6. SUMMARY AND CONCLUSION

From the time immemorial, plants have been used as a curative agent for a variety of diseases. In India about 2500 plants belong to 1000 genera are being used in indigenous system of medicine. India is sitting on a gold mine of well-recorded and traditionally well-practiced knowledge of herbal medicine. This country is perhaps the largest producer of medicinal herbs and is rightly called the botanical garden of the world. It is generally estimated that over 6000 plants in India are in use in traditional, folk and herbal medicine, representing about 75% of the medicinal needs of the Third World countries. Undoubtedly, the plant kingdom still holds many species of plants containing substances of medicinal value which have yet to be discovered.

Skin disorders affect 20-30% of general population in the world. Socio demographic factors play a pivotal role in determining the pattern of skin diseases. More over school going children are more frequently exposed to various risk factors. Since prevalence of skin diseases is more among children from low socioeconomic classes and developing countries like India. Studies on skin diseases are inevitable. Plants and plant extracts have been used for the treatment of skin disorders for centuries. Herbal therapy for skin disorders has been used for thousands of years. Specific herbs and their uses developed regionally, based on locally available plants and through trade in ethno botanical remedies.

There is no specific documentation on the traditional treatment method to cure skin diseases in the present study area used by traditional physicians. So the present investigation aims to highlight the first hand information on traditional methods to cure skin diseases by traditional physicians of Malabar region of Kerala.

In addition to documenting the traditional knowledge related to medicinal plants used for skin diseases, scientific validation of traditional medicinal plants by its Pharmacognostic, phytochemical, and anti-microbial studies have also been carried out. In addition, previously published studies also used in establishing links between traditional uses and modern scientific knowledge. The practice of
seeking evidence helps in identifying important medicinal plants and may also lead to the development of new or important pharmaceutical drugs with future bio prospecting potential.

Because of increasing resistance to antibiotics of many bacteria, plant extracts and plant compounds are of new interest as antiseptics and antimicrobial agents in dermatology. Therefore, many folk remedies from plant origin are to be tested for their potential anti bacterial properties causing skin disease in experimental models. It was in this background the present exercise of survey, documentation and scientific validation of plant commonly used for the skin ailments by the traditional healers of Malabar region of Kerala.

The major criteria that can be used for the standardization of raw drugs are Taxonomy, Pharmacognosy and Phytochemistry. These are species specific characters and can be exploited by developing anatomical and chemical fingerprints of each raw drug. The objective of the present study was to find out a scientifically unexplored, effective, reliable and non toxic medicinal plant used for the skin disease of Malabar area of Kerala. As per the survey conducted in this area revealed that, the tribes are using several plants for skin ailments but many of these plants are common to many skin disease.

The Malabar region of Kerala was explored during the ethno botanical survey. Survey was conducted in the study area from March 2008 – June 2011. Malabar is endowed with more than one-half of the geographical area starting from Thrissur to Kasaragod in the northern part of Kerala and also blessed with more than one-half of the total inhabitants of the state. Geographically, the Malabar Coast, especially on its westward-facing mountain slopes, comprises the wettest region of southern India as the Western Ghats intercept the moisture-laden monsoon rains.

The result of the present study demonstrate the persistence of folk medicine for different kinds of skin diseases in Malabar region of Kerala. The people are still depended on indigenous knowledge for primary health care. The interviewees mentioned 16 different skin diseases which are treated with different plant-based medication. Impetigo (32 interviewees) are by far the most recorded
skin problem treated followed by Eczema (26 interviewees), Boils (20 interviewees), Scabies (14 interviewees), wounds (13 interviewees) and Ringworm infection (10 interviewees).

Treatments are done with either single plant formulation, combinations of several plants or even with many parts of the same plant. From this survey it is revealed that out of 113 species studies, 17 formulations involved multiple drugs obtained from two or more different plant species. In the treatment of skin diseases the traditional physicians will give advices according to the intensity of the disease. For internal use most of the traditional physicians of the study area follows Ayurvedic treatises for drug preparations. For external application they keep their uniqueness. In most of the case leaves are frequently used plant parts for the drug preparations (48%). Of all the drug preparations, paste is the most preferred method followed by fresh juice extraction.

