Chapter 5

Summary and Conclusions
India is one of the twelfth mega biodiversity hotspot in the world. Eastern Ghats are one among them, which are characterized by different wild medicinal flora. Nallamalai hills as a part of Eastern Ghats in Kurnool District of Andhra Pradesh, India. The ethnic groups are inhabited mainly four ethnic groups (Chenchu, Sugali, Yerukala and Yanadi) in this region.

Traditional healers of these groups are having rich knowledge on traditional medicine. Most of the diseases cured by using available plants in their surrounding habitats. The traditional healers are mostly old generation and transformed their knowledge to the elder son in the same family through verbal transmission. There is no proper documentation of this knowledge. Moreover the younger generations are not showing much interest to continue their ancestral practice. This knowledge is slowly disappearing due to lack of proper documentation. Hence in the present study ethnomedical information was collected.

The first hand information was collected by using the proforma with regarded to folklore medicine to cure skin diseases by four ethnic groups of traditional healers.

The comprehensive list of medicinal plants used by ethnic groups of Kurnool District, Andhra Pradesh, India, are 90 plant species belonging to 80 genera and 52 families. All these 90 plants are using to cure 12 types of skin diseases by ethnic groups.

The medicinal plants used by the ethnic groups to cure skin diseases showed a great diversity, statistically analyzed on habitat wise 36 herbs (40%), 26 shrubs (28.88%) 6 climbers (6.6%) and 22 trees (24.4%).

The percentage of plant parts are used by the Traditional healers as follows the leaves contributing (38.89%), followed by bark (18.89%), root (10.00%), whole plant (7.78%), fruit (6.67%) and other plant parts (17.78%).

The medicines are preparing by ethnic groups from single or by using more number of plants. 33 plant species are used as simple on external applications (36.66%), whereas one plant in oral form (1.11%). 43 plant species are using by mixing with different plants or plant parts an external application (47.77%)
and 13 plant species (14.44%) are taken orally by mixing other plant parts. The reason could be that the efficacy of the drug may be improved by adding of another plant or ingredient, otherwise the drug may be more powerful due to the synergistic effect of molecular compounds present in the mixture.

Majority cases the drug is applying in the form of paste on externally (84.44%), and orally (15.55%) as in the form of decoction and pills. The reason could be that by preparing the medicine into paste the complex compounds are converted into simple forms and even into ions and these ionic forms can easily penetrate through skin.

Chi-square test was carried out to test the association of plant part used to cure 12 types of skin diseases; 'p' value is 0.003 for the corresponding chi-square value is 55.243.

Ethnomedical information was given by the traditional healers, was cross checked with Ayurvedic physicians for authentication. Among 90 plant species mentioned by the ethnic groups, 32 plant species are extensively used in the preparation of Ayurvedic medicines to treat various skin diseases by seven authenticated manufactures. Remaining 58 plant species should be explored for efficacy in the herbal preparation to cure the skin diseases.

Five plants were selected from 32 plant species, which are extensively using in the Ayurvedic preparations to treat skin diseases and five more plants were also selected from 58 plant species which are not using in the preparation of Ayurvedic medicines to cure skin diseases so far.

The experiments were conducted total 10 selected plants individually and these 10 plants were mixed into equal ratio and used as Mixed Plants Extract (MPE). Qualitative analysis of Phytochemical substances was revealed that the samples were rich in alkaloids, glycosides, steroids, flavonoids, tannins, triterpenoids and phenols, whereas less in saponins, anthraquinones, coumarins, lignins and reducing sugars.

Maximum number of phytochemical compounds found in *Withania somnifera* followed by *Plumbago zeylanica, Lawsonia inermis, Psoralea corylifolia* and
"Thespesia populnea." MPE contributed all secondary metabolites except coumarins and reducing sugars.

- Flavonoids, steroids, tannins and triterpenoids are found in the selected 10 medicinal plants and in the MPE as these compounds are known to possess antiviral, antifungal and antibacterial properties. Hence experiments were carried out on antimicrobial activity by using all selected medicinal plants.

