ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

THE BIOLOGICAL CHARACTERISTICS AND POTENTIAL SOURCES OF NOVEL DRUGS OF INDIAN MEDICINAL PLANTS. A REVIEW

***[1]N.Raja Sekhar Reddy,[2]C.Raja Kumar, [3]M.Sreekanth Reddy [4]T.Sreedhar Murthy**

[1]Department of Botany- Government College for men (A),Kadapa-A.P

[2]Department of Botany- Government Degree College, Huzurabad, Karimnagar (Dt)-T.S

[3]Department of Botany-YSR Vivekananda Government Degree College,Vempalli,YSR (Dt)-A.P

[4]Department of Botany- Government Degree College, Porumamilla, YSR (Dt)-A.P

***Corresponding author:** rsreddy71@gmail.com*

Abstract:

Ayurveda is a traditional herbal medicine system with a lengthy history and solid foundation in India. In both preventing and treating human illnesses, herbal plants are crucial. Traditional human medicine has been derived from plants since ancient times. Throughout history, plants have played a significant role in shaping human civilization. Yet, it is thought that plants are abundant in the phytochemical components necessary for their therapeutic benefits. It may be possible to create novel herbal medications by using medicinal plants. Today, the pharmacological properties of medicinal plants are seen to be a promising new class of drug or medication for the treatment of medical conditions. Rediscovered medicinal plants have piqued curiosity as a possible source of novel drugs in recent years. Thus, the current review's goal is to comprehend our current understanding of medicinal plants as a potential source for herbal medications in the future.

Keywords: Ayurveda, Herbal medicine, Medicinal plants, Novel drugs, Phytochemicals.

Introduction:

Ever before the dawn of time, humans have been acquainted with plants and have employed them for a multitude of purposes **[1].** In their quest for sustenance and effective coping mechanisms, early humans learned to discriminate between plants with potent pharmacological effects and those that were suited for medical use **[1].** The use of plants as medicines has increased as a result of the growing link between humans and plants. As our understanding of how to treat illnesses grew, so did the number of novel medications derived from plants **[3]. India has been dubbed the "Medicinal Garden of the World"** due to the vast abundance of medicinal plants that nature has given upon our nation. The therapeutic application of plants listed in Indian Vedas to treat various illnesses **[1].** The conventional medical system is currently widely recognised and used by people all around the world **[4].** At present point, India holds a special place in the globe for having several established traditional medical systems, including **Ayurveda, Siddha, Unani, homoeopathy, yoga and naturopathy [1].** Because medicinal plants contain qualities similar to those of drugs, they have been acknowledged as possible drug candidates **[2].**

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

Plants have been used for medical purposes for as long as humans have existed. Even if the exact chemical composition of medicinal plants is not always known, widespread observations about their usage and effectiveness have a vital role in disclosing their therapeutic qualities, leading to their frequent prescription **[5].** The usage of medicinal plants has greatly aided basic health care around the world, particularly in South American nations **[6].** It is estimated that there are between 250 and 500 thousand plant species on Earth, of which only 1 to 10% are consumed by humans and other animals **[6].** Brazil is the country with the largest biodiversity in the world, home to more than 20% of all known species **[7].** This nation has the most varied flora in the world, with over 55,000 species identified—or 22% of all species—described. The widespread acceptability of the use of therapeutic plants follows such biodiversity **[7].** Only 37% of pharmaceuticals sold commercially are used by the majority of Brazilians (80%), who rely nearly solely on natural treatment **[8].** Because the fundamental prerequisites for using medicinal plants do not require thorough quality control regarding safety and efficacy in comparison to other types of medications, phytotherapics entered the market with the promise of a quicker and less expensive production process **[9].**

Especially in underdeveloped nations, infectious diseases are a major source of morbidity and mortality among the general population **[9].** Consequently, the ongoing evolution of microbes resistant to traditional antimicrobials has spurred pharmaceutical companies to develop novel antimicrobial medications in recent years **[10].** Since there are frequent reports of the isolation of bacteria that are known to be sensitive to commonly used drugs and have developed multiresistant resistance to other medications on the market, it appears that certain bacterial species possess the genetic capacity to acquire and transmit resistance against currently available antibacterials **[7,8].** As a result, pharmaceutical companies frequently employ molecular structure modifications to existing medications to increase their efficiency or restore activity lost to bacterial resistance mechanisms in an effort to bring novel antimicrobial pharmaceuticals to the market **[11].** However, in light of the ongoing quest for novel antimicrobials, it is imperative to prioritise plant-based compounds, given Brazil's exceptional biodiversity and the fact that many of its plants have been utilised and tested for hundreds of years by many populations across the world **[12].** .

