



## GYMNOSPERMIC MEDICINES USED IN DISEASE TREATMENT

**Dr. Maruti S. Darade\***

Department of Botany Govt. Vidarbha Institute of Science and Humanities, Amravati -444604 (M.S.), India.

**Corresponding Author: Dr. Maruti S. Darade**

Department of Botany Govt. Vidarbha Institute of Science and Humanities, Amravati -444604 (M.S.), India.

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### ABSTRACT

The gymnosperms are naked seed producing plants grow in temperate, tropical and subtropical climate. They are grouped into different orders, families, genera and species. The genera are also called as members of the group. The orders of gymnosperms are Cycadales, Coniferales, Ginkgoales and Gnetales. The medicines are used in the treatment of various human ailments and diseases. The extract prepared from the seeds of *Dioon edule* is used in the treatment of neuralgia. The stem of *Cycas pectinata* is used in the treatment of hair roots. The ulcerated wounds are treated with *Cycas circinalis*. The pollen grains of *Cycas rumphii* are used to relieve pain and diminishes distress. The paste of *Cycas* seeds is used in the treatment of wounds, swellings, boils and skin diseases. The juice of young leaves of *Cycas revoluta* is used to control blood vomiting. The leaves, roots, seeds, stems and tubers of *Stangeria eriopus* are used as purgatives. The members of Coniferales include *Taxus*, *Cupressus*, *Picea*, *Pinus*, *Cedrus*, *Araucaria* etc. These members are also used in the preparation of valuable medicines. The *Ginkgo biloba* a members of order Ginkgoales is medicinally useful to cure human diseases. The leaves of *Ginkgo biloba* contains ginkgolides, bilobalides, flavonol glycosides and alkylphenols. The leaf extract is used in preparation of variety of medicines. The order Gnetales constitute of genera such as *Ephedra*, *Gnetum* and *Welwitschia*. These members are used in preparation of medicines. The Glycosides, Polyphenols, Alkaloids, polyphenols, Flavonoids, Stilbenes and Tannins are important phytochemicals found in gymnosperms. The phytochemicals are potentially used in synthesis of drugs. The phytochemicals are basis for their use in modern medicines. The phytochemicals are obtained from the bark, leaves, seeds and reproductive cones. The plant extract can be made with the help of different methods such as Soxhlet extraction, Percolation, Maceration, Ultrasound-assisted extraction etc. The plant extract of gymnosperms can be used against the inflammation, arthritis, bowel disease, cancer, heart disease and even stroke. The medicines prepared from leaf extract can be used to improve blood circulation. It also helps to improve health of heart. It reduces symptoms of psychiatric disorders and dementia. The medicines prepared from gymnospermic members are used to treat anxiety, stress, Alzheimer's disease and cognitive decline related to aging of a patient. The medicines also used in the treatment of depression, headaches, migraines, asthma. The medicines are useful to reduce Premenstrual syndrome and treat sexual dysfunction.

### INTRODUCTION

The medicines are obtained from different plant parts. In rural areas medicinal plants are widely used traditionally to cure health ailments. The dietary supplements are obtained from different plant sources to keep body healthy and sound. The plant kingdom constitutes of angiospermic and gymnospermic plants. The gymnospermic plants are found all over the world in colder as well as temperate regions. The species of gymnospermic plants are useful in preparation of valuable medicines. The phytochemicals and bioactive compounds present in them are used in synthesis of medicines. The sophisticated technology and different ways of phytochemical analysis has made it possible to find out drug and medicinal property in plants. The phytochemicals in plants are used in preparation of ayurvedic, Allopathic and Homeopathic medicines. The

medicines obtained from the plant part extract can be made into tablets, capsules, and injection forms. The report of W.H.O. indicates that about eighty percent world's population depends mainly on traditional medicines. The gymnospermic plants are divided into different groups like Cycadales, Coniferales, Ginkgoales and Gnetales. The genera and species included in these orders are providing us good quality phytochemical constituents and bioactive compounds which are used in preparation of medicines.

