CHAPTER-5

SUMMARY
The use of plant for the alleviation of human sufferings is as old as civilization itself. It is a well known fact that nature alone knows what is in its store. In all times people throughout the world have attempted to utilize the flora and fauna of their respective region. The curing properties of plants have been achieved through trial and error. The present system of medicine had gain the modern shape by assembling the past knowledge which has been passed down by our ancestor for remedies. Today pharmaceuticals from plants had attracted botanists, pharmacists, molecular biologists and above all major pharmaceutical companies. India has lot of potential to fulfill the growing demand of biopharmaceuticals from the plants. Sustainable and mass cultivation of the medicinal plants is a challenge. Several factors such as soil, rainfall, altitude, light, method of cultivation and numerous activities of man influence the growth and propagation of plants.

In the course of this exploratory work, above theme was a guiding and inspiring factor, hence the plants *C. paniculata*, *W. sominifera*, *C. aromatica*, and *A. calamus*, were studied carefully, keeping in view the medicinal uses of the species. The aim of this study is to make the optimum sustainable use of the plant resources gifted to man by nature, to mark out new and lesser known plants of medicinal uses from native places and the conservation of these resources.

The present work entitled “Ecophysiological and phytochemical studies on some medicinal plants”, contain an investigation on the following aspects.

1. Ecophysiological observations including the Study area, Phenological behaviour, Seed collection, Seed viability and Germination studies etc.

2. In the phytochemical studies the qualitative analysis of the plant part, which is medicinally important, was done.

The work has been grouped into different chapters followed by references.
First of all a brief introduction of distribution, tribal utility, cultivated area and historical background of medicinal plants was discussed. A detailed review of the work done by various researchers, botanists, medical practitioners etc. was acknowledged. The review includes recent work done on medicinal plants.

Study sites deals with the area where the research work is carried out which is located in Sagar district of Madhya Pradesh (MP). It occupies almost the central region in the country, situated at 23°10' and 24°10' N latitude and 78° 40' longitudes on an average height of 583 meters above mean sea level (msl). The main geological formation of the district is Basalt and Vindhyan sandstone. The climate of the region is broadly characterized by three distinct seasons. The temperature varies between 7°C to 44°C and the average annual rainfall is around 850 mm. The relative humidity varies from 25.93% to 94.17%. Out of total 10246 sq.km. area of the district 3014 sq km. area is covered with tropical dry deciduous forests. A brief description of species is also given.

Phenological events of the test species were observed through out the year i.e. from July 2004 to July 2005 at different sites of Sagar district, for recording flowering, fruiting, fruit maturation, seed dispersal, budding, and vegetative phases. These phenological events are in accordance with the findings of various workers of this area under study, where these events were restricted only to a particular period of the year.

Seed collection was done by hand plucking in *C. paniculata* and *W. somnifera* seed. Since *A. calamus* has spike and *C. aromatic* has spadix therefore seed extraction was done manually. All extracted seeds were stored in sealed polythene bags at room temperature in the laboratory.

Seed viability was tested by cutting test and biochemical test by 2, 3, 5 triphenyl tetrazolium chloride (TTC) and indigo carmine (IC) staining test. The results of cutting test for viability have provided reliable and accurate picture of healthy seeds correlated with germination percent on the basis of staining pattern of seeds with Tetrazolium chloride (TTC) and Indigo carmine (IC), seeds were
differentiated into viable and non viable. Seeds were classified into 8 vigour classes depending on the degree of staining in a seed lot.

For germination study, seed germination and vegetative propagation was studied by different methods which are:-

a. Seed size and weight  
b. Moisture content  
c. Seed storage  
d. Imbibition  
e. Temperature  
f. Hormone treatments  
g. Potting media  
h. Depth of sowing  
i. Light condition

Morphological parameters such as length, width, shape and size of seeds/propagule were studied. Wrinkled, damaged and infected seeds were separated from the total lot. Seed health was studied by blotter method and seed percentage was calculated from the seed lots.