Several ethanobotanical studies had been conducted in the Malabar region of Kerala, but the survey of medicinal plants used for skin diseases in particular was the first time. The present study revealed the use of 113 species of plants distributed in 103 genera belonging to 45 families which were commonly used by most of the traditional healers for the treatment of 16 types of ailments. The prominent family was Fabaceae with 14 species, followed by Lamiaceae with 9 species and Euphorbiaceae with 7 species. Each reported species are provided with botanical name, family, local (Malayalam) name, life form, Use value, parts used, ailments treated, method of preparation, mode of administration.

From the investigation it was found that there were 48 new claims about the plant species from the study area such as Beloperone plumbaginifolia L., Amaranthus viridis L., Aristolochia indica L., Bischofia javanica Blume., Cissus quadrangularis L., Justicia beddomei (Clarke) Bennet., Holigarna arnottiana Hook. f., Anethum graveolens L., Cocos nucifera L., Areca catechu L., Ayapana triplinervius Vahl., Elephantopus scaber L., Salacia fruticosa Heyne ex Lawson, Commelina erecta L., Shorea roxburghii G.Don., Briedelia stipularis (L.) Blume., Flueggea virosa (Roxb. ex Willd.) Voigt., Tragia involucrata L., Phyllanthus emblica L., Cullen corylifolium (L.)Medik., Derris scandens
(Roxb.)Benth., Desmodium motorium(Houtt.), Merr., Desmodium triflorum
Anisomeles indica (L.) O. Ktze., Plectranthus hadiensis (Forssk.)
Schweinf.var.tomentosus (Benth.ex.Emey) Codd., Premna serratifolia L., Vitex
negundo L., Allium cepa L., Grewia tiliifolia Vahl., Pavonia odorata Willd.,
Tinospora cordifolia (Willd.) Miers ex Hook. F. & Thoms., Naragamia alata
Wight & Arn., Myristica fragrans Houttt., Ficus racemosa L., Piper betle L.,
Oldenlandia umbellata L., Spermacoce latifolia Aubl., Glycosmis pentaphylla
(Retz.)DC., Citrus limon (L.)Burn.f., Ventilago madraspatana Gaerh.,Fruct.,
Smilax china L., Bacopa monnieri (L)Pennell., Picrorrhiza kurroa Royle ex
Benth., Symlocos cochin chinensis (Lour)Moore., Dendrocnide sinuata (Blume)
Chew., Zingiber zerumbet (L) J.E Smith., Marsilea minuta., were reported for the
first time from the study area. However, no plants were reported as a new
medicinal plant as all the plants were reported with different uses.

Habit-wise analysis of the plants indicates that herbs are highly used
followed by trees, shrubs, and climbers. In most of the case leaves are frequently
used plant parts for the drug preparations (48 %) followed by whole plant (17%),
bark (9%), root (7%), fruit, rhizome (5%), seed (4%), and flower, endocarp, stem
(2%), resinous exudation (1%).

Of all the drug preparations, paste is the most preferred method (31 %)
followed by fresh juice extraction (17%), oil extract (15%), Infusion (12%), root
paste (9 %), decoction(4 %), fruit juice, rhizome (3%), seed oil, whole plant juice
( 2%), ash( 1%). Like many other forms of indigenous knowledge, the nattu
vaidya tradition suffers from lack of support, and the rapidly diminishing the
number local folk medical practitioners or the vaidyas and their existence is also
threatening. Hence all these traditional knowledge acquired from the present study
required further scientific evaluation and documentation.

The information such as botanical name, family, part used, and Use value
are provided for each species. Informants consensus factor (ICF), fidelity level,
Correlation between fidelity level and citation of the plants are tabulated
separately. The ICF was used to analyze the agreement degree of the informants
knowledge about each category of ailments. Fidelity level was employed to
determine most important species of plants used to cure skin diseases by traditional physicians and elderly resident people.

Use value is the positive correlation between the importance value of a plant (measured by the number of informants for a particular plant) and the number of uses cited by the informants. The use value (UV), a quantitative method that demonstrates the relative importance of a species known locally.