Considering importance of medicines in curing and treating different types of human diseases and incredible role of gymnospermic plants in yielding valuable phytochemicals and drugs, attempts are made to focus on its important aspects.

## MATERIALS AND METHODS

The gymnospermic members are screened for its medicinal properties and importance. The role of different members of gymnosperms is illustrated as follows.

### Cycadales

It is the first order in the taxonomic rank of gymnosperms. It comprises about eleven living genera and species. The members included in the order are world wide in distribution. These members are commonly called as Cycads. The cycads are woody plants resemble externally as palms. They consist of cylindrical or columnar stem, producing a crown of foliage leaves at the apex. They produce naked seeds to the lateral side of female reproductive structure Megasporophyll. The Cycads includes are *Bowenia*, *Ceratozamia*, *Cycas*, *Dioon*, *Encephalartos*, *Lepidozamia*, *Macrozamia*, *Microcycas*, *Stangeria*, *Zamia* etc.

### Coniferales

The members of this order are large evergreen trees producing needle like leaves. They may be shrubs or trees. They can grow in wet, hot and dry climates. They are found in abundance in tropical lowland as well as submontane forests. The needle like leaves may be short or long and may be smooth or scaly. The members produce reproductive structures male cone and female cone. The cones vary in size and shape depending upon the species. The members includes *Pinus*, *Araucaria*, *Cupressus*, *Podocarpus*, *Cephalotaxus*, *Taxus*, *Juniperus*, *Abies*, *Picea*, *Dacrydium*, *Taxodium*, *Pseudotsuga*, *Agathis*, *Taxus*, *Larix*, *Cedrus*, *Torreya*, *Cryptomeria* etc.

### Ginkgoales

The order Ginkgoales includes one living member *Ginkgo biloba*. It is a tall and well-branched trees. It produces short and long shoots. The leaves are bilobed large, leathery, fan-shaped or strap-shaped showing dichotomous venation. The male reproductive structure is typical unbranched and appears as catkin-like inflorescence. The *Ginkgo biloba* is confined to China, Japan and Korea. It can be grown in different parts of the world. The tree is vigorously growing and showing typical pyramidal growth with spaced whorls of lateral branches.

### Gnetales

The order Gnetale includes members or genera like *Gnetum*, *Ephedra* and *Welwitschia*. These genera are morphologically very distinct. They are climbers, vines, shrubs and trees. They are producing proliferate branching showing decussate or whorled phyllotaxis. The *Welwitschia* is having a very condensed, unbranched stem with two persistent leaves. The male and female reproductive structures are borne on fertile shoot of plants.

### Plant extraction

The methods of preparation extract from stem, root, leaves and seeds can be different. The extract may be in the form of extract, decoction or powder. The required plant parts can be crushed or boiled. The extract can be isolated with the help of distilled water or any suitable solvent. The plant extract can be transformed into a powder and tablets. The plant material is dried and crushed to a powder. The extract can be converted into capsules or used in the form of injections. The traditional practice of medications is followed by tribal peoples. They directly crushed the plant material or boiled or applied whole plant part by wrapping on the body part of man. The body part was covered by the leaves as cloth to treat the ailment in the body.

There are different methods used commercially for extraction from plant parts are as follows.

#### 1. Soxhlet extraction

The Soxhlet extraction method for plant material is an efficient method as it gives maximum extraction. In this method there require less amount of solvent and minimum time for extraction. The solvents like methanol, petroleum ether and acetone can be used for extraction. High temperature affects on the important phytochemicals and bioactive compound present in plant. During extraction optimum temperature is required to avoid denaturation.

#### 2. Percolation

This method of extraction can be used to extract phytochemicals. In this method pre-soaked plant material is used for extraction. The crushing or grinding of plant material is made with chemical solvent. The extract is then filtered with the help of valve.

#### 3. Maceration

In this method maceration of plant material is made at room temperature. The plant material is constantly grinded and stirred in a container. This method cost effective and time consuming. This method is especially can be used for extraction of thermo labile bioactive components in plants.

