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*RESEARCH ARTICLE*

# MEDICINAL PLANTS: A RECOURSE TO ALLOPATHY – A REVIEW

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## *Abstract*

Bacteria and fungi are responsible for most of the infections that afflict human beings and animals, these infections are controlled by antibodies, as well as by wide spread use of chemo based synthetic antibiotics. The spore formers create hindrances in treatment due to their genetic ability to survive, transmit, and even develop resistance to these antibiotics, thus leading to the patient facing many ulterior side effects of these drugs. Research is now focused on the development of antibiotics from natural sources: medicinal plants. These naturally sources and purified antibiotics provide a safe treatment for the afflicted patient devoid of any side effects on one hand, and also help in conservation of natural resources to a large extent by curbing their depletion and reducing the load on the environment. These medicinal plant extracts provide a cure for a number of diseases like skin diseases, urinary tract and digestive system problems, heart related diseases, blood pressure regulation, including the treatment of cancer without administration of chemo therapy.



## Introduction:-

Planet earth has all features that support life on it. Life exists on earth in the form of humans, animals, birds, reptiles, and water dwelling creatures which are motile, and non motile life like trees, plants on crust as well as in swamps. Microorganisms like bacteria, virus and fungi are responsible for the spread of diseases among all living beings.

Antibiotics are commonly and widely administered for the treatment of many microbial infections and diseases. Usage of such enormous quantity of antibiotics should have created a situation today in which there would be no infectious diseases in the world. But the scenario is totally opposite. The actual fact is that, the problem of infectious diseases is ever increasing daily. Some of the main obstacles noticed are that the bacteria acquire a genetic ability of resistance towards these antibiotic drugs, termed as "Drug Resistance", and these drugs also have an adverse effect on the host. The consistent rise of new multi drug resistant pathogens has undermined the clinical viability of numerous prevailing antitoxins. Hence, many natural products have been explored to combat such problems[24, 33]. Nature is an infinite source of discovery of new drugs. Nature has a wide and complete repository of remedies to cure almost all ailments in human beings. The plant and animal life contribute to a number of materials which help in the survival of human beings. Utilization of these naturally occurring materials which possess antioxidant, antibacterial, antifungal and antimicrobial properties lead to the cure of various ailments that affect human beings in particular and all other motile beings in general[24].

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**Importance of Plants for Medicinal Purposes:-**

Plants have been traditionally used for healing human ailments for centuries in the past. Actually, plants were the only source of remedy until the advent of synthetic pharmaceutical products since last few years[4, 10, 11, 13].

As of today, it is found that almost 38 - 42 % of common drugs and 65 % of anticarcinogenic drugs available to us are of plant origin. It can be very safely predicted that almost 75 - 80 % of the world's population consumes medicines having plant origin.

Plants are natural chemical factories providing an in-exhaustive supply without any external demands like energy and skilled work force; which is a must in case of synthetic drugs. Plants from marginal desert zones, polar areas and the depths of the oceans are being explored for their medicinal potential. Gardens are a medicine cabinet full of useful everyday remedies that will treat a wide range of common ailments in a gentle but effective way[24].

Plants have their inbuilt capacity to synthesize an exceptional range of additional components, called secondary metabolites. Many secondary metabolites, due to their antibiotic nature, helps in imparting protection to the plants against fungi, bacteria, animals, and even other plants. These secondary metabolites are being explored by man for their antibiotic properties to combat various human ailments. This is due to the safe interpretation that every plant species contains chemicals that can affect some animals or micro-organisms negatively. Plants have been a rich source of medicines because they produce a host of bioactive molecules, most of which probably evolved as chemical defenses against predation or infection.

## Characteristics of Medicinal Plants:-

The three major characteristics of medicinal plants can be described as follows:

- **Synergic medicine:** The ingredients of plants all interact simultaneously, so their use may be either helpful or may lead to further damage to the host, or neutralize their possible effect due to the positive – negative reactions between the ingredients.
- **Support to official medicine:** In the treatment of complex illnesses like cancer the components of the plants proved to be very effective.
- **Preventive medicine:** Active components of the plants are also characterized by their ability to prevent the occurrence of some diseases. This directly leads to the decreased usage of synthetic drugs, which are used when the disease is already present. Hence, plants help in the reduction of the side effects associated with synthetic treatment.

