Introduction and Review of Literature
INTRODUCTION

India is enriched by a variety of flora comprising of medicinal and aromatic plants. Man is using plant products to cure disease since time immemorial. The Indian system of medicine consists of Ayurveda, Siddha, Unani and therapies such as yoga and naturopathy (Anonymous, 2000). Various herbs have been well recognized and cataloged by botanists from high ranges of the Himalayan tract to the sea shore of Kanyakumari. This extensive flora is being utilized as a source of drugs in the Indian traditional system of medicine (Agrwal and Paridhari, 2007). In this system of medicine several herbs are used as medicinal plants. India is rich source of plant wealth with approximately more than 25,000 plant species. Charaka samhita describes about 600 drugs of plant origin (Anonymous, 1992). About 1500 plant species in Ayurveda and 1200 in Siddha are used for drug preparation (Jain, 1987: Krishnakumar and Sureshkumar, 1995). About 7500 plant species are recorded as medicinal plants (Anonymous, 1996). The Indian traditional systems of medicine Ayurveda is referred to as the “mother of all healing”. Ayurvedic system of medicine goes back to over 5000 years, in the Himalayan mountains of India. The word Ayurveda has been derived from two Sanskrit words ayurh meaning life and veda meaning knowledge or science of life. Ayurvedic knowledge was transmitted orally through the generations and then written down in the Vedas. The Vedas were written in Sanskrit in approximately 2500 BC or earlier. Current knowledge about Ayurveda is mostly drawn from three main Ayurvedic texts primarily the Charaka Samhita (approximately 1500 BC). Charaka Samhita written by Charaka is the principal classic
reference. It gives importance to the nature of each person such as body care, mental regulation, and spiritual consciousness, Sushrut Samhita (300 - 400 AD) the most authentic compilation of Sushruta’s teachings contains 184 chapters and description of 1,120 illnesses, 700 medicinal plants, 64 preparations from mineral sources and 57 preparations based on animal sources. Ashtang Hrdyam (approximately 500 AD) is a concise version of the works of Charaka and Sushruta. These three sources of literature describe basic principles and theories from which Ayurveda has evolved.

Nagarjuna was the great scientists of India. He was a Buddhist monk Nagarjuna during 1st century A.D. and was the author of Rasavaisheshika Sutra, Siddha Nagarjuna which deals with fundamental theories in Ayurveda, Jeevaka was a well known physician of Lord Buddha who studied the science of medicine at the university Takshashila from reputed physician Bhikshu Athreya. It is said that he was expert in curing Eye diseases, Tumours, Dropsy, swelling glands and even performe cranial operations (Vorstermans, 2007). In Ayurveda plants and their products are used as the source of medicine. These plants are the chemical laboratories which synthesize biologically active secondary metabolites. Most of the modern medicinal knowledge originated from the plant metabolites. According to the data of Food and Agriculture organization more than 50,000 plant species are being used in the traditional folk medicine throughout the world (Schippmann et al., 2002). It is notable that World Health Organization is showing great interest on drugs derived from natural sources especially from traditional system and folk medicine. Among the natural sources plants are
economically viable and they are the source for abundant bio-chemical intermediates which produce new drugs with minimum side effects (Rastogi, 1980). Due to safety and acceptability of Indian system of medicine the demand of various plants for the pharmaceutical industry increased. It led to the change in social structure. Rapid advancement in this system of medicine as a result traditional skill and wisdom is slowly disappearing and led to adulteration within Ayurvedic drugs. Adulteration in traditional herbal drugs may take place due to poor taxonomic knowledge multiple vernacular names of medicinal plants. It also cause problems in the identification of correct botanical names of medicinal plants. Hence, it is necessary to properly document the ayurvedic knowledge and standardization of Ayurveda, Siddha and Unani medicines. Traditional prescriptions and practices will not sustain for use in later generations, if the drugs are not standardized.

**Pharmacognosy and standardization of drugs**

The term pharmacognosy is derived from two Greek words 'Pharmacon' meaning drug or medicine and 'gnosis' meaning knowledge. It was used for the first time by an Austrian physician, Schmidt in the years 1811 and 1815 as referred by Cr. Anotheus Seydle in his literature entitled ‘Analecta Pharmacognostica’. Pharmacognosy is closely related to medicines which were developed during early nineteenth century. It is considered as a branch of Materia medica and applied biology. It is oldest branch of pharmacy. The Greek physician Dioscorides is considered as the founder of Pharmacognosy in Europe during first century A.D. His book “Materia medica” was used as a handbook on the subject till 19th century.
Greek pharmacist Galen (131-200 A.D) described various methods for preparation of herbal medicines with the help of active constituents of crude drugs. At present the branch is dealing with the extraction of plant and animal drugs. Medieval Arab physicians made a major contribution to the field of pharmacognosy with original work in the form of literature such as prescription manuals and handbooks for the use of medicinal plants appeared in Russia in late 17th and early 18th centuries. The first Russian pharmacopoeia ‘Pharmacopoea Rossica’, came out in the year 1778; N. M. Ambodik-Maksimovich’s multi-volume *Materia medica* published between 1783 and 1788 included descriptions of many medicinal plants. A. P. Neliubin, Iu. K. Trapp, and V. A. Tikhomirov also made important contributions to Russian pharmacognosy (www. encyclopedia 2). It includes information of drugs having their origin in plant and animal kingdom. The subject pharmacognosy can also be treated as an applied science that deals with biological, biochemical, therapeutic and economic features of natural drugs and their constituents. Originally during the 19th century and beginning of the 20th century "pharmacognosy" was used to define the branch of medicine or commodity sciences which deals with drugs in crude or unprepared form. Crude drugs are the dried unprepared material of plant animal or mineral origin to be used for medicine. In the beginning of 20th century the subject developed mainly on the botanical side being particularly concerned with the description and identification of drugs both in their sole state and in powder form. The studies on pharmacognosy of plant drugs include parameters such as sources of drug, morphological character, histological characters,
chemical constituents and their qualitative tests, physicochemical tests and pharmacological action of either drug or the active constituents. Natural Products Alert Database (NAPRALERT) and dictionary of natural products are the two main databases for natural products (Corley and Durley, 1994).