Biological properties of Indian medicinal plants:

Traditionally, medical systems have employed medicinal plants for ages to both cure and prevent various illnesses **[13].** They have anti-inflammatory, immunomodulatory, anticancer, liver-protective, cardioprotective, neuroprotective, and anti-diabetic qualities among their biological attributes **[12].** They also have antimicrobial and antibacterial actions. The main ingredients include glycosides, terpenoids, alkaloids, and Flavonoids **[13].** Though flavonoids and terpenoids guard against oxidative damage, antioxidants neutralise free radicals **[14].** The immune system is stimulated by immunomodulatory actions, while antimicrobial and antibacterial qualities aid in the fight against infections **[15].** Along with possibly lowering blood sugar and enhancing insulin sensitivity, several plants may also have anticancer properties **[11,12].** A safe and effective use requires proper identification, preparation and dose.

ISSN PRINT 2319 1775 Online 2320 7876

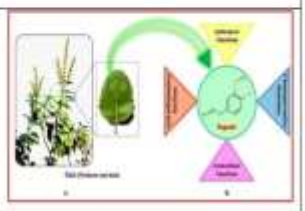
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

Potential Sources of Novel Drugs in Indian medicinal plants:

India is rich in biodiversity, and its traditional systems of medicine, such as Ayurveda, have been using medicinal plants for centuries **[14, 15].** Many of these plants harbor bioactive compounds that show promise as potential sources for novel drugs. Here are some examples of Indian medicinal plants with potential for drug discovery **[16].**

Table.1. Indian medicinal plants and its available drugs (*Self making table*)

Table.1. Indian medicinal plants and its available drugs

S .no	Name of the plant	Scientific name	Active Constituents	Description	Image of plant
1	Neem	Azadirachta indica	Azadirachtin, Nimbin, Nimbidin.	**Potential Applications:** Antimicrobial, anti-inflammatory, antiviral, and antifungal activities. Neem extracts have been explored for their potential in treating skin disorders and as an insecticide.	
2	Turmeric	Curcuma longa	Curcuminoids (especially curcumin).	**Potential Applications:** Anti-inflammatory, antioxidant, anticancer, and antimicrobial activities. Curcumin has been extensively studied for its potential in the treatment and prevention of various diseases, including cancer and inflammatory conditions.	
3	Tulsi	Ocimum sanctum	Eugenol, ursolic acid, rosmarinic acid.	**Potential Applications:** Antimicrobial, anti-inflammatory, and antioxidant properties. Tulsi has been traditionally used for its adaptogenic and immune-modulating effects.	

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

4	**Ashwagandha**	**Withania somnifera**	**Withanolides**	**Potential Applications:** Adaptogenic, anti-stress, anti-inflammatory, and immunomodulatory properties. Ashwagandha is used traditionally to enhance vitality and as a tonic for overall health.	
5	**Brahmi**	**Bacopa monnieri**	**Bacosides**	**Potential Applications:** Cognitive enhancement, neuroprotective, and anxiolytic effects. Brahmi has been traditionally used in Ayurveda to improve memory and cognitive function.	
6	**Ginger**	**Zingiber officinale**	**Gingerol, shogaol.**	**Potential Applications:** Anti-inflammatory, antiemetic, and antioxidant activities. Ginger has been investigated for its potential in managing nausea, arthritis, and inflammatory conditions.	
7	**Amla**	**Phyllanthus emblica**	**Vitamin-C, Tannins, Flavonoids**	**Potential Applications:** Antioxidant, immunomodulatory, and hepatoprotective effects. Amla is a rich source of vitamin C and is traditionally used for various health benefits.	
8	**Guggul**	**Commiphora wightii**	**Guggulsterones.**	**Potential Applications:** Anti-inflammatory and lipid-lowering effects. Guggul has been traditionally used in Ayurveda for its potential in managing cholesterol levels.	
9	**Rauwolfia**	**Rauvolfia serpentina**	**Reserpine.**	**Potential Applications:** Antihypertensive and antipsychotic effects. Rauwolfia has been historically used to treat hypertension and mental disorders.	
10	**Garlic**	**Allium sativum**	**Allicin, ajoene**	**Potential Applications:** Antimicrobial, anti-inflammatory, and cardiovascular protective effects. Garlic has been studied for its potential in managing cardiovascular conditions and as an antimicrobial agent.	

