## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTENTS</td>
<td>1</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>V</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>VI</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>IX</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>X</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>XI</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2. LITERATURE REVIEW</td>
<td>5</td>
</tr>
<tr>
<td>2.1 History</td>
<td>5</td>
</tr>
<tr>
<td>2.1.1 Early History</td>
<td>5</td>
</tr>
<tr>
<td>2.1.2 Modern History</td>
<td>7</td>
</tr>
<tr>
<td>2.2 Main Producing Areas and Extents</td>
<td>10</td>
</tr>
<tr>
<td>2.3 Production Systems, Holding Size and Age of Cultivations</td>
<td>11</td>
</tr>
<tr>
<td>2.4 Botany and morphology</td>
<td>12</td>
</tr>
<tr>
<td>2.4.1 Cytology</td>
<td>12</td>
</tr>
<tr>
<td>2.4.2 Structure of the plant</td>
<td>13</td>
</tr>
<tr>
<td>3.4.2.1 Leaves</td>
<td>13</td>
</tr>
<tr>
<td>2.4.2.2 Inflorescence and flowers</td>
<td>14</td>
</tr>
<tr>
<td>2.4.2.3 Fruits</td>
<td>14</td>
</tr>
<tr>
<td>2.4.3 Cultivars</td>
<td>14</td>
</tr>
<tr>
<td>2.5 Ecology</td>
<td>15</td>
</tr>
<tr>
<td>2.5.1 Climate</td>
<td>15</td>
</tr>
<tr>
<td>2.5.2 Soil</td>
<td>15</td>
</tr>
<tr>
<td>2.5.3 Altitude</td>
<td>15</td>
</tr>
</tbody>
</table>

I
2.6 Uses of Cinnamon product
   2.6.1 Cinnamon in culinary 15
   2.6.2 Cinnamon as a spice 16
   2.6.3 Medicinal uses 18
   2.6.4 Synergistic and suppressive effects 20
   2.6.5 Cinnamon -in perfumes and beauty care 21
   2.6.6 Cinnamon -an antimicrobial agent 21
   2.6.7 Cinnamon-an antioxidant 22
   2.6.8 Cinnamon -in home remedies 22
   2.6.9 Industrial uses 23
2.7 Harvesting of Cinnamon 24
2.8 Yield 25
2.9 Production process 26
2.10 Cinnamon Products 31
   2.10.1 Cinnamon quills 31
   2.10.2 Quillings 31
   2.10.3 Featherings 32
   2.10.4 Chips 32
2.11 Quality of Cinnamon Bark Products 32
2.12 Grading 36
3. EXPERIMENTAL

