TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>INTRODUCTION</td>
<td>1-5</td>
</tr>
<tr>
<td>1.1</td>
<td>Objectives</td>
<td>5</td>
</tr>
<tr>
<td>2.0</td>
<td>REVIEW OF LITERATURE</td>
<td>6-40</td>
</tr>
<tr>
<td>2.1</td>
<td>About fungi</td>
<td>6</td>
</tr>
<tr>
<td>2.2</td>
<td>Historical background</td>
<td>6</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Mycology and mycoses</td>
<td>6</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Dermatophytosis</td>
<td>6-7</td>
</tr>
<tr>
<td>2.3</td>
<td>Classification of dermatophytes</td>
<td>7-8</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Microsporum</td>
<td>8</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Trichophyton</td>
<td>8</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Epidermophyton</td>
<td>8</td>
</tr>
<tr>
<td>2.4</td>
<td>Ecology of dermatophytes</td>
<td>8-9</td>
</tr>
<tr>
<td>2.5</td>
<td>Clinical features of dermatophytosis</td>
<td>10-16</td>
</tr>
<tr>
<td>2.5.1</td>
<td>Tinea capitis</td>
<td>11-12</td>
</tr>
<tr>
<td>2.5.2</td>
<td>Tinea barbae</td>
<td>12</td>
</tr>
<tr>
<td>2.5.3</td>
<td>Tinea faciei</td>
<td>12</td>
</tr>
<tr>
<td>2.5.4</td>
<td>Tinea corporis</td>
<td>12</td>
</tr>
<tr>
<td>2.5.5</td>
<td>Tinea cruris (Jock itch)</td>
<td>12</td>
</tr>
<tr>
<td>2.5.6</td>
<td>Tinea pedis (Athlete’s foot)</td>
<td>12-13</td>
</tr>
<tr>
<td>2.5.7</td>
<td>Tinea manuum</td>
<td>13</td>
</tr>
<tr>
<td>2.5.8</td>
<td>Tinea gladiatorum</td>
<td>13</td>
</tr>
<tr>
<td>2.5.9</td>
<td>Tinea unguium</td>
<td>13</td>
</tr>
<tr>
<td>2.5.10</td>
<td>Tinea imbricata</td>
<td>13</td>
</tr>
<tr>
<td>2.6</td>
<td>Chronic dermatophytosis</td>
<td>16</td>
</tr>
<tr>
<td>2.7</td>
<td>Cultivation of dermatophytes and their colony characteristics</td>
<td>16</td>
</tr>
<tr>
<td>2.7.1</td>
<td>Commonly used growth media</td>
<td>16</td>
</tr>
<tr>
<td>2.7.1.1</td>
<td>Sabouraud’s dextrose agar (SDA) with chloramphenicol and cyclohexamide</td>
<td>16</td>
</tr>
<tr>
<td>2.7.1.2</td>
<td>Dermatophyte test medium (DTM)</td>
<td>16</td>
</tr>
</tbody>
</table>
2.7.1.3 Corn meal agar (CMA) 17
2.7.1.4 Potato dextrose agar (PDA) 17

2.7.2 Other differential features 17
  2.7.2.1 Nutritional requirements 17
  2.7.2.2 Temperature 17

2.7.3 Differential tests 18
  2.7.3.1 Urease Test 18
  2.7.3.2 Hair perforation Test 18
  2.7.3.3 Rice Grain Test 18

2.8 Epidemiology of dermatophytosis 19-20
  2.8.1 Global scenario of dermatophytosis 20
    2.8.1.1 Dermatophytosis in United States of America 20-21
    2.8.1.2 Dermatophytosis in Europe 21-23
    2.8.1.3 Dermatophytosis in Africa 23-24
    2.8.1.4 Dermatophytosis in Australia 24
    2.8.1.5 Dermatophytosis in Asia 24-26
  2.8.2 Dermatophytosis in India 26-28
    2.8.2.1 Miscellaneous dermatophytosis reported in India 28

2.9 Pathogenesis of dermatophytosis 28-29
2.10 Virulence factors of dermatophytes 29
  2.10.1 Adherence to host superficial skin tissues and their invasion 29
  2.10.2 Proteases and growth of dermatophytes on keratinized substrate 29
  2.10.3. Factors encountering immune mechanisms 29-30