- Nanoparticles are gaining much importance especially in medical field. The chemical synthesis of nanoparticles is toxic and costly affaire. Hence biosynthesis of nanoparticles was carried out by using the selected 10 plant species. As silver is known to improve the immunity since ancient times, Ag(NO₃)₂ was used for biosynthesis of nanoparticles by using selected plant material.

- Silver nanoparticles (SNPs) were synthesized by using aqueous extracts of 10 selected medicinal plants and MPE used to cure skin diseases by the ethnic groups. Withania somnifera, Eclipta alba, Lawsonia inermis, and Psoralea corylifolia are the best source for the synthesis of SNPs in fast rate as the plant extracts developed dark brown color with in 10 min by addition of Ag (NO₃)₂.

- Changing of color has been ranging from cream, light yellow, orange to dark brown within 15 to 20 min in other selected medicinal plants. The color change of plant extracts is indicate that the synthesis of SNPs due to availability of H⁺ ions released from glycolysis or ascorbic acid to reduce silver.

- In nanotechnology size of the particles are highly important and the size was measured by using AFM. The size of the synthesized SNPs was ranging from 25 nm to 48 nm in all selected medicinal plants and MPE, except Thespesia populnea.

- The three dimensional images of rod shaped SNPs are attached with one another and look like a cluster in an area of 15μm.
When the SNPs of 10 selected medicinal plants were tested for antimicrobial activity the root extract of *Withania somnifera* showed highest inhibition zones against gram positive bacteria *Staphylococcus aureus* (12.6±0.31) and *Bacillus* (11.8±0.35). Whereas SNPs of leaf extract of *Eclipta alba* and *Cadaba fruticosa* showed higher antibacterial activity against gram negative bacteria *Salmonella typhi* (11.6±0.18) and *E. coli* (12.2±0.43) respectively.

SNPs of seed oil extract of *Psoralea corylifolia*, leaf extract of *Lawsonia inermis* and rhizome extract of *Curcuma longa* showed highest antifungal activity against *Paecilomyces variotii* (11.6±0.68), *Pencillium rubrum* (12.55±0.64) and *Aspergillus flavus* (9.5±0.42) respectively.

The SNPs synthesized from the mixed plants extract are efficient to control the pathogens of gram positive bacteria (*Staphylococcus aureus*, *Bacillus*) and gram negative bacteria (*E. coli* and *Salmonella typhi*) and fungal species *Pencillium rubrum*, *Paecilomyces variotii* and *Aspergillus flavus*, due to cumulative effect of all plants, when compare with SNPs synthesized from individual plants.

The SNPs of 10 selected medicinal plants shows effective inhibition of microbial growth than that of control plant extracts. The small size SNPs are able to penetrate inside the microbial cell and cause further damage of DNA. DNA loses its replication ability, proteins and enzymes are became inactive resulting to denature of the cell and inhibit the growth.

Standard drugs (Gentamycin/Nystatin), showed higher inhibition zones, because these are highly purified forms may be leads to side effects in high dosage, whereas the SNPs are biologically synthesized form with less or no side effects.

The SNPs of MPE is an efficient against the microbial growth, the studied microorganisms are susceptible to the SNPs of MPE when compared with individual plant extracts. The reason may be that the synergistic effect of secondary metabolites or active molecules present in the MPE of selected medicinal plants used by the ethnic groups of Kurnool district of Andhra Pradesh, India, to cure various skin diseases.

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Based on the experimental results the SNPs of mixed plants are the best source to prepare medicine to cure skin diseases.

The selected study on the biological synthesis of SNPs through medicinal plants pave the way to pharmaceutical industry to synthesize a new medicine for current day needs. Moreover, the present studies also helpful to produce novel antibiotics against pathogens, as the pathogens are developing resistance to traditional drugs.