A system to ensure that every packet of medicine that is being sold include specific substances in specific amount to induce its therapeutic effect is known as standardization. (Ekka et al. 2008). The standardization for every medicine in the market is important as variation in different batches of medicine is enormous. World Health Organization (WHO) encourages and promotes herbal remedies in national health care programs as they are easily available in the market at low cost are safe and the people have faith in them. The WHO assembly emphasized the need to ensure quality control of medicinal plant products by using modern techniques and suitable standards. (Chaudhury 1999; Raina 2003)

**TOPOGRAPHY OF MARATHWADA REGION**

The Marathwada region is spread over 64,798 Sq.Km having population of 1,56,29,248 souls with population density 241 souls/ Sq. Km² (as per 2001 census). Marathwada region comprises eight districts viz. Aurangabad, Beed, Hingoli, Jalna, Latur, Nanded, Osmanabad and Parbhani. The location of Marathwada is on 70°5’-78°5’ E longitude and 17°5’-20°5’ N latitude which forms the part of the vast Deccan plateau of India and is one of the six divisions of Maharashtra State. The Marathwada region is bounded by Vidarbha on the north, Andhra
Pradesh on the east and southeast Karnataka on the south and western Maharashtra on the West. The entire region is situated at an average height of about 300-650 m. above mean sea level which is gradually sloping from west to east and is traversed by hill ranges originating from the Sahyadris in the West and the Satpudas in the north. Different ranges derive their names from local sources the northern being Ajanta-Satmala ranges and the Southern being Balaghat ranges. In addition to these there are scattered hillocks of varying heights throughout the region the highest peak Surpal Nath (960 m. above msl) being situated near Kannad in Aurangabad district.

**SOIL**

Soil of Marathwada region is red as well as black cotton soil formed by granitic rock. Deep black soils are found in major parts formed by trap rock. Variation occurs in soil according to the type of area for example in the eastern parts along with sandy soil along the bank of river clay and loam gets accumulated at the hill tops barren land and low lying area. The geological formations of the regions are characterized by the Deccan traps (Upper cretaceous to lower Eocene).

**CLIMATE AND RAINFALL**

The climate of Marathwada region is generally hot and dry. It receives low rainfall. Average temperature ranges from 27.7 °C to 38.00 °C during days, while in the night temperature ranges from 20.0 °C to 26.9 °C. The temperature during summer is highest and may reach to about 43.3 °C while it is lowest during winter nights (about 6.0 °C). Relative humidity is extremely low for major part of the year (between
35 to 50%) while it is highest (85%) during monsoon. The middle of June to the end of September are rainy seasons. Winter starts in the middle of November and ends by the end of the January while summer from February to middle of June. The rainfall is variable from year to year and on an average the region receives about 90 cm rain during a year. However, the average rainfall has decreased in the recent years. The region falls in the rain shadow of the Sahyadris. The major amount of south west monsoon precipitation is received on the west Coast of India due to the Sahyadris and only a small amount escapes through high hills which is received by the Deccan Plateau.

The Godavari is the main river in the Marathwada region. The region is divided into upper and lower Godavari basin. Bindusara, Manjra, Manad, Terna, Teru, Kayadhu and Lendi are tributaries of Godavari and Sukhna rivers.

Marathwada region receives low rainfall. Some parts of Marathwada having good fertile land with favorable climate. These regions show ample bio-diversity. Other parts of the region also shows its importance by producing medicinal and other useful plants. Aurangabad and Nanded districts of Marathwada region show relatively more forest cover. The trees of *Tectona grandis*, *santalum album* L., *Hardwickia binata* L., *Madhuca longifolia* (Koen.) Macbride etc. are of common occurrence in these forests. In Aurangabad district, Gautala is a well known sanctuary. This thorny scrub forest has major trees like *Zizipuz jujuba*, *Acacia nilotica* etc. Marathwada region is rich in vegetation specially that of medicinal plants which are available on a large scale. At present more than 1719 flowering plants have been
reported to occur in Marathwada. At least 22% species are known to possess considerable medicinal properties. The multitude local names, imperfect botanical knowledge as well as intentional adulteration in raw material has resulted into impure and ineffective Ayurvedic medicine. As a result of which the pharmaceutical companies are not in a position to produce good quality of medicine. Identification of raw material, which is available in the market is difficult as it is supplied in the form of either powder or extract.