As indicated in Table-4.2, UV were calculated for all the species and the single use by the single informant was not considered for analysis. The plant species, *Derris scandens* and *Aristolochia indica* scored a high UV (1.50each), followed by *Myristica fragrans* (1.33each), then *Vitex negundo* and *Bischofia javanica* (1 each ) respectively. Plant with high UV is the indication of its importance in the herbal medicine practice.

The informant consensus factor (ICF) was used to identify the ethno pharmacological importance of the collected plant species. ICF values will be low (near 0), if plants are chosen randomly or if informants do not exchange information about their use. A low value indicates that the informants disagree on the taxa to be used in the treatment within a category of illness. Values will be high (near or more than1), if there is a well defined selection criterion in the community and/or if information is exchanged between informants or high value (close to 1.0) indicates that relatively few taxa are used by a large proportion of the informants.

The treatment for different types of skin diseases by the herbal healers are classified in to16 categories and the ICF values for each category are given. ICF values obtained for the reported categories indicate the degree of shared knowledge for the treatment of each category of ailment. The highest ICF scored for Impetigo is 0.58. 14 plants are being used to treat this ailment and were cited by the 32 practitioners. Most of the practitioners quoted leaves of *Aristolochia indica*, *Derris scandens*, and *Myristica fragrans* to treat the disease. Boils scored the second highest value of ICF i.e. 0.36. It is a very common type of skin infection in the study area. 13 plants with 20 citations are recorded to treat the
ailment. Leaves of *Vitex negundo*, *Bischofia javanica* and *Centella asiatica* are extensively used to treat the infection. Psoriasis recorded the third highest value (ICF=0.25). 7 plants with 9 citations are recorded to treat the ailment. Eczema recorded the fourth highest value (ICF=0.2) Comparatively low scores are for insect bite, Foot crack, Athelets foot disease, Tinea infection, Leucoderma, Ringworm infection, Wound healing, anti-inflammatory activity, Chicken pox, Scabies, Burns etc.. They scored ‘zero’ or less than zero as the informants did not share their knowledge to treat these ailments. ICF value is a proportion between the uses of different plants by various herbal healers for a particular disease category suggesting the level of sharing the knowledge about the use of medicinal plants amongst the healers. High ICF value indicates the use of same plants by many healers. Whereas negative value means use of different plants by many healers and ICF value would be ‘zero’ when different plants are employed by few herbal healers.

The fidelity level (FL) is useful for identifying the inhabitants ‘most preferred species in use for treating certain ailments. FL values vary from 1.0% to 100%. Generally, a FL of 100% for a specific plant indicates that all of the use reports mentioned the same method for using the plant for treatment.

Fidelity level is calculated for the plants which are used to treat most frequently reported ailment categories for both higher ICF values (ICF=0.2 and above) and lower ICF values (ICF=0.00), as both have scored a highest fidelity value (50% or above). The plants cited only once by a single informant are not considered for the Fidelity level analysis. In the higher ICF category 6 plants for boils, 5 plants for Impetigo, 6 plants for Psoriasis, and 2 plants for Eczema scored100% fidelity level. On the other hand only 5 plants for Scabies, 3 plants for Ringworm infection scored 100% fidelity level in case of lower ICF category.

Correlation between fidelity level and Use mention (Np) of the plants is an important criterion for evaluating the medicinal value of a particular plant. A correlation between FL and Np revealed that, plants with highest FL may score low Np and such plants are of less significance. Whereas, plants which score high
FL and high Np for a particular disease are worth taking up for further scientific validation. (Table 5).