2.11 Diagnosis 30
  2.11.1 Clinical examination 30
  2.11.2 Laboratory examinations 31
    2.11.2.1 Direct potassium Hydroxide (KOH) preparation 31
    2.11.2.2 Gross morphology of dermatophyte species 31
    2.11.2.3 Microscopic examination of lactophenol cotton blue stained preparations 31
    2.11.2.4 Microscopic characteristics of common dermatophytes 32
  2.11.3 Molecular diagnosis 34-36

2.12 Therapeutics 36-37
  2.12.1 Oral Triazoles 37
2.12.2 Topical Azoles 37-38
2.12.3 Allylamines 38
2.12.4 Morpholines and ciclopirox 38
2.13 Antifungal susceptibility testing 38-39
2.14 Preventive and control 39-40

3.0 RESEARCH METHODOLOGY 41-48

3.1 Collection of samples 41
3.1.1 Inclusion and exclusion criteria 42
3.2 Examination of direct KOH mounts of the samples 42
3.3 Isolation and identification of dermatophytes 43
  3.3.1 Isolation on Sabouraud’s Dextrose Agar 43
  3.3.2 Culturing on Dermatophyte Test Media (DTM) 43
  3.3.3 Microscopic examination 43
  3.3.4 In vitro hair perforation test 43-44
  3.3.5 Urease test 44
3.4 Determination of in vitro antifungal susceptibility of dermatophytes using broth micro-dilution method.
  3.4.1 Dermatophyte species tested 44
  3.4.2 Antifungal agents used in assay 44
  3.4.3 Broth micro-dilution method 44
  3.4.4 Drug dilutions 45
  3.4.5 Preparation of inoculums of dermatophyte species 45
  3.4.6 Test procedure of broth micro-dilution test 45
  3.4.7 Quality control reference strains 45-46
  3.4.8 Determination of MIC values of antifungal agents 46
  3.4.9 Data analysis 46
3.5 Molecular Identification 46
  3.5.1 DNA extraction 46-47
  3.5.2 Polymerase chain reaction assay 47
  3.5.3 Gel electrophoresis of amplicons 47
  3.5.4 Nucleotide sequencing of amplicons 47-48
  3.5.5 Determination of homology of the sequences of amplicons with published standard strains 48
  3.5.6 Determination of the phylogenetic relationship 48

4.0 RESULTS 49-104
4.1 Isolation of dermatophyte species 49
4.2 Identification of dermatophyte species 49
4.3 Epidemiological data 50
4.4 Antifungal susceptibility testing 50-51
4.5 Visualization of genomic DNAs of isolates of dermatophyte species 51
4.6 PCR amplification of ITS1 and ITS2 gene amplicons of rRNA of dermatophyte isolates.

4.7 Nucleotide sequence homology of ITS1 and ITS2 gene amplicons of rRNA of dermatophyte species.

4.7.1 Nucleotide sequence homology of isolate VBS0-3 with the standard NCBI sequences

4.7.2 Nucleotide sequence homology of isolate VBS0-5 with the standard NCBI sequences

4.7.3 Nucleotide sequence homology of isolate VBS0-6 with the standard NCBI sequences

4.7.4 Nucleotide sequence homology of isolate VBS0-13 with the standard NCBI sequences

4.7.5 Nucleotide sequence homology of isolate VBS0-17 with the standard NCBI sequences

4.7.6 Nucleotide sequence homology of isolate VBS0-18 with the standard NCBI sequences

4.7.7 Nucleotide sequence homology of isolate VBS0-20 with the standard NCBI sequences

4.7.8 Nucleotide sequence homology of isolate VBS0-29 with the standard NCBI sequences

4.7.9 Nucleotide sequence homology of isolate VBS0-30 with the standard NCBI sequences

4.7.10 Nucleotide sequence homology of isolate VBS0-62 with the standard NCBI sequences

4.7.11 Nucleotide sequence homology of isolate VBM-3 with the standard NCBI sequences

4.7.12 Nucleotide sequence homology of isolate VBP-24 with the standard NCBI sequences

4.7.13 Nucleotide sequence homology of isolate VBS-3 with the standard NCBI sequences

4.7.14 Nucleotide sequence homology of isolate VBS-32 with the standard NCBI sequences

4.8 Phylogenetic relationship of dermatophyte species

5.0 DISCUSSION

5.1 Future Projections

6.0 SUMMARY AND CONCLUSIONS

7.0 REFERENCES

PUBLICATIONS

ANNEXTURE- I, II, III and IV