The pharmacognostic parameters are major, reliable and inexpensive criteria for conformation of the crude drugs. It is concerned with solving the problem of drug adulteration with identification of plant material as well as market sample. The present work, therefore, attempts to report various necessary pharmacognostic standards such as Botanical identification, Pharmacognosy, Antibacterial study, Chemical analysis etc. which may help in this respect. A list of certain medicinal plants is given below:
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Botanical Name</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Helicteres isora</em> L.</td>
<td>Malvaceae</td>
</tr>
<tr>
<td>2</td>
<td><em>Tribulus terrestris</em> L.</td>
<td>Zygophyllaceae</td>
</tr>
<tr>
<td>3</td>
<td><em>Oxalis corniculata</em> L.</td>
<td>Oxalidaceae</td>
</tr>
<tr>
<td>4</td>
<td><em>Cullen corylifolium</em> (L.) Medik.</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>5</td>
<td><em>Ludwigia perennis</em> L.</td>
<td>Onagraceae</td>
</tr>
<tr>
<td>6</td>
<td><em>Echinops echinatus</em> Roxb.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>7</td>
<td><em>Eclipta prostrata</em> (L.) Mant.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>8</td>
<td><em>Glossocarpus bosvallea</em> (L.f.) DC.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>9</td>
<td><em>Tridax procumbence</em> (L.) L.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>10</td>
<td><em>Mimusops elengi</em> L.</td>
<td>Sapotaceae</td>
</tr>
<tr>
<td>11</td>
<td><em>Rauvolfia tetraphyla</em> L.</td>
<td>Apocynaceae</td>
</tr>
<tr>
<td>12</td>
<td><em>Hemidesmus indicus</em> (L.) R. Br</td>
<td>Apocynaceae</td>
</tr>
<tr>
<td>13</td>
<td><em>Nanorrhinum ramosissinum</em> (Wall.) Batsche.</td>
<td>Plantaginaceae</td>
</tr>
<tr>
<td>14</td>
<td><em>Verbascum chinense</em> (L.) Santapau</td>
<td>Scrophulariaceae</td>
</tr>
<tr>
<td>15</td>
<td><em>Dolichandrone falcata</em> (Wall, ex DC.) Seem.</td>
<td>Bignoniacae</td>
</tr>
<tr>
<td>16</td>
<td><em>Hygrophilla auriculata</em> (Schumach) Heine.</td>
<td>Acanthaceae</td>
</tr>
<tr>
<td>17</td>
<td><em>Phyla nodiflora</em> (L.) Greene</td>
<td>Verbenaceae</td>
</tr>
<tr>
<td>18</td>
<td><em>Lavandula bipinnata</em> (Roth.) Kuntze.</td>
<td>Lamiaceae</td>
</tr>
<tr>
<td>19</td>
<td><em>Leucas cephalotes</em> (Roth.) Spreng.</td>
<td>Lamiaceae</td>
</tr>
<tr>
<td>20</td>
<td><em>Cruculigo orchoides</em> Gaerth.</td>
<td>Hypoxidaceae</td>
</tr>
<tr>
<td>21</td>
<td><em>Drimia indica</em> (Roxb.) Jessop.</td>
<td>Asparagaceae</td>
</tr>
<tr>
<td>22</td>
<td><em>Ledebouria revoluta</em> (L. f) Jessop.</td>
<td>Asparagaceae</td>
</tr>
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</table>
During present investigation, pharmacognostic standards of selected plant parts were studied using following parameters:

I. Morphology :- The gross morphological characters of selected plant parts which include habit, nature of the leaves, floral characters and information on fruits and seeds, in addition to additional characters.

II. Anatomy : Anatomical studies include histological observations of transverse sections of the medicinally important plant organs along with their measurements, which enable to understand the nature of different cell arrangement of selected plant parts which are having medicinal uses.

III. Maceration :- Maceration studies include observations on Parenchyma, Fibres, Trecheids and Vessels of selected plant parts, along with their dimensions.

IV. Epidermal studies :- Epidermal studies include details of the epidermis, cuticle, Trichomes, Stomata and Guard cells with their dimensions. In addition it will give information on stomatal index.

V. Phytochemistry :- Phytochemical studies include detection of active constituents with their chemical structure and molecular formula of selected plant parts.
VI. Antibacterial activity :- Antibacterial studies were carried out using methanol extract of selected plant parts against the growth of three human pathogenic bacteria.

The above parameters were used to compare samples and also for authentication of selected plants or plant parts. These combinations are useful in accurately determining purity of drugs and their adulterants if any. The results of the studies are presented in following chapters -

I. Introduction and Review of Literature.
II. Materials and Methods.
III. Morphology and Medicinal uses of plants.
IV. Anatomy of plants.
V. Maceration of plants.
VI. Epidermal study of plants.
VII. Phytochemistry of plants.
VIII. Antibacterial study of plants.
IX. Results and Discussion.
X. Conclusions.
XI. Bibliography.
REVIEW OF LITERATURE

The forest of Maharashtra has a great potentiality both from economic and botanical point of view. Maharashtra state is medicinally well explored, for which most of the work was done during the years 1982-2012. The work done so far in the field of ethnobotanical resources by different workers, is helpful in retaining the disappearing knowledge and making it available to local communities in Maharashtra state.

frequency, distribution and phenology of various medicinal plants for their proper utilization.