#### 4. Ultrasound-assisted extraction

In this method plant material is taken in a glass container containing solvent. The material with solvent is kept in ultrasonic bath. The material is cellularly broken down mechanically.

**5. Distillation method:** The distillation method may be adopted for extraction.

## RESULTS AND DISCUSSION

In the present investigation, hydro alcoholic and chloroform extracts of leaves of *Cycas revoluta* were screened for antimicrobial activity against some pathogenic micro organisms by well diffusion method.

The hydro alcoholic extracts of the leaves of the plant showed potent activity against *Klebsiella pneumoniae* (zone of inhibition: 15.0 mm) followed by *Saccharomyces cerevisiae* (zone of inhibition: 14.0 mm) and *E.coli* (12.0 mm). Hydro alcoholic extracts of leaves of the plant showed potency against *Klebsiella*

*pneumoniae* (MIC: 0.8 mg/ml; MLC: 0.9 mg/ml), *E.coli* (MIC: 0.8 mg/ml; MLC: 0.9 mg/ml) and *Saccharomyces cerevisiae* (MIC: 0.7 mg/ml; MLC: 0.8 mg/ml).

Hydro alcoholic extracts showed no activity against *Lactococcus* sp., *Streptococcus pyogenes*, *Aspergillus niger* and *Candida albicans*. Hexane extracts showed almost similar potency against *Saccharomyces cerevisiae* (zone of inhibition: 12.0 mm) and *E.coli* (zone of inhibition: 11.0 mm). Hexane extracts showed no activity against *Lactococcus* sp., *Klebsiella pneumoniae*, *Streptococcus pyogenes*, *Aspergillus niger* and *Candida albicans*. The results are shown in Table 1 and 2; Figure 1 (a) and (b).

#### Antioxidant activity

In vitro antioxidant activities of hydro alcoholic and chloroform extracts were determined by Superoxide anion radical scavenging activity, Total antioxidant activity and Total Phenolic Content. Hydro alcoholic extracts showed potent antioxidant activity in comparison to chloroform extracts.

Hydro alcoholic extracts showed prominent superoxide anion radical scavenging activity (77.0 %) followed by chloroform extracts (75.0 %). The results are shown in Table 3 and Figure 3. The findings also support the results of Total antioxidant activity.

Hydro alcoholic extracts (A695-0.161) showed prominent antioxidant activity in comparison to chloroform extracts (A695-0.07). The results are shown in Table 4 and Figure 4. TPC content also validates the above findings. TPC content in hydro alcoholic extracts (92.30 mg/g gallic acid) was found to be prominent in comparison to that of chloroform extracts (83.56 mg/g gallic acid). The results of TPC are shown in Table 5 and Figure 5.

World Journal of Science and Technology | www.worldjournalo Antimicrobial activity

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The potential for developing antimicrobial drugs from higher plants appears rewarding as it will leads to the development of a phytomedicines to act against microbes. Plant based.

The plants are used in the preparation medicines in pharmaceutical industry. There are many bioactive compounds extracted from plants. The gymnospermic plants are rich with medicinal properties and bioactive compounds .The gymnospermic plants are grouped into different orders as follow.

#### Medicinal Utility of Cycadales

The members of Cycadales contain cycasin, macrozamin and nontoxic glycosides. They also contain  $\beta$ -methylamino-l-alanine. The research reports indicates that the members of Cycadales contain potent bioactive compounds The decoction of seeds of *Dioon edule* is used in the treatment of neuralgia.The young seeds of *Cycas* are used against bowel complaints The *Cycas* gum is used to cure malignant ulcers. The ulcerated wounds are treated with mucilaginous terminal buds of *Cycas circinalis*. The pollen grains of *Cycas circinalis* and *Cycas rumphii* are used to relieves pain. The seed paste of *Cycas* prepared in coconut oil is used in the treatment of wounds, swellings, boils and skin diseases. The juice obtained from young leaves of *Cycas revoluta* is used to cure blood vomiting. The decoction of stems and seeds

of various Cycads are used in the treatment of high blood pressure, headaches, rheumatism and bone pains. The decoction of cycad leaves is used in the treatment of cancer. The terminal shoot of cycads is astringent and diuretic the leaves, roots, seeds, stems and tubers of *Stangeria eriopus* are used as purgatives.