It's important to note that while these plants show promise, further research and clinical trials are needed to validate their efficacy and safety for use as pharmaceutical drugs. Additionally, the development of novel drugs from medicinal plants requires a thorough understanding of their bioactive compounds and mechanisms of action.

IJFANS International Journal of Food And Nutritional Sciences
Official Publication of International Association of Food and Nutrition Scientists

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

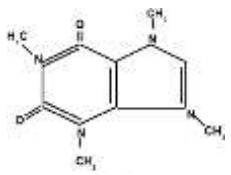
Traditional System of Indian Medicine:

Ayurveda is an ancient Indian health care method that has been practiced in rural and tribal regions for over 5000 years. It seeks to protect, promote, and prolong excellent health while also preventing disease through healthy lifestyle choices **[17].** Herbal remedies are the most common type of traditional medicine, with an estimated 7,500 herbs employed in local health traditions. Global demand is expanding for herbal medicine, health products, pharmaceuticals, food supplements, nutraceuticals, and cosmetics **[18].** By 2020, the Indian herbal sector is predicted to increase by Rs. 80 to 90 billion **[17, 18].** The government has established a National Level Policy for the Growth and Development of the Traditional sector of Indian Medicine in order to meet increasing difficulties in the healthcare sector **[19].**

Herbal medicine:

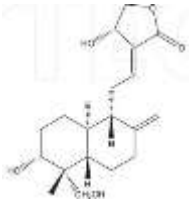
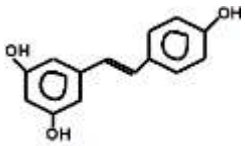
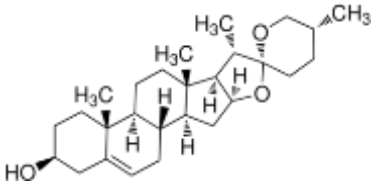
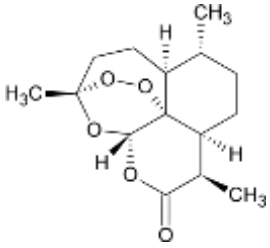
Herbal medicine, also known as phytomedicine, is the use of plants for medical and therapeutic purposes in order to cure diseases and enhance human health **[18].** Plants have secondary metabolites known as phytochemicals (***'phyto from Greek - meaning 'plant'***). These chemicals protect plants from microbiological diseases and pest infestations **[19].** Phytochemicals are active compounds with therapeutic qualities that are used as a treatment or therapy**[18,27].** Phytochemicals are classed based on their chemical composition. Plants have been used for thousands of years as food and traditional medicine due to their high therapeutic efficacy, antioxidant effects and economic feasibility **[20].**They produce phytochemicals, which are important to health because they cannot be produced by the human body. Metabolites are organic chemicals found in plants that are classed as main or secondary metabolites **[21].** Primary metabolites promote human growth and development, whereas secondary metabolites such as alkaloids, flavonoids and saponins are utilised to treat a variety of disorders **[22].** A Chinese pharmacologist named You Tu discovered "Artemisinin" from Artemisia annua, a novel herbal antimalarial medication. Some plants, however, contain toxic compounds that can be hazardous **[27].**

Table: 2, Various phytochemicals in Indian Medicinal plants: [1].