Dama et al. (2011) studied the cardiac stimulant effect of fruits and compared it with cardiotonic activity of digoxin the life saving cardiotonic. The activity was tested by using isolated frog heart. The preliminary studies confirm better cardiotonic activity of Helicteres isora L. as compared to digoxin. Akhila and Aleykutty (2012) reported docking studies of the plant constituents using autodock 4.0 and the receptors used were aldose reductase and insulin receptor protein. Analysis of the results showed that with both the receptors, yohimbine had the best binding energy and so most potent antidiabetic constituent among the identified constituents of Helicteres isora L. fruit. Dhevi et al. (2008) revealed that at the dose of 250 mg/kg, Helicteres isora L. had a hepato-curative potential after CCl4 intoxication in rats. They and provided a scientific background for traditional use of this plant in the management of liver diseases Mathew and Unithan (1992) reported anticancer properties of Hemidesmus indicus (L.) R. Br. Celastrus paniculatus, Helicteres isora used by the tribals of Wyanad, Malappuram and Pal ghat districts of Kerala, India. Kumar et al. (2007) showed that Helicteres isora L. bark extract has anti-hyperglycemic effect and consequently may alleviate liver and renal damage associated with streptozotocin induced diabetes in rats. Pohocha and Grampurohit (2001) conducted acute toxicity studies on mice and the LD50 was determined. The result indicated that the fruits possess very good antispasmodic activity. Elsa et al. (2012) reported antibacterial activities of isolated constituents of methanolic extract of fruits of
Helicteres isora L. against Escherichia coli, Pseudomonas aeruginosa, Salmonella abony and Staphylococcus aureus. The presence of phenolic compounds, flavonoids, and alkaloids were responsible for the potent antibacterial activity of the fruits of Helicteres isora L.

Prusty et al. (2012) reported that methanolic and aqueous extracts of Tribulus terrestris L. is effective against ethylene-glycol induced urolithiasis in albino rats. Mahato et al. (1978) isolated diosgenins from Tribulus terrestris L. Patil et al. (2012) reported that T. terrestris L. extracts contain significant amount of phenols and flavonoids. Bedir and Khan (2000) isolated, new steroidal glycosides from the fruits of Tribulus terrestris L. Bhutani et al. (1969) reported kaempferol 3-glucoside, kaempferol 3-rutinoside and tribuloside -4 from fruits and leaves of T. terrestris L. Ren et al. (1994) reported a new derivative of cinnamic amide from Tribulus terrestris L. which was named as terrestrimamide and a known compound 7, Methylhydroindanone Tomova et al. (1974) isolated, steroid saponins and sapogenins IV from Tribulus terrestris L. Kumar et al. (2011) investigated that Tribulus terrestris L. fruit extract exerted significant and much better anti microbial and anthelmintic activities. Jindal et al. (2012) evaluated antimicrobial study against two Gram negative bacteria (Escherichia coli MTCC 46 and Proteus mirabilis MTCC 1425), one Gram positive bacteria (Staphylococcus aureus MTCC 87) and two fungi (A. flavus MTCC 277 and A. niger MTCC 282). The plant exhibited good activity against bacteria while it showed no activity against fungi during his studies on antimicrobial activity of Tribulus Terrestris L.
Salave and Reddy (2012) surveyed Garbhagiri hills in Ahmednagar district for documentation of information on the traditional vegetable of the native wild ethenoflora. Among the local inhabitants *oxalis corniculata* leaf and shoot were found to be using used as vegetable. Ciocarlan (2000) reported that *Oxalis corniculata* L. was of mediterranean origin. Kirtikar and Basu (1975) reported *Oxalis corniculata* L. as a sub-tropical plant originated from India. Koditala et al. (2012) reviewed, phytochemical and pharmacological details about the plant. Phytochemical investigations of *Oxalis corniculata* L. Han (1998) revealed the presence of tannins, palmitic acid, a mixture of oleic, linoleic, linolenic and stearic acids. Raghvendra et al. (2006) reported that methanolic and ethanolic extracts of this plant show the presence of carbohydrate, glycosides, phytosterols, phenolic compounds, flavanoids, proteins (12.5%), amino acids and volatile oil in addition to antibacterial activity. Manna et al. (2010) concluded that Galacto-Glycerolipid isolated from *Oxalis corniculata* is a strong therapeutic agent to eliminate intestinal pathogens *Entamoeba histolytica* and *Giardia lamblia*. Unni et al. (2009) studied antibacterial activity and phytochemistry of medicinal plants of five traditional medicinal plants, *Leucas lanata*, *Murraya koengigi*, *Oxalis corniculata*, *Alternanthera sessilis* and *Piper peepuloides* which showed good inhibition zones. The leaves of *O. corniculata* also exhibited higher percentage of protein (12.5%). Patil (2011) evaluated and suggested antiulcer activity of *oxalis corniculata* leaf due to the presence of flavanoids and tannins in them. Khan et al. (2012) Suggested antioxidant potential of *Oxalis*
corniculata methanol extract as evidenced by scavenging of free radicals and hepatoprotective capacity.

Khan (1975) mentioned that, *Cullen corylifolium* (L.) Medik. is distributed all over Pakistan. Datta and Das (1970) studied detail Morphology and anatomy of *Cullen corylifolium*. Sangeetha and Sarda (2012) gives a overall view of the phytochemicals present in the seeds of *Cullen corylifolium* (L.) Medik. which can be used as biological products in the field of medicine as well as Agriculture. Wang et al. (2009) screened and identify bioactive compounds with anticancer activity from the seeds of *Cullen corylifolium* (L.) Medik. These results suggested that *psoralen* and *isopsoralen* are responsible for anticancer effect of *Cullen corylifolium* (L.) Medik. Gidwani et al. (2010) studied the efficacy of an herbal semi solid formulation prepared from hexane extract of seeds of *Cullen corylifolium* (L.) Medik. which has anti-inflammatory and antimicrobial properties, in the treatment of eczema Abeysekera et al. (2012) studied composition and standardization of “Bakuchi oil” prepared From *Cullen corylifolium* (L.) Medik. used in the treatment of Vitiligo.