### Medicinal Utility of Coniferales

The members of Coniferales contain isoprenoids which is the main and largest group of natural phytochemicals. The phytochemicals play an important role as anti-inflammatory, anticancer, antioxidant and neuroprotective agent. It is used in the treatment of malaria and cancer. Thymol is having antiseptic property. The members of coniferales yield alkaloids like quinolizidines, indoles, tropanes, pyrrolidines, and pyrrolizidines etc. These bioactive compounds show properties like antitumor, anti-hyperglycemic and antibacterial. The *Taxus* bark yields a drug named Taxol. The Taxol is used as anti-cancer drug. The juice obtained from leaves and barks of *Taxus* is used in the treatment of bronchitis, asthma, inflammatory diseases of urinary tract, renal stones. The dried leaves are powdered and used in the treatment of epilepsy and headache. A decoction obtained from the bark is used to relieve muscle pains of knees. The leaves and stem of *Taxus orientalis* are used to cure nervous system disorders like insomnia, heart palpitations and hemorrhage.

The Polyphenols act as antioxidants and antimicrobial. The genera like *Araucaria*, *Pinus*, *Cedrus* yields good quality Polyphenols which are used in the treatment of cancer, diabetic patients. The flavonoids are the abundant phenol found in the leaves, barks and seeds of many conifers. The Stilbenes are found in *Pinus sylvestris*, *Picea* and *Abies*. The stilbenes are excellent antimicrobial compounds.

The phenolic compounds such as trans-pinossylvin; cis-stilbene, resveratrol and piceatannol are isolated from the barks of conifers. The Tannins present in conifers also act as antimicrobial agents.

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The fresh leaves of *Cedar* are traditionally used by physicians to encourage hair growth. The leaves, cones; stem bark of *Cupressus* is useful in the treatment of bleeding, asthma, cough, rheumatism, piles, urinary tract infection and excessive vaginal discharge. The resin obtained from bark and leaves of *Pinus* are reported to be used in the treatment of influenza, tuberculosis and bronchitis. The extract obtained from the leaves and bark of *Juniperus* is used in the treatment of chronic eczema, hyperglycemia, obesity, tuberculosis, bronchitis and pneumonia. The *Juniperus* species especially *Juniperus foetidissima*, *Juniperus communis* and *Juniperus excelsa* are used in the preparation of tonic and is used in the treatment of gout, rheumatism, urinary tract infection, stomach ache etc.

### Medicinal Utility of Ginkgoales

This order contains single living member named as *Ginkgo biloba*. The leaves and seeds of *Ginkgo biloba* yield biflavones, terpenoid trilactones, flavonol glycosides, proanthocyanidins, alkylphenols, simple phenolic acids, 6-hydroxykynurenic acid, 4-O-methylpyridoxine, and polyphenols. They also yield flavonoids such as quercetin, kaempferol and isorhamnetin. It also contains ginkgolides and bilobalides.<sup>[1]</sup> The biflavones include amentoflavone, 5-methoxybilobetin, bilobetin, isoginkgetin, ginkgetin, and sciadopitysin. The standardized ginkgo leaf extract contains about 3.1% ginkgolides, 2.9% bilobalides, and 24% flavonoids in leaves.<sup>[2,3,4]</sup> The ginkgolides obtained from *Ginkgo biloba* are used in the treatment of neurodegenerative diseases. The flavonoids and terpenoids are having antioxidant property. The

Terpenoids are used to enhance flow of blood circulation. The *Ginkgo biloba* is considered as a store house of riboflavin, niacin, thiamin, pantothenic acid, vitamin B-6, folates, copper, manganese, potassium, calcium, iron etc.