Substances derived from medicinal flora and fauna have gained greater importance in recent years in the prevention and cure of human diseases as they are fully bio-friendly. According to a general estimate, around six thousand Indian medicinal plants have gained use since centuries as medicines that is mentioned in old folk cultures. It has been observed that these medicinal herbs cater in meeting approximately seventy five percent medicinal requirements of the third world countries[39].

Herbal preparations are known to be utilized for the treatment of different ailments throughout the history of mankind. This is done by utilizing commonly accessible items; either as unadulterated mixes or as in institutionalized plant concentrated form, furnishing expensive chances for new drug findings due to their nonstop accessibility and wide chemical diversity. Nano particles have gained major attention in the discovery of new drugs. The nano particle size of Ayurvedic powders or 'bhasamas' has been the subject of extreme examinations, as the nano particles reach the target area in the cells as they spread very fast due to their extremely small size, hence the damage to the cells is stopped and repairs initiated. This most recent headway in exploration of natural drugs has opened another window by the utility of Ayurvedic bhasamas in herbo-mineral antidotes[15].

Research has been diverted to the efficacy of *Abharaka bhasama* or *Sahastraputi*, the age-old Indian Ayurvedic product relied upon getting relief from gastric and nervous system abnormalities. Cow urine has been mixed these *Abharaka bhasama* in order to get an enhanced synergistic effect. Bacterial growth was retarded by this process against a number of test bacteria, but the fungal attack was not affected as there was no effect on the fungi under test. So this mixture has definitely proved to be efficient in combating bacterial related sicknesses[40].

**Ayurvedic Significance of Indian Medicinal Plants:-**

The Indian medicinal plants are the heritage of India from the Great Age due to the importance they have commanded from time immemorial. Ayurveda and Unani in itself is a deep study and experiments conducted over time to access the natural wealth of plants available on our land. This has resulted in to the development of drugs to curb varied ailments that affect man in particular and the animals in general. These drugs developed from natural resources which are cheap, abundantly available, and finally are fully eco-friendly. Drug resistance has been observed to be almost nil even after a long time period. Modern cell culture techniques help in the cultivation and growth of those species that are on the verge of depletion due to over exhaustion[24].

Generally all Ayurvedic medicines consists of 15 or more drugs mixed together in a single potion; a poly herbal formulation. Some medicines which are meant to cure a particular ailment like sore throat or common colds are equally effective against external skin disorders like dermatitis. The well known Ayurvedic tonic: Dashmularishtha is a combination of 67 different herbal extracts. Similarly, Khadiradi Vati for sore throat contains 08 formulations and 05 to 37 herbal extracts. Allopathic healers will consider this to be absurd; doubting even the authenticity of certification from renowned Ayurvedic science institutes. Similar traditional treatments of foreign countries are the Unani treatment, dominating from the Muslim ruled territories of the world, and also the Western medicine treatment. Hence, the combination of all these three main systems: Ayurveda, Unani and the Western; led to the evolution of the commonly known Indian Indigenous Drugs[15].

Antifungal activities of medicinal plant extracts against clinical isolates were determined against *Candida neoformans* and *Candida albicans* by using broth dilution method[38]. Volatile oils obtained from different plants like pepper, nutmeg, etc were accessed for antibacterial activity against twenty-five different types of organisms which included animal and plant pathogens, and the bacteria responsible for food spoilage and poisoning. The test results showed that the volatile oils exhibited considerable inhibitory effects against all organisms that were subjected to the test, while their other major components showed various degrees of growth inhibition[9].