Khanna (2009) reported 153 invasive alien taxa of angiosperms naturalized in the flora of Uttar Pradesh. Data on correct botanical name, family name, nativity and habit of each taxa have been provided. Roy et al. (2011) reported an eco-taxonomic study of the genus *Ludwigia* of Chhattisgarh India which provides eco-taxonomic account of Genus *Ludwigia* of family onagraceae, which is represented by 5 species in Chhattisgarh. Their nomenclature, description, Phenological data, Distribution and uses etc. are given along with key to the species. Jangid
et al. (2012) studied bioaccumulation and Phytotoxicity of Copper in
*Ludwigia perennis* L. in Urban Industrial Environment and concluded
that *Ludwigia Perennis* L. is tolerant to the elevated copper
concentrations therefore *Ludwigia perennis* L. may be used for
biomonitoring of copper pollution in the environment. Rothe (2011)
reported Exotic medicinal plants from west vidarbha region the work
deals with the report of 26 medicinally important exotics from Vidarbha
region and their medicinal use. Singh et al. (2012) reported leaf of
*Ludwigia* in Odisha for diarrhoeal diseases. He documented 203 plant
species which are currently used in folk medicines for treatment of
diarrhoeal diseases in Odisha. Shrisha et al. (2011) reported
bioprospecting of selected medicinal plants for antibacterial activity
against some pathogenic bacteria.

Khan (2000) discussed ethnobotany and taxonomic studies of
*Echinops echinatus* Roxb. (Untkatara) from Potohar region of Pakistan.
The ethnobotanical information was verified by cross-checking with
the people of different localities. The plant is diuretic, alterative,
aphrodisiac and nervine tonic. It is also recommended in hysteria,
dyspepsia, jaundice and scrofula. Somashekar and Mishra (2007)
reported macroscopy, microscopy and phytochemistry for evaluation of
the roots of *Echinops echinatus* Roxb. Leena et al. (2010) discussed
traditional uses of plants as cooling agents by the tribal and traditional
communities of Dang region in Rajasthan, India. *Echinops echinatus*
Roxb. paste smeared on soles and palms prevent heatstroke. Singh et al.
(1999) described anti-inflammatory activity of ethanol extract of
*Echinops echinatus* Roxb. Chaudhuri (1997) isolated Echinozolinone, an
alkaloid from *Echinops echinatus* Roxb. In addition to echinopsine and echinopsidine, a new alkaloid, echinozolinone, has been identified in *Echinops echinatus* Roxb. as 3(2-hydroxyethyl)-4 (3H)-quinazolinone from its spectral data. Singh et al. (1998) investigated antifungal activity of some new flavones and flavone glycosides of *Echinops echinatus* Roxb. Four phenolic compounds viz. apigenin, apigenin-7-O-glucoside, echinacin and echinaticin were isolated from the whole plant of *Echinops echinatus* Roxb. The latter two compounds were isolated for the first time. Echinacin which was highly effective at 150 μg mL-1, is considered as most promising and its use as a control measure against *Alternaria* blight of pigeon pea under field conditions has been suggested.

Rechinger (1989) stated in his Flora Iranica that *Eclipta* includes about four species in tropical and subtropical regions. Umemoto et al. (2007) reported that *Eclipta* in eastern Asia is taxonomically revised, and four species are recognized, of which *E. angustata* is described as new. One species *Eclipta alba*, is introduced from the New World, and the other three species are endemic in eastern Asia. *Eclipta prostrata* L. and *E. angustata* Umemoto & H. Koyama. are distributed in Thailand as well as in the neighboring areas, but *E. thermalis* is known in the temperate regions of eastern Asia. Holm et al. (1977) mentioned that plants adapt easily to the changing environmental conditions and are most troublesome in warm, low-lying areas with high rainfall but can also tolerate saline conditions, higher altitudes and drier sites. Behera and Patnaik (1977) reported *Eclipta prostrata* (L.) L. Mant. an edible plant is of great economic value both for its protein content as well as

Sangai (1995) investigated morphological and anatomical characters for studies on pharmacognosy of Glossocardia bosvallea (L.f.)Dc. Patil et al. (2006) described herbal remedies with Glossocardia bosvallea (L.f.) Dc. and other plants used by tribals of Nasik district, Maharashtra. Fawar et al. (2001) described Glossocardia bosvallea (L.f.) Dc. and other medicinal plants as a Herbal folk Medicines of Jalgaon district Maharashtra Birasdar et al.(2010) described medicinal uses of Glossocardia bosvallea (L.f.) Dc. and other plants of tribals of Kinvat forest of Nanded district (Maharashtra). Yadava et al.(2012) reported the isolation and structural elucidation of a new allelochemical
5,6,7,4′, tetrahydroxy 3-methoxy flavone -7-O-β-D xylopyranosyl (1→4)-O-β-D- glucopyranoside (A) which showed antiviral activity, along with two known compounds 6, 4′-dimethoxy-5, 7-dihydroxy-flavone (B) and Isoorientin (C) from methanolic extract of the stems of *Glossocardia bosvallea* (L.f.) Dc. Dagawal *et al.* (2011) studied antibacterial activity of *Glossocardia bosvallea* (L.f.) Dc. using petroleum ether, chloroform, methanol and distilled water extract. Petroleum ether extract showed maximum activity against *Proteus vulgaris*. All extracts showed significant activity against *Staphylococcus aureus* while petroleum ether, chloroform and acetone extracts did not show any activity against *Pseudomonas aeruginosa*.