The extract obtained from the plant parts of *Ginkgo* act as an antioxidant which slow down changes in the brain. It is thought that problems pertaining to anxiety and vision can be treated and cured. The therapeutic effect and pharmacological action are due to the joint effect of multiple bioactive components present in *Ginkgo*.<sup>[5,6]</sup> The leaves and fruits of *Ginkgo biloba* are used to treat many human diseases.<sup>[7]</sup> The medicines prepared from *Ginkgo* are used to cure cardiovascular diseases, cancer, tinnitus, vertigo, age-related muscular degeneration, and psychological disorders like schizophrenia. It is significant in reduction of symptoms associated with dementia and Alzheimer's Disease. The extract can be used for thousands of years for treating memory loss.<sup>[8]</sup> The leaf extract seems to improve symptoms of dizziness and balance disorders in human beings. The hearing loss, can be repaired with medication of *Ginkgo*. The extract keeps the skin healthy and tight as it slow down wrinkles and age old depicting symptoms. The extract of *Ginkgo* has been shown to improve memory function and enhance motivation in a monoaminergic, in particular dopaminergic role associated with the underlying mechanism of clinical effect in *G. biloba*.<sup>[9]</sup>

#### Medicinal Utility of Gnetales

The Gnetales include species of *Gnetum* and *Ephedra*. The leaves of *Gnetum* are rich in bioactive compounds. They are flavonoids and stilbenes. The oil obtained from plant is to enhance illumination and treatment of rheumatism. The species *Gnetum montanum* yields bioactive compounds which have pesticidal properties. The *Ephedra* contains an alkaloid Ephedrine which is obtained specially from *Ephedra gerardiana*, *Ephedra intermedia*, *Ephedra nebrodensis* and *Ephedra sinica*. The alkaloids are used in the treatment of asthma, bronchitis, cough, cold, nasal disorder and hay fever. The decoction of stem and root of *Ephedra gerardiana* is used to improve circulatory and cardiac system.

The gymnospermic plant parts are used in the pharmaceutical industry for preparation of medicines which are used in treatment of various human diseases. The gymnospermic members contains bioactive compounds in root, leaves, and stem and reproductive cones. The pharmaceutical value of plant part is increasing day by day. The Standardization of the extract into dosage for safe human use are facilitated and safety measures are taken to treat the human diseases. The phytoactive compounds act as antioxidants which are useful to treat diseases of nerves, blood vessels, heart muscles and retina. The gymnospermic members contains large amounts of boflavin, niacin, thiamin, pantothenic acid, vitamin B-6, and folates. The Cycads contains  $\beta$ -methylamino-l-alanine. The modern

research focuses on the extract of medicinal plant. The therapeutic use depends upon multiple bioactive compounds. The commercial use of *Ginkgo* leaf and seeds were developed for pharmaceutical purpose since 1965 and 1974.<sup>[10,11,12]</sup> The novel phytochemicals in plants are terpenes and trilactones which are medicinally important. About 20 flavonoid glycosides are found in *Ginkgo biloba*. The antioxidants combat or neutralize the damaging effects of free radicals. The research states that *Ginkgo* extract is useful in the treatment of many diseases.

#### CONCLUSION

The medicines obtained from plant sources are widely used in the treatment of various human diseases. The source of phytochemical compounds in plants are roots, leaves, stems, barks, seeds and reproductive cones. The phytochemicals are used in preparation of allopathic, homeopathic and Ayurvedic medicines. The medicines obtained from plant sources are used to prevent ailments. The sophisticated technology has contributed a lot in the preparation of wide variety of medicines. The medicines prepared from plant sources may be in the form of tablets, capsules, injections, decoction and extracts. There are about 8 % world's population depends mainly on traditional practice of medicines. The tribal peoples are using crude extract as medicine to treat different diseases. The medicines are obtained from genera included under the orders Cycadales, Coniferales, Ginkgoales and Gnetales. The members are rich in secondary metabolites that are important in synthesis of medicines. The allopathic medicines are used to treat human diseases like dementia, fatigue, anxiety, depression, schizophrenia, insufficient blood flow to the brain, blood pressure problems, altitude sickness, erectile dysfunction, asthma, neuropathy, cancer, premenstrual syndrome, attention deficit, hyperactivity disorder, macular degeneration etc.

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