**Main Medicinal Plants of India.**

| Sr | Traditional Name | Scientific Name | Sr | Traditional Name | Scientific Name |
|---|---|---|---|---|---|
| 1 | Shatavari | *Asparagus racemoscus* | 14 | Shankhapushpi | *Convolvulus pluricaulis* |
| 2 | Tulsi | *Oscimum sanctum* | 15 | Amla | *Emblica officinalis* |
| 3 | Gaduchi | *Tinospora cordifolia* | 16 | Hingu | *Ferula foetida* |
| 4 | Ashwagandha | *Withania somnifera* | 17 | Yashtimadhu | *Glycyrrhiza glabra* |
| 5 | Chameleon plant | *Houttuynia cordatta* | 18 | Long pepper | *Peeper longum* |
| 6 | Indian fumitory | *Fumaria indica* | 19 | Chandana | *Santalum album* |
| 7 | Chilbil / Kanju / Papri | *Holoptelea integrifolia* | 20 | Sarpagandhaa | *Rauvolfia serpentine* |
| 8 | Indian tree of heaven | *Ailanthus excels* | 21 | Arjuna or Arjun tree | *Terminalia arjuna* |
| 9 | Ghritakumaari | *Aloevera* | 22 | Lavanga | *Syzygium aromaticum* |
| 10 | Pithraj tree | *Aphanamixis polystachya* | 23 | Jambu | *Syzygium cuminii* |
| 11 | Braahmi | *Bacopa monnieri* | 24 | Ashoka | *Saraca asoca* |
| 12 | Guggul | *Commiphora mukul* | 25 | Gokshura | *Tribulus terrestris* |
| 13 | Guggulu | *Commiphora wightii* | | | |

The positive action of Indian medicinal plants has been assessed on some bacterial strains like *Bacillus cereus, Staphylococcus aureus, Enterobacter aerogens, Escherichia coli* and *Klebsiella pneumonia* by researchers in the near past by taking the aqueous and methanol extracts of the medicinal plants for the study. The plants belonged to the arid regions of North-Gujarat where rain-fall is scanty. The plants under investigation were *Galtoro, Dudhli, Sharu, Chanothi, Kagdonio, Durva, Gulmohar, Thor, Vad, Shivan, Shwet chandan* and *Ragat rohido.* Different parts of the plants like leaf, stem, fruit, branches, pods or even the whole plant was used in preparation of the extracts. Their results showed that strongest antimicrobial effect was of *Galtoro,* which was followed by other two in decreasing order by *Dudhli, Sharu.* Here also it was observed that the methanol based extracts showed highest positive results against Gram negative species: *Klebsiella pneumonia*. Many different sicknesses affecting man like nervous disorders, diarrhoea, dysentery, fever, piles, general wounds, worms, bowel disorders, asthma were cured effectively by the first three plant species: *Galtoro, Dudhli* and *Sharu.* Greater emphasis was given to *Galtoro* as it exhibited its potential in curing many ailments. This type of investigations promotes the exploration of natural plant based resources to be incorporated as potent drugs to counter various microbial and viral sicknesses[29]. The anti-

inflammatory, antioxidant nature, antimicrobial and analgesic actions of *Sansevieria roxburghiana* has been a subject of deep research[2, 6, 23, 27, 28, 36].

Researchers have observed that the phytochemicals extracted from medicinal plants have included alkaloids, flavonoids, with certain steroids, tannins, anthraquinones and a number of other chemicals. Chemicals possessing antibacterial properties are mainly alkaloids, flavonoids, and tannins. The studies regarding the general chemical and antibacterial activity of five South Algerian medicinal plants have been carried out. Here, the assessment of antibacterial activity was done on both Gram Positive and Gram Negative bacterial strains. The results so obtained showed the plants to have a M.I.C. ranging between 0.045 to 0.135 mg/ml depending on their species and also on the microbial strain under test[16].

