. From tropical evergreens to wet deciduous and even mangroves, the woods are diverse. The Lakshadweep group of islands consists of 36 main islands that have a total area of 32 square kilometres.

8.2.1 Affinities and Phytogeographical Distribution[19]

The survey of a region's flora, including its origins and affinities, is called Phytogeography. Plant layout is the survey of plant distribution in the present and past.

8.2.2 Floristic Analysis

In all, 274 wild edible Angiosperms, Gymnosperms, Pteridophytes, and Fungi species from 187 genera and 93 families are included in the current study, with 47 new species. There were 220 Dicotyledon species belonging to 150 genera in 67 families, 38 Monocotyledon species belonging to 25 genera in 15 families, 1 Gymnosperm species belonging to 1 genus in 1 family, 12 Pteridophytes species belonging to 10 genera in 9 families, and 3 Fungi species belonging to one genus in a single family.

The current research on wild edible plants covers a variety of species that fall into several habit categories, the most common of which are herbs, shrubs, trees, and climbers. Herbs (135), followed by trees (58), climbers (41), and shrubs (37) with fungus, were the most commonly utilised groupings by the locals (3). There are a lot of dominating families, genera, and species out there. Aerva lantana, Aerva sanguinolenta, Evolvulus numularis, Galinsoga parviflora, Melochia corchorifolia, Menya spinosa, Polygonum

Table 1. Status and occurrence percentages of wild edible species[19]

Plant groups	No. of families	No. of genera	No. of species	% of species occurrence
Dicots	67	150	220 (39*)	80 %
Monocots	15	25	38 (7*)	14%
Gymnosperms	1	1	1 (1*)	0.4%
Pteridophytes	9	10	12	4.6%
Fungi	1	1	3	1%
Total	93	187	274	

*-Additional species

strigosum, Rumex maritimus, Urtica dioica, and other species were introduced to the Flora of Assam.

8.2.3 Exotic Wild Edible Plants

According to the current survey, there are 21 exotic wild edible plants in the Sonitpur region of Assam. The species (18) that have become naturalised in this area are marked with an asterisk (*).

8.2.4 Rare And Endangered Plants

The native habitat of the types was misplaced as a consequence of overexploitation and urbanization, and the species are now classified as endemic, rare, endangered, Data Deficient (DD), or extinct, depending on their current condition. These plants' classifications are mostly found in red data books, CITES, and IUCN records. These red-listed species require extra care in terms of cultivation and conservation.

9. Conclusion

In this brief review, problems associated with biodiversity and the use of modern tools to resolve these issues are discussed. In this review, the various plant drugs are discussed related to their various morphology, phytogeography, chemotaxonomy and taxonomy.

10. Acknowledgments

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