Chauhan *et al.* (2008) stated that *Tridax procumbens* (L.) L. a native plant of tropical America and naturalized in tropical Africa, Asia, Australia and India. Funk *et al.* (2005) reported Asteraceae as the richest vascular plant family in the world, with 1600 -1700 genera and 24,000-30,000 species Mazari *et al.* (2012) reported palynological diversity in selected medicinal plant species of Asteraceae (Compositae) from flora of Kaghan Valley. Bhalerao *et al.* (2012) made attempts to highlight the phytochemical properties of *Tridax procumbens* (L.) L. Subramanian *et al.* (1968) isolated Luteolin and Glucolutyeolin from the flowers of *Tridax procumbens* (L.) L. Bhagwat *et al.* (2008) reported that leaf extract of *Tridax procumbens* (L.) L. show antidiabetic activity Jain *et al.* (2012) reviewed Medicinal Importance of *Tridax procumbens* (L.) L.

Kirtikar and Basu (2001) stated that *Mimusops elengi* L. is distributed throughout South India and Andaman Islands in evergreen
forests and grown as avenue tree. Kadam et al. (2012) studied, pharmacognostical parameters for the bark of *Mimusops elengi* L. which mainly included macromorphology and microscopical characters, physio-chemical constants and phytochemical screening for standardization of quality, purity and sample identification of stem bark. Pimpre et al. (2012) analyzed bark of this plant for the first time for Thymol using GC-MS and HPTLC analysis. Chaiyan et al., (2011), investigated the antioxidant capacities of the phenolic compounds extracted from immature green, mature green and orange ripe fruits of *Mimusops elengi* L. Sehgal et al. (2011) demonstrates the potential antipyretic and analgesic effect of *M. elengi* leaves. Abbas et al. (2008) evaluated antimicrobial activities of *Mimusops elengi* L. fruit extracts, which was less potent against most of the tested organisms compared to those obtained from bark and leaves and were inactive against the fungus *Trichoderma viride* leaves extracts displayed good activity against *Bacillus subtilis* and *Trichoderma viride* and were inactive against *Helminthosporium sativum*. Durre et al. (2009) reported antibacterial activity of leaf extracts of *Mimusops elengi* L. against gram positive and gram negative bacteria however, the fruit and seed extracts were found inactive, while stem bark extracts showed antibacterial activity against all 6 bacterium, the ethyl acetate extract exhibited the highest inhibition against *B. subtilis* the aqueous methanol extract also showed significant results with inhibition against *N. asteroids*.

Jyothi et al. (2012) reported that in *Rauvolfia tetraphylla* L. root prismatic crystals and stone cells were present in stem pith while leaf showed paracytic stomata. Kumar et al. (2011) reported 6.11 %
Yohimbine Alkaloid in the leaves of the *Rauvolfia tetraphylla* L. and absent in stem, root and seeds Yohimbine could be used as a good aphrodisiac. Selwyn and Kumari (2006) reported that leaf explants were induced to produce calli by using the phytohormones 2,4-D, NAA, IBA and IAA. Among these, 9 μM 2,4-D was found suitable for maximum callus induction (95%). The calli produced in this hormone concentration were subjected to NaCl salt treatment (0, 25, 50, 75 and 100 mM) and the effect of salinity on callus growth and reserpine accumulation was observed. Shariff (2006) reported antimicrobial activity of *Rauvolfia Tetraphylla* L. and *Physalis Minima* L. leaf and callus extracts against pathogenic bacteria. Methanol extract showed MIC of 0.25 to 100 mg/ml against bacterial pathogens and 0.5 to 100 mg/ml against fungal pathogens. Kavitha et al. (2012) reported that methanolic extract of *Rauvolfia tetraphylla* L. presented highest *Streptococcus pyogenes* activity and was effective against all bacterial strains tested except *Staphylococcus aureus* and *Escherichia coli*. Aqueous and methanol ether extracts were ineffective in inhibiting the fungal growth or showed poor inhibition. Austin et al. (2008) reviewed the hidden potential uses of *Hemidesmus indicus* (L.) R. Br. (Rajan et al. (2011) reported pharmacognosy using parameters such as Organoleptic, macroscopic, microscopic, physicochemical and phytochemical and fluorescence features. Vijayalakshmi et al. (2010) reported physico-phytochemical investigation and anti-inflammatory screening of *Capsicum annum* L. and *Hemidesmus indicus* (L.) R. Br. Alam et al. (1998) isolated 2-hydroxy-4-methoxy-benzoic acid from the root extract *Hemidesmus indicus* (L.) R. Br. Gayathri et al. (2010) reported 2-
Hydroxy 4-methoxy benzoic acid isolated from roots of *Hemidesmus indicus* (L.) R. Br. ameliorates liver, kidney and pancreas injury due to streptozotocin-induced diabetes in rats.