A study dealing with the phytochemical analysis and different biological activities after the extraction and assessment of indole alkaloids from "Rauwolfia Serpentina" was carried out to observe their antimicrobial and antiproliferative activities. The detection or the deficiency of indole alkaloids was carried out using both T.L.C. and more reliable H.P.T.L.C. methods. The principle center of these routines was on the qualitative and quantitative determination of indole alkaloids. Four different alkaloid derivatives were detected. Spectrophotometry was done for the quantitative estimation of the alkaloids from Rauwolfia. A positive antimicrobial activity, M.I.C. and M.B.C were noted by using well diffusion assay technique. The study also reported that as the root extract performed better against *Salmonella typhi*, it has proved to be a better and suitable alternative for further drug development[8].

The leaf extract of Ancistrocladus heyneanus, a tropical liana plant had been taken up for study. The studies revealed it to be rich in Napthyl Isoquinolin alkaloids. Antimicrobial activity against one Gram positive and three Gram negative bacteria had been tested against crude aqueous and organic solvent extracts of Ancistrocladus heyneanus using agar well method. The alkaloids from crude organic solvent extract were isolated by H.P.T.L.C. Four distinct bands of the alkaloids were observed. Each one of them was tested for their antimicrobial activity. Fraction 1 showed positive action against only Gram positive bacteria but not against any Gram negative bacteria. Whereas, inhibition of growth of Gram positive bacteria *Staphylococcus aureus* were obviously more when H2 and H4 fractions of alkaloids were tested. Both crude extracts as well as isolated alkaloid fractions showed considerable activity against Gram positive bacteria but there was no activity against Gram negative bacteria[35].

*Salmonella* has been detected to be the primary cause of food poisoning in the whole world, and many times such food poisoning out breaks are massive and affects a large world population. In USA alone, the Centre for Disease Control and Prevention has put up an estimate of a minimum of 14 lakhs cases of *Salmonella* infections per year. The European Union has reported on an average over 1.0 lakh cases annually. Certain pathogenic *Salmonella* serotypes like *Salmonella typhi* and *Salmonella paratyphi* are prevalent in man, usually leading to diseases such as enteric fever. A few pathogenic *Salmonella* serotypes such as *Salmonella enteritidis* and *Salmonella typhimurium* are able to infect humans and animals and so they are termed as ubiquitous. Synthetic antibiotics are mainly employed in the treatment employed and annihilation of these microbes. Antimicrobial operators are for the most part managed remedially and prophylactically to cure *Salmonellosis* in human and animal world-wide. However, a marked and increase resistance to these antibiotics is an inevitable side effect of these synthetic drugs, with the recent studies proving right the increased presence of *Salmonella* resistant to antibiotics in both humans and animals[3, 12, 26].

Medicinal herbs have a long history of use as drugs in Asia either as crude or in extract form added in food or administered orally. These herbs possess bio active components, and this has brought about an improved comprehension of their numerous capable clinical, physiological, and therapeutic applications in the current medical fraternity[21, 41]. A very large number of plants exceeding more than one thousand have been observed to exhibit antimicrobial effects[25], which provide a safe and effective treatment against various diseases. A member of *Schizandraceae* family, *Schizandra chinensis*, bears a fruit known as *Schizandrae Fructus*, is used in the treatment of dyspnea, irritability, palpitation, coronary illnesses, and likewise sleep deprivationin Asia[17]. Elixirs of *Schizandrae Fructus* have been discovered to show a positive hepatoprotective impact in both viral hepatitis and antimicrobial activities on *Staphylococcus aureus*[34].

*Sansevieria roxburghiana* is another herb found in the geographical areas of Tamil Nadu, Southern Andhra Pradesh of India and Sri Lanka. This herb had found its use as a medicine to counter common ailments through ages for the treatment of common human ailments like chest and stomach pains, ear-ache and diarrhoea. In case of ear-ache, the

leaves are heated to boil and the warm potion is applied on the affected part to get immediate results. Also, the sap of the leaves is administered on to common skin sores and graze injuries, and fungal skin infections like scabies. Microbial and phytochemical studies on the extracts of the leaves and rhizome of this herb showed the optimum presence of tannins, flavonoids, phenols; and also carbohydrates, saponin, anthocyanin, proteins, glycosides, phytosterols and β-cyanin. Prominent antimicrobial action was observed by subjecting the methanol and acetone extracts of the leaves to a number of common Gram positive bacteria, Gram negative bacteria and fungal strains. This action of the leave extracts was far greater than what that was observed from the ethyl acetate extract of the rhizome, which also promoted comparatively lesser anti microbial activity against a wide spectrum of microbes. The antimicrobial activity of both the leaves and the rhizome of *Sansevieria roxburghiana* against different pathogens have been investigated in detail[7].