Seeds were used right after collection. Seeds can be stored for long duration, provided suitable conditions of moisture, temperature; aeration, light etc. Besides the atmospheric humidity, moisture content of seed is also very important factor as seeds are normally hygroscopic and loose or gain moisture content depending upon the difference between the moisture status of both the atmosphere and seeds (which differ from species to species).

Effect of storage period on seed germination was studied and it was observed that the seeds stored for 6, 12 and 24 months period showed a decline with the passage of time in germination. The viability or germinability of *W. somnifera* and *C. paniculata* exhibits a trend of a sharp decline at room temperature with increase in the storage period. In *W. somnifera*, at room temperature germination was 80% in fresh seeds, which declined to 40% after 24 months. In *C. paniculata* seeds lost their viability after 8-10 months even though they were stored in sealed polythene bags.
Summary

Imbibition of water is the first process in the seed germination. In *W. somnifera* maximum germination was found when seeds were imbibed for 8-12 hours. In *C. paniculata* seeds with the increase in imbibition period, germination percent was increased. Therefore imbibition period enhances germination percentage as well as the speed of germination to a certain extent, after that it goes on decreasing.

Temperature has profound affect on the seed germination. At very low and very high temperature seed germination of both the species was visualized. Comparatively higher germination occurred between 20°C to 35°C. The best germination in *W. somnifera* and *C. paniculata* was observed between temperature 25°C to 35°C. The germination percent rises with the rise in temperature. In both the species germination was highest at 30°C. It was observed that germination speed was slower at 20°C and at 40°C. Since at these temperatures the metabolic activities might have remained slow.

The effect of different concentration of hormones on seed germination indicated that seed germination was good at 2, 5 and 10 ppm concentrations. With increase in IAA concentration there was decline in germination percentage. Presoaking treatment with IAA, IBA and GA₃ shows good germination between 2-10ppm while results were not satisfactory when the concentration is increased. Hormone treatment saw good germination as compared to control.

For studying the effect of potting media on seed germination and seedling growth, three different potting media were taken. It was observed that the best medium for germination and growth of seedlings in *W. somnifera* and *C. paniculata* is soil (100%). This is due to suitable aeration and water retaining capacity of soil (100%), which favours germination.

Sowing the seeds at 2.5 cm depth was found suitable for better germination. The seeds completely failed to germinate at a depth of 5 cm. When seeds were sown by different methods i.e. broadcasting, strip and dibbling method, germination percent was found comparatively low in dibbling method. In *W. somnifera* best result was observed with broadcasting and in *C. paniculata* best result was observed with strip method.
An attempt has been made to study the effect of different light condition on seedling growth. The effect of light condition on root and shoot length in *W. somnifera* and *C. paniculata* indicated that root length was maximum in full Sunlight condition. Root /shoot ratio, in both species, is maximum in full Sunlight, optimum in semi shady and minimum in shady condition. This appears due to different needs of individual species with respect to the microclimatic requirements such as humidity, temperature and soil condition, which are all affected due to light conditions.

Vegetative propagation of *A. calamus* and *C. aromatica* was carried out in different potting media, depth of sowing, light condition and different hormone treatments. *A. calamus* and *C. aromatica* show good germination when propagated in soil (100%). Sprouting percent and plant percent was also good in soil (100%).

Depth of sowing had marked effect on the propagation of rhizomes. The rhizomes were planted at the depths of 4.0cm, 5.5cm and 7.0 cm. The number of leaves per plant, number of sprouts and shoot length were maximum at shallow depth of planting. In *A. calamus* the height of the plant was 60.0 cm after 65 days and 78.0cm after 85 days when rhizomes were planted at the depth of 4 cm. Maximum numbers of leaves per plant after 65days was 9.06 and after 85 days was 13.0. In *C. aromatica* height of plant was 5.0cm and 42.5cm after 65 and 85 days when rhizomes were planted at the depth of 4.0cm. Maximum sprouting percent was 3.94 after 65 days and 5.06 after 85 days, number of leaves per plant after 65 days was 6.03 and after 85 days it was 8.0.