S. No.	Phytochemicals	Chemical structure	Example
1.	Alkaloids	Nitrogen atom in heterocyclic rings  Caffeine	Morphine, caffeine, Berberin, codeine

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

2.	Glycosides	Derived from carbohydrates and noncarbohydrates molecules.  Andrographolide	Amygdalin, gentiopicrin, and rographolide, polygalin, Cinnamyl acetate
3.	Polypheno les (Flavonoids, Phenolics Tannins)	Aromatic aliphatic ring containing phenols  Resveratrol	Quercetin, reservaratrol kaempferol and quercitrin, caffeic acid, flavones, rutin, naringin, hesperidin and chlorogenic, tannic acid, gallic acid and ellagic acid
4.	Saponins	Sugar attached to triterpene or steroid aglycone  Diosgenin	Diosgenin and hecogenin
5.	Terpenes (Carotenoids, steroids)	Long unsaturated aliphatic chains (isoprene units)  Artemisinin	Artemisinin, α-carotene, β-carotene, lycopene, lutein and zeaxanthin

The importance of plants as a source of new drugs:

Herbal medicine has become a worldwide phenomenon, with 4 billion people utilising it for primary care **[23].** According to the World Health Organisation (WHO), around 11% of 252 medications are derived from plants. Antioxidants, phytochemicals, and micronutrients included in vegetarian foods improve health and protect against disease **[24].** Plants have antioxidant, antiviral, anticancer, antibacterial, antifungal and antiparasitic properties **[25].**

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

Phytochemicals have been demonstrated to lower the risk of a wide range of diseases, including cardiovascular disease, hepato-renal disease, diabetes, cancer, and neurological disorders **[26].**

Summary and Conclusions:

Indian medicinal plants have been studied for their rich phytochemical makeup, bioactive chemicals, and traditional usage. These findings imply that these plants have medicinal promise, with substances such as alkaloids, flavonoids, terpenoids, and polyphenols demonstrating interesting bioactivities. The study also emphasises the significance of combining traditional knowledge with modern scientific methodologies in order to ensure sustainable harvesting and conservation of medicinal plants. The discovery of bioactive chemicals could lead to additional therapeutic development with improved efficacy and safety characteristics. However, obstacles such as herbal extract standardisation, toxicity assessments, and clinical validations remain. The study advances ethnopharmacology and establishes the groundwork for future research into the medicinal potential of these natural resources.

Acknowledgements:

The author would like to express their heartfelt gratitude to the **Dr.V.Uday Kiran** for their constant support for completion this work. We also want to thanks Co-authors for contributing literature.

References:

1. **Arvind Kumar Shakya (2016).Medicinal plants:** Future source of new drugs, International Journal of Herbal Medicine 2016; 4(4): 59-64.
2. **Bernhoft A (2010).** A brief review on bioactive compounds in plants, In: Bioactive compounds in plants – benefits and risks for man and animals, Oslo: The Norwegian Academy of Science and Letters, 2010, 11-17.
3. **Gajalakshmi S, Vijayalakshmi S, Devi Rajeswari V (2013).** Pharmacological Activities of Catharanthus Roseus: A Perspective Review. International Journal of Pharmaceutical and Biological Sciences. 2013; 4(2):431- 439.
4. **Gupta SK, Sharma A (2014).** Medicinal properties of Zingiber officinale Roscoe - A Review. IOSR Journal of Pharmacy and Biological Sciences. 2014; 9(5):124-129.
5. **Hasani, P., Yasa, N., Vosough-Ghanbari, S., Mohammadirad, A., Dehghan, G. and Abdollahi, M., (2007).** *In vivo* antioxidant potential of *Teucrium polium* as compared to _-tocopherol. Acta Pharm, 57: 123–129.
6. **Jain S, Mohan R, Rai R (2015).** Ocimum sanctum as an Herbal Medicine: A Review. International Journal of Maxillofacial Research. 2015; 1(1):1-12.
7. **Jitendra Mittal, Madan Mohan Sharma, Amla Batra (2014).** Tinospora cordifolia: a multipurpose medicinal plant- A review. Journal of Medicinal Plants Studies. 2014; 2(2):32-47
8. **Khan KH (2009).** Roles of Emblica officinalis in Medicine - A Review. Botany Research International. 2009; 2(4):218- 228.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

