CHAPTER 8

SUMMARY AND FUTURE SCOPE
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The present research work was aimed to evaluate the plant extracts for skin care properties. Anti-acne and anti-aging potential of selected plant extracts were investigated by various in vitro assays. After detailed literature review of plants studied for anti-aging and anti-acne properties, it was decided to carry out research on alcoholic extracts of *Ocimum tenuiflorum* Linn (Leaves), *Citrus reticulata* Blanco (Peel), *Citrus aurantifolia* Christm (Peel), *Butea monosperma* Lam (Seeds) and *Vitis vinifera* Linn (Seeds). Literature review revealed that there are number of literature published on antioxidant and antimicrobial activities of plant extracts but no references are available for anti-collagenase and ant-elastase activity of selected plants. Many researchers studied the antimicrobial activity of crude plant extracts against acne causing bacteria however very few of them throw light on the actual compounds responsible for antibacterial effect. In the present study, anti-acne and anti-aging activities of selected plant extracts are assessed in order to obtain herbal actives for skin care.

The selected plant materials were initially studied for pharmacognostic characteristics including macroscopic and microscopic characteristics, physicochemical parameters including ash values and extractive values. Extraction of each plant was performed by Soxhlet method and maceration, thus twao extracts i.e. hot alcoholic extract (HAE) and cold alcoholic extract (CAE) were obtained for each plant. Yields were calculated for obtained extracts. Qualitative phytochemical analysis revealed the presence of carbohydrates, amio acids and flavonoids in all plant extracts. Total phenolic and flavonoid contents were estimated and it was found that OT HAE exhibited highest phenolic and flavonoid contents among all extracts. In order to obtain most efficacious extracts for anti-acne and anti-aging activities, screening of all plant extracts was performed by antioxidant and antimicrobial assay. DPPH free radical scavenging assay was carried out and EC$_{50}$ values were determined. Results suggested that, extracts of *Ocimum tenuiflorum* Linn and *Citrus reticulata* Blanco possessed strong antioxidant potential among all test extracts hence their four extracts i.e OT HAE, OT CAE, CR HAE, CR CAE were selected further, for evaluation of anti-aging activity. Agar well diffusion assay was performed to assess the antimicrobial potential of test extracts and OT HAE, OT CAE, CR HAE, CR CAE
were selected further, for evaluation of anti-acne activity as they exhibited strong antibacterial activity.

Further, selected four extracts were investigated for anti-aging activity through in vitro antioxidant assays including superoxide anion scavenging assay, ABTS radical scavenging assay and Oxygen radical absorbance capacity assay. EC\textsubscript{50} values and ORAC vaues were obtained for OT HAE, OT CAE, CR HAE and CR CAE extracts. Results demonstrated that, extracts obtained by Soxhlation method were more potent for scavenging free radicals than extracts obtained by maceration. Anti-collagenase and anti-elastase activities were evaluated to check the ability of extracts on collagenase and elastase inhibition. OT HAE and CR HAE were found to be more effective and thus could be able to protect the ECM and prevent skin aging if incorporated in anti-aging cosmeceuticals.

Anti-acne activity was evaluated by antimicrobial and anti-lipase assay. The study showed that extracts obtained by maceration i.e OT CAE and CR CAE exhibited strong antimicrobial activity against acne inducing bacteria through agar well dilution method. Anti-lipase assay was performed to check the ability of extracts on inhibition of \textit{P. acnes} lipase, a major factor responsible for inflammation in acne vulgaris. OT CAE and CR CAE were found to be potent lipase inhibitors.

TLC-Bioautography of extracts was performed to understand the nature of the compounds responsible for inhibition of acne inducing bacteria. These compounds present in a group, were isolated by preparative HPTLC and identified by GC-MS.

In conclusion, the extracts of \textit{Ocimum tenuiflorum} Linn and \textit{Citrus reticulata} Blanco were found to be useful for skin care purpose, as anti-acne and anti-aging agents. Rapid and simple TLC-Bioautography-GC-MS method was developed for isolation and identification of phytoconstituents responsible for antimicrobial activity.
8.2. FUTURE SCOPE

- Isolated and identified compounds from *Ocimum tenuiflorum* Linn and *Citrus reticulata* Blanco can be taken up further as an anti-acne agent and possible synergism of antimicrobial activity among these isolated compounds can be evaluated.

- Anti-acne skin care formulations can be prepared based on the efficiency of the isolated phytoconstituents instead of crude extracts.

- Extracts showing potent antioxidant, anti-collagenase and anti-elastase activity can be incorporated in to anti-aging skin care formulations as an active ingredients.