3.1 Theme 1

3.1.1 Experiment 1.1

3.1.1.1 Introduction

3.1.1.2 Materials and methods

3.1.1.3 Results and discussion

3.1.1.4 Conclusion

3.1.2 Experiment 1.2

3.1.2.1 Introduction

3.1.2.2 Materials and method

3.1.2.3. Results and discussion

3.1.2.3.1 Removing knots

3.1.2.3.2 Scraping

3.1.2.3.3 Rubbing

3.1.2.3.4 Peeling

3.1.2.4 Conclusions

3.1.3 Experiment 1.3

3.1.3.1 Introduction

3.1.3.2 Materials and method

3.1.3.3 Results and discussion

3.1.4 Experiment 1.4

3.1.4.1 Introduction

3.1.4.2 Materials and method

3.1.4.3 Results and discussion
3.2 Theme 2

3.2.1 Experiment 2.1

3.2.1.1 Introduction

3.2.1.2 Materials and method

3.2.1.2.1 Scale up process

3.2.1.2.2 Comparison test

3.2.1.3 Results and discussion

3.2.1.4 Conclusion

3.2.2 Experiment 2.2

3.2.2.1 Introduction

3.2.2.2 Materials and method

3.2.2.2.1 Design process

3.2.2.2.2 Testing procedure

3.2.2.3 Results and discussion

3.2.2.4 Conclusion

3.2.3 Experiment 2.3

3.2.3.1 Introduction

3.2.3.2 Materials and method

3.2.3.3 Results and discussion

3.2.3.4 Conclusions

4. CONCLUSION AND RECOMMENDATION

5. FUTURE RESEARCH DIRECTIONS

6. LITERATURE CITED

7. APPENDICES
LIST OF TABLES

Table 2.1: Distribution of the cinnamon in major producing districts 10
Table 2.2: Factors affecting the quality of Cinnamon bark products at different points of the trade channel 35
Table 2.3: Classification of cinnamon quills 36
Table 3.1.1: Technical parameters of cinnamon bush and harvested cinnamon sticks 47
Table 3.1.2: Time consumption for removing knots 55
Table 3.1.2.2: Time consumption for scraping 57
Table 3.1.2.3: Time consumption for rubbing 59
Table 3.1.2.4: Time consumption for peeling 61
Table 3.1.2.5: Time consumption for each processing steps 64
Table 3.1.4.1: Sampling sites in Matara and Galle districts 70
Table 3.1.4.2: Diameter ranges of the cinnamon sticks 71
Table 3.1.4.3: Variation of the mean diameter 71
Table 3.2.1.1: Technical specification of REWEKACG 77
Table 3.2.1.2: Dimensional changes of the each element in the scale up process 83
Table 3.2.1.4: Average time requirement to rub 85
Table 3.2.1.5: Stroke difference of the two cinnamon rubbing device 85
Table 3.2.2.1 Mean values for time consumption for insertion sticks 93
Table 3.2.3.1: Time consumption for manual and machine rubbing 96
LIST OF FIGURE

Figure 2.1: Histogram of Cinnamon Holdings Size 11
Figure 2.2: Histogram of Age of Cinnamon Holdings 12
Figure 2.3: *Cinnamomum verum*: Cinnamon 13
Figure 2.4: Flow diagram of cinnamon processing and products 26
Figure 2.5: Steps of cinnamon Peeling 28
Figure 2.6: Historical Photographs about cinnamon processing 29
Figure 2.7: The Banner 30
Figure 2.8: Cinnamon products 31
Figure 2.9: Grading of cinnamon quills 37
Figure 3.1: Floor diagram of experimentation 40
Figure 3.1.1.1: Variation of Canopy height of cinnamon bushes 43
Figure 3.1.1.2: Variation of usable shoot length 44
Figure 3.1.1.3: Variation of shoots per bush 44
Figure 3.1.1.4: Number of shoots harvest 45
Figure 3.1.1.5: Variation of convenient processing length 45
Figure 3.1.1.6: Variation of knots per stick 46
Figure 3.1.1.7: Variation of stick weight 46
Figure 3.1.2.1: Kattha 49
Figure 3.1.2.2: Modified Kokattha 50
Figure 3.1.2.3: Stick after rubbing process 51
Figure 3.1.2.4: Small knife used for peeling 52
Figure 3.1.2.5: Difference between unpeelable bark and peelable bark 52
Figure 3.1.2.6: Detail description of time consumption for removing knots 54
Figure 3.1.2.7: Relationship between removing knots and diameter 56
Figure 3.1.2.8: Detail discretion of time consumption for scraping 57
Figure 3.1.2.9: Relationship between scraping and diameter
Figure 3.1.2.10: Detail description of time consumption for rubbing
Figure 3.1.2.11: Relationship between rubbing and diameter
Figure 3.1.2.12: Detail description of time consumption for peeling
Figure 3.1.2.13: Relationship between peeling and diameter
Figure 3.1.2.14: Comparison each processing steps among different stations
Figure 3.1.2.15: Time distribution among different processing steps
Figure 3.1.2.16 Summarization of mean time
Figure 3.1.3.1: Associated difficulties of (RUWEKA-CG)
Figure 3.1.4.1: Getting samples and data collection
Figure 3.1.4.2: Frequency distribution of large end diameter in Galle district
Figure 3.1.4.3: Frequency distribution of large end diameter in Matara district
Figure 3.1.4.4: comparison of mean diameter in different districts
Figure 3.2.1.1: Rubbing devices (RUWEKA-CG)
Figure 3.2.1.2: Components of the rubbing device (RUWEKA-CG)
Figure 3.2.1.3: Accumulative frequency distribution in Matara and Galle
Figure 3.2.1.4: Accumulative frequency distribution in Galle
Figure 3.2.1.5: A. Rubbing machine (RUWEKA-CG) B. New machine
Figure 3.2.1.6: Time taken for both machines over the stick diameter
Figure 3.2.2.1: Component of the Polly-cam mechanism
Figure3.2.2.2: Function of the Polly-cam mechanism
Figure 3.2.2.3: Insertion of cinnamon stick with Polly-cam mechanism
Figure 3.2.2.4: Drawing 1
Figure 3.2.2.5: Drawing 2
Figure 3.2.2.5 Time variation of inserting sticks
Figure 3.2.2.6 Box plot for variation of time in insertion process
Figure 3.2.3.1: Variation of the time consumption for manual rubbing 97
Figure 3.2.3.2: Variation of the time consumption for machine rubbing 97