9. **Kumar N, Wani ZA, Dhyani S (2015).** Ethnobotanical study of the plants used by the local people of Gulmarg and its allied areas, Jammu & Kashmir, India. International Journal of Current Research in Bioscience and Plant biology. 2015; 2(9):16-23.
10. **Moteriya P, Satasiya R, Chanda S (2015).** Screening of phytochemical constituents in some ornamental flowers of Saurashtra region. Journal of Pharmacognosy and Phytochemistry. 2015; 3(5):112-120.
11. **Nisar Ahmad, Hina Fazal, Bilal Haider Abbasi, Shahid Farooq, Mohammad Ali, Mubarak Ali Khan (2012).** Biological role of Piper nigrum L. (Black pepper): A review. Asian Pacific Journal of Tropical Biomedicine. 2012, S1945-S1953.
12. **Paarakh PM (2010).** Terminalia arjina (Roxb.) Wt. and Arn: A Review. International Journal of Pharmacology. 2010;6(5):515-534.
13. **Pankaj K, Sahu Deen Dayal Giri, Ritu Singh, Priyanka Pandey, Sharmistha Gupta, Atul Kumar Shrivastava, *et al* (2013).** Therapeutic and Medicinal Uses of Aloe vera: A Review. Pharmacology & Pharmacy. 2013; 4:599-610.
14. **Priyadarshini K, Keerthi Aparajitha U (2012).** Paclitaxel against *Cancer*: A Short Review. Medicinal chemistry. 2012; 2:139-141.
15. **Ram J, Moteriya P, Chanda S (2015).** Phytochemical screening and reported biological activities of some medicinal plants of Gujarat region. Journal of Pharmacognosy and Phytochemistry. 2015; 4(2):192-198.
16. **Seyyed MJ, Saied RF (2012).** Therapeutic application of different parts Berberis vulgaris. International Journal of Agriculture and Crop Sciences. 2012; 4(7):404-408.
17. **Shakya AK, Sharma N, Saxena M, Shrivastava S, Shukla S (2012).** Evaluation of the antioxidant and hepatoprotective effect of Majoon-e-Dabeed-ul-ward against *carbon* tetrachloride induced liver injury. Experimental Toxicology and Pathology. 2012; 64(7-8):767-73.
18. **Shiyou Li, Wanli Zhang (2014).** Ethnobotany of Camptotheca Decaisne: New Discoveries of Old Medicinal Uses. Pharmaceutical Crops. 2014; 5:140-145.
19. **Silva NCC (1), Fernandes Júnior A (1) (2010).** Biological properties of medicinal plants: a review of their antimicrobial activity, The Journal of Venomous Animals and Toxins including Tropical Diseases ,ISSN 1678-9199 | 2010 | volume 16 | issue 3 | pages 402-413.
20. **Singh VK, Singh DK (2008).** Pharmacological Effects of Garlic (Allium sativum L.). ARBS Annual Review of Biomedical Sciences. 2008; 10:6-26.
21. **Singh, R., Singh, S., Kumar, S. and Arora, S., (2004).** Hydroxyl radical scavenging potential of acetone extract/fractions of *Acacia nilotica* (L.). Willd Ex Del. Int J Biosci Rep, 2: 440–446.
22. **Singh, R., Singh, S., Kumar, S. and Arora, S., (2007).** Evaluation of antioxidant potential of ethyl acetate extract/fractions of *Acacia auriculiformis* A. Cunn. Food Chem Technol, 45:1216–1223.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11, Iss 11, 2022

23. **Umadevi M, Rajeswari R, Sharmila Rahale C, Selvavenkadesh S, Pushpa R, Sampath KP, *et al*.(2012).** Traditional And Medicinal Uses of Withania Somnifera. The Pharma Innovation. 2012; 1(9):102-110.
24. **Vivek Sharma (2013).** Part Based HPLC-PDA Quantification of Podophyllotoxin in Populations of Podophyllum hexandrum Royle Indian Mayapple from Higher Altitude Himalayas. Journal of Medicinal Plants Studies. 2013; 1(3):176-183.
25. **Wenzel E, Somoza V (2005).** Metabolism and bioavailability of trans-resveratrol. *Mol Nutr Food Res*, 2005; 49, 472-81.
26. **Wink M (2010).** Introduction: Biochemistry, Physiology and Ecological Functions of Secondary Metabolites, Second Edition Annual Plant Reviews, 2010, 40.
27. **Yadav M, Chatterji S, Gupta SK, Watal G (2014).** Preliminary phytochemical screening of six medicinal plants used in traditional medicine. International Journal of Pharmacy and Pharmaceutical Sciences. 2014; 6(5):539-542.