

SUMMARY AND CONCLUSION

In searching of potent antidermatophytic drug for more susceptible human skin from more resistant plant skin, the epidermal gland extracts, from three glandular South Indian thelypteroid ferns, *Amphineuron terminans* (Hook.) Holttum, *Christella parasitica* (L.) H. Lev. and *Cyclosorus interruptus* (Willd.) H. Ito, were screened for antimicrobial activity at various levels. Based on the preliminary antimicrobial screening on the above three species, intensive antimicrobial screenings and phytochemical analysis were carried out on the antimicrobially potent and commonly available fern, *Cyclosorus interruptus*. The epidermal gland extract of all the three ferns show antifungal effect on mycoflora of seed (Green gram), leaf (Mango) and potato-tuber with comparatively higher antifungal activity in *Cyclosorus interruptus*. Preliminary anticandidal activity in epidermal gland extract of *Christella parasitica* and *Cyclosorus interruptus* both individually and in combination showed maximum activity in epidermal glands *Cyclosorus interruptus* individually.

In order to find macroscopic and microscopic parts with maximum antimicrobial activity, different parts such as rhizome, root, rachis, croziers, fertile-sterile leaves, sporangia, spores and *in vitro* gametophytes were screened for antibacterial activity by using *Staphylococcus aureus* and maximum antibacterial activity was found in leaves with epidermal glands.

Intensive antibacterial (*Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli* and *Pseudomonas aeruginosa*) and anticandidal (*Candida tropicalis*, *C. krusei*, *C. parapsilosis* and *C. albicans*) screenings made on crude extract of epidermal glands of *C. interruptus* and its sequential fractions with hexane, chloroform and ethyl acetate showed comparatively higher degree of antibacterial and anticandidal activities, particularly against *Staphylococcus aureus* and *Candida albicans*.

Minimum Inhibitory Concentration (MIC) and Minimum Fungicidal Concentration (MFC) were also determined for crude extract of epidermal gland of *C. interruptus* and its hexane, chloroform and ethyl acetate fractions against above four *Candida* species and the MIC in general ranges from 0.0625 to 1.0mg/ml and the MFC in general ranges from 0.01562 to 2 mg/ml. Based on MIC and MFC the ethyl acetate fraction was shown as potent antifungal agent with MFC range from 0.01562 to 1.0mg/ml. The MIC and MFC for five other fungi (*Aspergillus flavus*, *A. niger*, *Fusarium* sp. *Mucor* sp. and *Rhizopus* sp.) tested with ethyl acetate fraction showed the nil activity in *Rhizopus* sp. and the MIC and MFC ranges for other four fungi are 0.125-0.5mg/ml and 0.25 – 1.0 mg/ml respectively.

Out of six clinical samples (*Candida albicans* and five unknown *Candida* sp.) tested with ethyl acetate fraction of epidermal glands of *C. interruptus*, four samples were susceptible while two samples were resistant and *C. albicans* was more susceptible to all the 12 concentrations (50 - 1500µg/disc) tested.

The preliminary phytochemical screening, TLC, HPTLC, HPLC and FTIR analysis on epidermal gland extract of *C. interruptus* show the presence of common epicuticular lipophilic wax compounds like such as alkanes, alkenes, primary alcohols, triterpenoids, fatty acids and their derivatives along organometallic, organohalogen and alkyl halide compounds. The HPTLC, HPLC and FTIR spectra show only slight difference between the crude extract and its ethyl acetate fraction.

The bioautographic analysis shows that the compounds with Rf values 0.3 to 0.7 may be responsible for antimicrobial activity of epidermal gland extract. All the compounds in the epidermal gland extract have already been proved to be of potent antimicrobial agents. Based on the present study it has been concluded that such a complex mixture of compounds in the epidermal glands of *C. interruptus* acts synergistically with multi-target mechanisms, particularly by interfering with cell wall and cell membrane of fungi and also by acting as anti-biofilm agent.

Based on the present *in vitro* antimicrobial screenings, it has been proved that the more resistant skin of *Cyclosorus interruptus* with several defense chemicals is of potent antimicrobial agent, which may be useful to cure various skin pathogens and it can also be used as potent biopesticide in agriculture. Further study on the isolation and testing of antimicrobial activity of individual compounds of epidermal glands of *Cyclosorus interruptus* is necessary to prove the synergistic effect of the bioactive compounds and also to identify the key compounds for antimicrobial activity.