As a result of survey report, review of literature and quantitative analysis of data, the plants with high Use value, high fidelity level, five traditionally important plants such as *Aristolochia indica*, *Derris scandens*, *Myristica fragrans*, *Bischofia javanica*, *Vitex negundo* were selected for skin diseases and to conduct further scientific validation. All these plants were taxonomically identified and collected in bulk for preparation of quality standards.
PHARMACOGNOSTIC STUDIES

The pharmacognostical study is a major and reliable criterion of identification of plant drugs. These parameters are necessary for the confirmation of identity and determination of quality and purity of crude drugs. To ensure reproducible quality of herbal products, proper control of genuine materials are utmost essential. Thus, in recent years there has been an emphasis on standardization of medicinal plants and evaluation of plant drugs by pharmacognostical studies which is more reliable, accurate and inexpensive means. According to World Health Organization (WHO) the macroscopic and microscopic description of a medicinal plant is the first step towards establishing its identity and purity and should be carried out before any tests are undertaken. The major anatomical features of the raw drugs were identified in all the selected species and found out the diagnostic features to distinguish the raw drugs in fresh as well as in dried form. As the useful part is leaf, the taxonomic as well as pharmacognostic studies are very important for the quality standard preparation. In the present study we have developed pharmacognostic parameters for Aristolochia indica, Derris scandens, Myristica fragrans, Bischofia javanica, and Vitex negundo.

PHYTOCHEMICAL STUDIES

The plants selected for scientific validation are subjected to detailed phytochemical screening. Phytochemical screening of the crude extracts revealed the presence of alkaloids, flavonoids, terpenoids, steroids, phenolics, carbohydrates, amino acids and quinines. In D. scandens and M. fragrans, the test for the alkaloids given negative results. The preliminary phytochemical screening tests may be useful in the detection of the bioactive principles and subsequently may lead to the drug discovery and development.

In the present investigation all the crude extracts contain Carbohydrates, glycosides, tannin, phenolics, steroids. The leaves of Aristolochia indica, Bischofia javanica, Vitex negundo contain alkaloids except D. scandens and M. fragrans. Except Aristolochia indica all the plants shows the presence of
flavonoids. All the plant extract contain the Phenolics and tannin. All the plant extract contain terpenoids except Aristolochia indica.

HPTLC STUDIES

Using TLC finger printing technique evolved a method for checking the purity of herbal drugs. The drugs were extracted with water and alcohol. The HPTLC comparison revealed that the finger printing profiles of leaves consists of more prominent bands corresponding to chemical constituents in each species.

The HPTLC compiled data will be useful for quality control and authenticity testing of specific plant extracts containing phyto pharmaceuticals. So HPTLC profiling was done for the selected plants and quantification of markers compounds were carried out. The specific Rf values under specific solvent systems were recorded and tabulated for making quality standard parameters.

GC /MS ANALYSIS OF ESSENTIAL OILS

Essential oils and their volatile constituents are used widely to prevent and treat human disease. It has generally been the essential oils of these plants rather than their extracts that have had the greatest use in the treatment of infectious pathologies in the respiratory system, urinary tract, gastrointestinal and biliary systems, as well as on the skin. In Myristica fragrans, from the GCMS investigation 41 compounds were identified from the leaf oil, of which α-pinene predominates in the oil with 13.78%. 4-terpenone (6.81%), Terpenolen (5.22), Elemicin (4.54%), Myristisin (3.2%) were the other major compounds present in the oil analysed. In Vitex negundo about 30 compounds were identified in leaf oil, of which Ledol predominates in the oil with 17.14 %. Caryopyllene (6.81%), β-Linalool (3.1), are the other major compounds present in the oil analysed.

PHARMACOLOGICAL PROPERTIES OF SELECTED PLANTS

All the selected plants for the present study having anti-microbial, anti-oxidant activity and anti-inflammatory activities. All the plants having anticancerous property except Derris scandens. Among 55 plants having high Use
vale, all the documented plants possess anti-microbial properties, 44 having anti-oxidant activity, 37 plants having anti-inflammatory activity, 28 having anti-cancerous activity, 2 plants having anti-allergic activity.

**ANTI-MICROBIAL STUDIES**

Long before mankind discovered the existence of microbes, the idea that certain plants had healing potential, indeed, that they contained what we would currently characterize as antimicrobial principles, was well accepted. Since antiquity, man has used plants to treat common infectious diseases and some of these traditional medicines are still included as part of the habitual treatment of various maladies.

All the selected plants through quantitative analysis of data were subjected to anti-microbial activities on different grades of bacteria utilizing commercially available alcoholic and water for extraction. Traditional practitioners make use of water preliminary as solvent, but our studies showed that the ethanolic extract of plant parts are certainly much better and powerful. This may due to the better solubility of their active components in organic solvents.