Researchers on natural plant based potent drugs have been trying to develop the extractions from the crude plants by newer techniques which are more efficient and rapid, using lesser quantities of solvent. Extractions of the alkaloids were successfully and rapidly accomplished by utilising non-fatty soap as the extracting agent. The soaps used were anionic and non-ionic in nature. In this process the precipitates of the alkaloids were dissolved at pH greater than 8.5, and finally extracted with chloroform. The quality of the alkaloids thus obtained had same characteristics as the older methods. This type of procedure can be made applicable to the extraction of secondary metabolites. A concentration of 0.1 to 0.2 % (m / v) of the soap yielded good results, but it was felt that if the concentration of alkaloids in the plant sample is more; than a slightly higher concentration of the soap was required to get a better output[1].

## Prominent Medicinal Plants Across the Globe:-

Libyan medicinal plants are a traditional source of remedies to fight many ailments. The main five of them: *Thapsia garganica, Hammada scoparia, Euphorbia serrata, Hyoscyamus albus* and *Retama rateam* have been scientifically investigated for their antimicrobial activities. The extracts of these plants were evaluated for their gross phenolic and flavonoid content on which their antimicrobial potential is directly dependent. Research showed that the ratio between their anti oxidant activity and the gross phenolic content to be 1: 0.77 and to the flavonoid content to be 1: 0.98. The crude, aqueous and methanol extracts of these plants were tested against Gram positive and Gram negative bacteria. Here it was deduced that the extracts of *Hammada scoparia, Euphorbia serrata* gave good results against *Escherichia coli* and the extracts of *Hammada scoparia* and *Hyoscyamus albus* exhibited an exceptionally good antifungal and antimicrobial effect due to their potently high alkaloid content. Hence their antioxidant nature made them favourable for use since ages by the local natives[32].

Four medicinal plants that are traditionally used in the Eastern Cape region, a province of South Africa, for treating burn wound infections were collected for investigation and invitro antibacterial activity was carried out against eight different bacteria[18]. The invitro antibacterial potential of the leaves of Annona muricata extracts in solvents like water and methanol was evaluated on bacterial strains like *Bacillus subtilis, Enterobacter aerogenes, Eschericha coli, Klebsiella pneumonia, Proteus vulgaris, Staphylococcus aureus, , Streptococcus pyogenes and Salmonella typhimurim*. The invitro antibacterial activity was analysed by the application of agar cup method. The results showed that the Gram positive bacteria *Bacillus subtilis* and *Staphylococcus aureus* were most susceptible, and the Gram negative bacteria which were observed to be most susceptible were *Klebsiella pneumoniae* and *Proteus vulgaris.* The antibacterial activity of the plant extracts was accessed using the standard antibiotic: Streptomycin (100 ppm). The results obtained in that study suggested that Annona muricata can be suitaibly used in treating diseases caused by the above mentioned organisms under test[30].

In order to identify herbs with medicinal properties, twenty two medicinal herbs of Korean origin which were employed in the treatment of Gastro-intestinal infections were screened for their therapeutic potential in the treating three different serovar of *Salmonella*. The minimal inhibitory concentrations of the concentrates from *Schizandrae Fructus* were intensely studied by feeding the mice infected with *Salmonella typhimurium* with *Schizandrae Fructus* . *Salmonella typhimurium* affected mice which were not given a dose of *Schizandrae Fructus* demonstrated clinical side effects of lethargy, and damage in liver cells and tissues, kidney, intestine and spleen. In contrast, clinical abnormalities and tissue damage were less seen in *Salmonella typhimurium* affected mice administered with the concentrate of *Schizandrae fructus*. The aqueous and methanol concentrates of *Schizandrae fructus* demonstrated antmicrobial effect against all sixteen strains of eight different *Salmonella* serovars tested, wherein, the methanol concentrate showed to have a somewhat higher activity than the water extract[22].