**Pandya et al. (2013)** reported that *Nanorrhinum ramosissimum* (Wall.) Betsche. roots shows diuretic activity in albino rats. **Arekal et al. (1964)** reported detail structure of female gametophyte of *Nanorrhinum ramosissimum* (Wall.) Betsche. **Pandya et al. (2012)** reported macroscopy and microscopy, phytochemical study of *Nanorrhinum ramosissimum* (Wall.) Betsche. Janch. root for diagnosis of drug. **Pandya et al. (2012)** reported microscopic and macroscopic phytochemical study of *Nanorrhinum ramosissimum* (Wall.) Betsche. Janch stem for diagnosis of drug. **Hosamani et al. (2000)** reported industrial utilisation of *Verbascum chinese* (L.) Santapau seed oil as a moderate source of isoricinoleic acid. The seed oil was found to contain 22.0% 9-hydroxyoctadec-cis-12-enoic acid (isoricinoleic acid) previously unknown in the Scrophulariaceae plant family. **Agarwal et al. (1974)** reported Celsiogenin-C a new Genin from Celsiosides isolated from *Verbascum chinese* (L.) Santapau **Kapoor (1975)** reported detail ontogeny, structure and distribution of trichomes on the floral parts of *Verbascum chinese* (L.) Santapau **Kumar et al. (2006)** reported that aerial parts of *Verbascum chinese* (L.) Santapau and *Mollugo pentaphylla* L. shows anthelmintic activities.

**Anonymous (1952)** reported *Dolichandrone falcata* (Wall, ex. DC.) Seem. grows abundantly in central India Bihar and the deccan plateau. **Rahmatullah et al. (2010)** reported ethnomedicinal, pharmacological and phytochemical review of some Bignoniaceae
family plants and described Bignoniaceae plants in folk medicinal uses in Bangladesh. **Korpenwar et al. (2011)** reported that *Dolichandrone falcata* (Wall. ex DC.) Seem. leaves cures piles in Buldhana Tahsil, Dist. Buldhana (M.S.). **Mungle et al. (2012)** reported that the aqueous extract of *Dolichandrone falcata* (Wall. ex DC.) Seem. Leaves showed significant reduction in blood glucose level in in alloxan induced diabetic rats. The antidiabetic activity was found to be significant and dose dependant. **Wikhe et al. (2012)** reported alcoholic and aqueous leaf extract of *Dolichandrone falcate* (Wall. ex DC.) Seem. Were found to prolong the estrous cycle significantly, particularly the distorts phase. **Wikhe et al. (2010)** reported that aqueous,chloroform and alcoholic extract of *Dolichandrone falcata* (Wall ex. DC) Seem. exhibited significant abortive activity. The aqueous and alcoholic extracts at a dose of 400 mg/kg and 200 mg/kg body weight were found to be most effective in causing abortion activity in female albino rats. **Saifuddin et al. (2010)** suggested that the aqueous extract of *Dolichandrone falcata* (Wall. ex DC) Seem. leaves had no effect on locomotion and thus its side effect profile might be considered superior to the benzodiazepines. Thus present findings indicated that *Dolichandrone falcata* (Wall. ex DC). Seem. leaves exhibited anxiolytic effect.. **Subramanian et al. (1972)** reported Chrysin-7-rutinoside from the leaves of *Dolichandrone falcata* (Wall. ex DC). Seem.

**Datta et al. (1969)** reported detail anatomy of root, leaf and seed of *Hygrophila auriculata* (Schumach.) Heine. **Mazumder et al. (1969)** reported chemistry and pharmacology of *Hygrophila spinosa* root. **Sunita and Abhishek (2008)** reported maximum content of
Lupeol in roots (0.25%) while maximum content of β-sitosterol was found in the leaves (0.069%) of *Hygrophila auriculata* (Schumach.) Heine. *Patra et al.* (2009) observed that the hydroalcoholic extract of the leaves of *Hygrophila spinosa* collected during mid-september to October end showed significant activity against different gram positive *Staphylococcus aureus* & *Bacillus subtilis* and gram negative *Escherchia coli* & *Pseudomonas aeruginosa* compared to the extracts of leaves collected at some other time.

*Shukla et al.* (2009) reported diuretic potential of methanol and aqueous extracts of the aerial parts of *Phyla nodiflora* L. when assessed in albino rats using in-vivo Lipschitz test model. The results indicated that methanol and aqueous extract @ 500 mg/kg body weight shows significant (p<0.05) increase in the urine volume and electrolyte excretion (p<0.001) when compared to control. Both extracts showed significant diuretic activity and it was concluded that the constituents present in methanol and aqueous extracts may be responsible for diuretic activity. *Yen et al.* (2012) reported that over expression of tyrosinase can cause excessive production of melanin and lead to hyperpigmentation disorders including melasma and freckles. Methanol extract of *Phyla nodiflora* (L.) Greene down regulate tyrosinase synthesis and decrease melanin production, and it can thus be used as a clinical and cosmetic skin-whitening agent to cure or prevent hyperpigmentation. *Ahmed et al.* (2004) examined the methanolic extract of the leaves of *Lippia nodiflora* L. for antinociceptive activity in carrageenin-induced paw edema in rats and anti-inflammatory activity against acetic acid induced writhing in white albino mice. anti inflammatory and antinociceptive
activities comparable to phenylbutazone and diclofenac sodium respectively were observed. **Faheem et al. (2011)** reported that the plant contain triterpenoids, flavonoids and steroids possessing analgesic, antiinflammatory, antioxidant, antinociceptive, antimicrobial, antipyretic, antitumor, lipid peroxide scavenging and free radical scavenging activities. **Ravikumar et al. (2012)** reported that ethanol extracts, petroleum ether and aqueous fraction revealed the presence of alkaloids, carbohydrates, phenolic compounds, proteins amino acids and flavonoids and showed that the ethanol extract and petroleum ether extract from the leaves and stems of *Phyla nodiflora* (L.) Greene have antimicrobial properties against *Staphylococcus aureus*, *Micrococcus luteus*, *Proteus micrococcus luteus*, *Shigella boydii*, *Aspergillus niger* and *Candida albicans*. **Kanga (1914)** isolated Oil from the flowers and leaves of *Lavandula Burmanni*. **Manohar (2010)** analysed Essential oils of *Lavandula bipinnata* (Roth.) Kuntze. using Gc-Ms showed their antimicrobial activity against bacteria and fungal spores. **Kamble et al. (2010)** reported that Bhilla tribe of Maharashtra apply root paste of *Lavandula bipinnata* (Roth.) Kuntze. daily on boils.