In general, the plant antibiotic substances appear to be more inhibiting to gram positive organisms than gram negative type. In the present investigations, ethanol extract of leaves posses alkaloids, flavonoids, tannin, and phenolic compounds which might be the reason for showing antibacterial activity.

Demands of the scientific community have necessitated experimental evidence to further underline the medicinal importance of these five plants. Taking clue from these traditional and folk systems of medicine, scientific studies have been designed and conducted in order to pharmacologically validate these claims.

In the *in vitro* anti bacterial screening, the aqueous extract of *Aristolochia indica* leaf showed maximum inhibitory activity against gram positive organisms like *Staphylococcus aureus* and *Bacillus subtilis* in different degrees. But it is not showing any activity against gram negative bacteria like *P. aeruginosa* and
In *Derris scandens* the ethanolic extract of leaf showed inhibitory activity against test organisms in different degrees. The result clearly indicate that gram positive strains *Staphylococcus aureus* and *Bacillus subtilis* are highly susceptible to ethanolic extract of leaf of *D. scandens*. The gram negative strain, *Klebsiella pneumoniae* shows moderate activity. The gram negative strains *Pseudomonas aeruginosa*, *Escherichia coli* is resistant to ethanolic extract of leaf of *D. scandens*

The antibacterial activity of *Myristica fragrans* aqueous extract of leaf showed inhibitory activity against gram positive strains *staphylococcus aureus* which is highly susceptible. *Bacillus subtilis* shows less activity compared to *staphylococcus aureus*. The gram negative strains *Escherichia coli*, gram positive strain *Pseudomonas aeruginosa* shows moderate activity. *Klebsiella pneumoniae* is resistant to aqueous extract of leaf of *Myristica fragrans*. The ethanolic extract of *Bischofia javanica* leaf showed inhibitory activity against gram positive strains *staphylococcus aureus* and gram negative strains *Escherichia coli*, *Klebsiella aerogenes*, are highly susceptible to ethanolic extract of leaf of *Bischofia javanica*. In *Vitex negundo* the ethanolic extract of leaf showed inhibitory activity against gram positive strains *staphylococcus aureus*, *Bacillus subtilis* and gram negative strains *Escherichia coli*, *Klebsiella aerogenes* are susceptible to aqueous extract of leaf of *Vitex negundo*. The gram negative strain *Pseudomonas aeruginosa* is resistant to aqueous extract of *Vitex negundo*. In short all the selected plants based on the quantitative analysis showed antibacterial activity and it is a positive correlation to the analysis. Further isolation and characterization of compounds from these plants and their antibacterial activity against the commercial antibiotic will be the future challenge in this area.

There is no doubt that the 113 recorded plant species are awaiting search for new uses. So, further scientific assessment of these medicines for phytochemical, biological and clinical studies is however greatly needed. The present research work indicates that research projects should be designed in priority on this area for the pharmacological evaluation and conservation of
medicinal plants in the study area. These studies even provide a significant frame work for utilization of such traditional knowledge in deriving conservation strategies.

Ayurvedic practitioners have not given much emphasis to the evaluation of adverse side reactions. The efficacy of some herbal products is beyond doubt. However, mutagenic and carcinogenic effects have been identified in some of these drugs. Research needs to be enhanced to identify plants with potential medicinal value and to isolate compounds of medicinal importance. Every plant-based product should be documented properly with regard to the identification of species and utilization of specific parts of the plant. The documented 114 plant species for skin diseases are need to be screened further to elucidate a good antibiotic. So, further scientific assessment of these medicines for biological and clinical studies is however greatly needed.

The conservation of medicinal plants has a key role on biodiversity components and ethanobotanical studies also resolving conservation and developmental issues. These studies even provide a significant frame work for utilization of such traditional knowledge in deriving conservation strategies.

We hope that the result from this study will lead to develop a scientific data of the selected plant. It is also expected that through bio prospecting of the selected plant, the details of the plant species have been scientifically validated for the future benefit of the researchers and herbal industry