*Schizandrae fructus* had shown antibacterial activity against *Helicobacter pylori* and many other gram positive bacteria[20, 34]. Its antimicrobial activity is due to the presence of some endotoxins and exotoxins or a wide range of antibiotics. It had been proved that, several secondary metabolites from plant origin such as alkaloids, tannins, saponins, and sterols have been associated with antimicrobial activity[19].

Even in the popular treatment of chemotherapy to control tuberculosis, Japanese researchers have identified *Stephania cepharantha* to be used in the treatment by the isolation of active alkaloids present in them[37]. Similarly, Chinese researchers have been working on the usage of local plants to counter tuberculosis, have reported the activity of alkaloids in Coptis root[5].

The effectiveness of an aqueous extract of *Caryocar brasiliense* (Caryo caraceae) fruit pulp, popularly known in Brazil as Pequi, against clastogenicity induced by cyclo phosphamide and bleomycin was evaluated using an in vivo mouse bone marrow cell micro nuclei test on in vitro Chinese hamster ovary cell (CHO-K1) chromosome aberration test and an in vitro antioxidant assay based on oxidative damage to 2-deoxy D ribose (2DR) induced by hydroxyl radicals generated by the reactions between Ascorbic acid and $Fe^{+++}$ EDTA. In the mouse bone marrow extract, all the plant extract showed protective effect against micronuclei induced by cyclophosphamide and bleomycin but did not interfere with polychromatic bone marrow erythrocyte proliferation, except when the mice had been previously treated with a highest dosage of cyclophosphamide. When CHO-K cells were pre-treated adding 0.01 ml, 0.05 ml. and 0.1 ml of concentrate per ml of cell culture medium 24 or 48 hours before bleomycin or cyclophosphamide, there was a noticed protective effect against chromosome breaks, and also a major drop in the mitotic index of CHO-K cells. The extract also showed a protective effect against oxidative hydroxy radical damage to 2-DR[14].

Anticlastogenic effect was studied by using in vivo erythrocytes micro nuclease assay. Blood samples were collected and counted for reticulocytes with and without a micro nuclease using the fluorescent microscope. After comparing with the controls, we found that 25% of AP and IM leaves in diet have shown a significant decrease in micro nucleated peripheral reticulocytes (MNRETs) induced by MMC, CYP, and MMC, DMBA respectively ($p<0.05$). While IM fruit juice at 10 and 20ml/kg BW decreased MNRETs induced only by MMC in a very low dose, still the major decrease occurred only in high dose ($p<0.05$). The results showed that AP leaves and IM (leaves and fruits) were able to inhibit clastogenic activity of both direct and indirect acting clastogens in the mice, IM leaves showed the highest inhibitory effect[31].

## Conclusion:-

Last few decades have witnessed a tremendous development in Ayurvedic medicine because of the increase of multi drug resistant microbes to allopathic medicines. Resistant strain development towards medicine makes the future of an antimicrobial drug uncertain. Plant and animal products contain valuable resources of nature necessary for the upkeep of human health. Hence, the use of plant extracts is extremely effective in the treatments of various microbial afflictions. Alkaloids detected in plant extracts are known as potential pharmacological agents. They are amazing chemicals that have given humanity an extensive variety of characteristic natural products that are used in the cure of various ailments. As host resistance to current synthetic drugs is always on a increasing trend in terms of severity and extent on the passage of time, the recognizable proof of such new and structurally novel natural products showing noticeable antimicrobial activity, and which are immune to any form of host resistance, have hopefully been pointers to new modes of action for tackling this problem.

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