**Hedge (1990)** reported that the genus *Leucas* comprises of about 80 species. **Ryding (1998)** reported highest species diversity in east Africa. **Sofi et al. (2011)** demonstrated that *Leucas cephalotes* (Roth.) Spreng. possesses significant hepatoprotective activity against CCl4 induced hepatotoxicity. **Khanam et al. (2005)** recognized eight species of the genus *Leucas* at Bangladesh and described them in the paper with artificial key and illustrations. **Bavarva et al. (2010)** reported that *Leucas cephalotes* (Roth.) Spreng. regulates both carbohydrate and lipid
metabolism and, improves body antioxidant defense systems in both types of diabetes. Madhukiran et al. (2002) reported that hexane and methanolic extracts of *Leucas cephalotes* (Roth.) Spreng. leaf showed prominent antibacterial activity against pathogenic organisms of *staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris and Klebsiella pneumonia*.

Joy et al. (2004) reported *C. orchioides* Gaertn. in natural habitat, under cultivation and in trade market in south India and showed that there was considerable variation with biotypes and habitats. Soni et al. (2011) revealed standardization profile of *Curculigo orchioides* Gaertn, which would be of immense value in botanical identification and authentication of plant drug and may help in preventing its adulteration. Daffodil et al. (2012) identified six compounds using Gc-Ms these compounds were Hexadecane, 5-butyl, Benzoic acid, 4-ethoxy-, ethyl ester, Ethyl iso allocholate and Dodecane 2,6,11-trimethyl. Soni et al. (2012) reported phytochemistry, traditional uses, tissue culture study and its pharmacological properties. Rao et al. (1978) reported that Curculigo’s rhizomes also contain β-sitosterol, sapogenin and alkaloid lycorine. Gupta et al. (2005) isolated two phenolic glucosides named orchiosides A and B. Misra et al. (1990) reported that the rhizome also contains curculigol, a cycloartane triterpene alcohol. Lakshmi et al. (2003) isolated two phenolic glycosides and a purified glycoside fraction and observed significant immuno-stimulant activity in purified glycoside-rich fraction isolated from the ethyl acetate extract. Tiwari and Mishra (1976) isolated new glycoside 5, 7 dimethoxymyricetin 3-O-α-Lxylopyranosyl 4-O-β-D glucopyranoside from the rhizomes of
Curculigo orchioides Gaerth. Chauhan and Germination (2008) evaluated ethanolic extract of rhizomes which increased spermatogenesis in albino rats which was confirmed by change in histoarchitecture as evidenced by increase in number of spermatocyte and spermatids. These findings support the folk use of this plant as an aphrodisiac. Nagesh and Shantamma (2009) reported that root oil of Curculigo orchioides Gaerth. showed significant antimicrobial activity against various bacterial strains such as Bacillus anthracis, Bacillus subtilis, Salmonella pylorum and Staphylococcus aureus and fungal strains such as Fusarium monili forme, F. solani, Aspergillus flavus and Cladosporium.

Beri and Pharasi (1971) described the properties of bulb powder of Urginea indica which possesses good adhesive properties and has indicated great possibilities for its use as a thickening agent for colours to be used in screen printing of textiles. Chelladurai et al. (2004) gives information on the medicinal uses of Drimia indica (Roxb.) Jessop. and other plants of Kuthiraimozhi at Thoothukudi districts. Kameshwari et al. (2012) studied genetic variability and genomics in Urginea indica Kunth. Chittoor et al. (2012) showed Anthelmintic and antimicrobial activity due to presence of alkaloids and phenolic compounds in aqueous extracts of Drimia indica (Roxb.) Jessop. Bulbs.

Tripathi et al. (2000) concluded that the alcoholic extract of the bulb of Ledebouria revoluta (L.f.) Jessop is a potent antioxidant at lower dose range. Sharma et al. (1998) reported in Bastar district of Madhya Pradesh that the bulbs of the plant can be used as cardiac stimulant and diuretic. Khan et al. (2012) showed that Ledebouria revoluta (L.f.) Jessop bulb displayed highly potent virus inhibitory activity against new
semliki forest virus due to presence of diosgenin saponin. Chakravati et al. (2001) showed that $\gamma$-irradiation can be used to increase regeneration capacity of *Ledebouria revoluta* (L. f.) Jessop *in vitro* and produce more vigorous plants. Rao (1956) studied cytology of *Ledebouria revoluta* (L.f.) Jessop in India.