In *A. calamus* the GA₃ (gibberlic acid) treated rhizome did not show any good rooting response. Although, sprouting and rooting percent was quit higher at all the concentrations of GA₃ than in IBA while rooting percent, shoot length, root length percent was low. Rhizomes treated with 400 ppm and 600 ppm concentrations of IBA shows highest responsiveness in percent sprouting, percent rooting, shoot length, and root length. In *C. aromatica* sprouting percent was higher in 400 ppm and 600 ppm concentration of GA₃ but rooting percent, shoot length and root length was low.
Maximum length of rhizome in *C. aromatica* was obtained in semi shady condition while in *A. calamus* maximum rhizome length is observed in full Sunlight condition. However, the minimum rhizome length was recorded in shady condition. Maximum number of leaves was observed in *C. aromatica* in semi-shady condition, while in *A. calamus* maximum leaves were observed in full Sunlight. Plant height was highest in semi-shady condition in *C. aromatica* and in *A. calamus* maximum height was observed in full Sunlight.

The objective of the phytochemical screening of plants was to find out biologically active chemical compounds, which can be modified through chemical procedures into drug. The phytochemistry has played a dynamic role in the well being of man kind. The curative value of the medicinal plants is due to the presence of active principles in them. After the establishment of the ethanomedicinal importance of both the species, all the plant parts were subjected to phytochemical analysis for detecting the presence of active constituents such as alkaloids, glycosides, carbohydrates, phenols, tannins, saponins, steroids, flavonoids and essential oil etc.

In the present study plants parts which are medicinally important were extracted by Soxhelet extractor. Preliminary successive solvent extraction was done with different solvent system i.e. petroleum ether, Benzene, chloroform, acetone, ethanol and chloroform: water (1:9). These extracts were subjected to qualitative chemical test to check the presence of different active chemical groups and compound viz. alkaloids, glycosides, carbohydrates, amino acids, tannins, flavonoids, etc.
GLOSSARY

- **Analgesic** – A compound capable of producing analgesia, i.e. one that relieves pain by altering perception of nociceptive stimuli without producing anesthesia or loss of consciousness.
- **Aphrodisiac** - Increasing sexual desire.
- **Diaphoretic** - Relating to, or causing, perspiration.
- **Emetic** - Relating to or causing vomiting.
- **Emmenagogue** - An agent that induce or increase menstrual flow.
- **Stimulant** - Stimulating; exciting to action.
- **Tonic** - In a state of continuous unremitting action.
- **Antibacterial** - Destructive to or preventing the growth of bacteria.
- **Antidote** - An agent that neutralizes a poison.
- **Anti-inflammatory** - Reducing inflammation by acting on body mechanisms.
- **Antipyretic** - Reducing fever, An agent that reduce fever.
- **Anticonvulsant** - Preventing or arresting Seizures.
- **Anti-asthmatic** - Tending to relieve or prevent asthma.
- **Anti-oxidant** - An agent that inhibit oxidation and thus prevents rancidity of oil and fats.
- **Epilepsy** - A chronic disorder characterized by paroxysmal brain dysfunction due to excessive neuronal discharge.
- **Delirium** - An altered state of consciousness.
- **Hysteria** - A somatoform disorder in which there is an alteration or loss of physical functioning that suggests a physical disorder such as paralysis or an arm or disturbance of vision.
- **Sedative** - Calming; a drug that quiets nervous excitement.
- **Antidepressant** - An agent used in treating depressant.
- **Laxative** - Having the action of loosening the bowels.
- **Rheumatism** - Indefinite term applied to various conditions with pain or others symptoms of articular origin or related to other ailments of musculoskeletal system.
- **Carminative** - preventing the formation or causing the expulsion of flatus.
- **Psoriasis** - A common multifactor inherited condition characterized by the eruption of circumscribed.