TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
ABSTRACT	ii
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF COLOR PLATES	xi
ABBREVIATIONS	xiii
1. INTRODUCTION	1
2. LITERATURE REVIEW	7
2.1 Medicinal plants	7
2.2 Medicinal plants in Sri Lanka	9
2.3 Market scenario and future potential of medicinal plants	10
2.4 Constraints and remedies in the use of medicinal plants	11
2.5 Germplasm collection and conservation	14
2.6 Red sandalwood as a medicinal plant	16
2.6.1 Synonyms	16
2.6.2 History of red sandalwood	18
2.6.3 Botany	19
2.6.4 Distribution	25
2.6.5 Ecological requirements	26
2.6.6 Pest and diseases	27
2.6.7 Chemical composition	27
2.6.8 Importance	29
2.6.9 Trade	32

2.7 Plant Propagation	34
2.7.1 Propagation through seeds	34
2.7.2 Seed germination	35
2.7.3 Seed treatments	36
2.7.4 Nursery establishment of seeds	37
2.7.5 Field establishment	38
2.7.6 Plant protection	39
2.7.7 Propagation through vegetative methods	39
2.7.7.1 Propagation through air layering	40
2.7.9.2 Propagation through cuttings	41
2.8. Plant Tissue Culture	41
2.8.1 Introduction to plant tissue culture	41
2.8.2 Importance of tissue culture	43
2.8.3 Application of plant issue culture in different crops	45
2.8.4 Plant tissue culture in medicinal plants	47
3. MATERIALS AND METHODS	48
3.1 In-vitro Establishment of red sandalwood seeds	49
3.1.1. Selection of suitable surface sterilization	
procedure for the establishment	49
3.1.2. Effect of pod size on <i>in-vitro</i> germination of	
red sandalwood seeds	51
3.1.3 Effect of storage time of pods on In-vitro	
germination of red sandalwood seeds	53

	3.1.4 Selection of suitable establishment media	
	for in-vitro propagation	54
3.2	Effect of different culture media on in-vitro growth	
	performance of red sandalwood seedlings	56
3.3	Proliferation of <i>in-vitro</i> cuttings of red sandalwood	57
3.4	In-vitro rooting of red sandalwood cuttings	58
4. RESULT	IS AND DISCUSSION	61
4.1	In-vitro establishment of wed sandalwood seeds	61
	4.1.1 Selection of suitable surface sterilization	
	Procedure	61
	4.1.2 Effect of the pod size on <i>in-vitro</i> germination of	
	red sandalwood seeds	66
	4.1.3 Effect of storage time of the pods on <i>In-vitro</i>	
	germination of red sandalwood seeds	68
	4.1.4 Selection of a suitable establishment media for	
	in-vitro propagation	71
	4.1.5 Effect of basal medium on <i>in-vitro</i> growth performance	
	of red sandalwood seedlings	80
4.2	Shoot proliferation on <i>in-vitro</i> nodal cuttings	8 6
4.3	In-vitro rooting of red sandalwood cuttings	91
5. CONCL	USIONS	99
6. RECOM	MENDATIONS AND SUGGETIONS	101
7. REFERE	ENCES	103
8. APENDI	ICESS	109

viii

LIST OF TABLES

Table	Page
2.1 Places where mature red sandalwood trees exist in Matara district	26
3.1 Different exposure times in 0.1 % HgCl ₂	50
3.2 Categorization of Red Sandalwood pods according to their highest	
external diameter	51
3.3 Different storage periods for red sandalwood pods	53
3.4 Different culture media for in-vitro establishment of seeds	54
3.5 Different culture media for in-vitro development seeds	56
3.6 Combinations of BAP and NAA used for shoot proliferation	57
3.7 Concentration of IAA in the medium used for root induction on	
in-vitro stem segments	58
3.8 Concentration of IBA in the medium used for root induction on	
in-vitro stem segments	59
3.9 Different levels and combinations of IAA and IBA used for	
in-vitro root induction	60
4.1 Effect of storage period on <i>in-vitro</i> germination of seeds	70
4.2 Effect of different basal media and activated charcoal on germination and	
in-vitro establishment of red sandalwood seedlings	80
4.3 Effect of different culture media on <i>in-vitro</i> growth performance of	
red sandalwood seedlings	84
4.4 Effect of different culture media and hormone combinations on shoot	
proliferation of red sandalwood nodal cuttings	89
4.5 Effect of different combinations of IAA and IBA on rooting of	
red sandalwood nodal cuttings	95

LIST OF FIGURES

Figure	Page
4.1 Percentage of fungal and/or bacterial contaminations of red sandalwood	
seeds at different exposure times in 0.1% HgCl ₂	61
4.2 Effect of exposure time in 0.1% HgCl ₂ on <i>in-vitro</i> germination of	
red sandalwood seeds	62
4.3 Percentage seed germination in-vitro as affected by pod diameter	67
4.4 Effect of pod diameter on <i>in-vitro</i> seed germination time	67
4.5 Effect of storage period on in- vitro germination	69
4.6 Effect of storage period on in-vitro germination time	69
4.7 Effect of culture media on <i>in-vitro</i> seed germination percentage	72
4.8 Effect of culture media on <i>in-vitro</i> germination time	73
4.9 Effect of different culture media on hypocotyls length	73
4.10 Effect of different culture media on plant height	81
4.11 Effect of different culture media on mean number of shoots	81
4.12 Effect of different culture media on formation of leaves	82
4.13 Effect of different culture media on average leaf diameter	82
4.14 Effect of different levels of BAP levels on proliferated number of shoots,	
number of nodes in the main shoot and number of leaves on it in WPM	
incorporated with 0.2 mg/l NAA	86
4.15 Effect of different levels of BAP levels on proliferated number of shoots,	
number of nodes in the main shoot and number of leaves on it in WPM	
incorporated with 0.2 mg/l NAA and 1 g/l activated charcoal	87
4.16 Effect of different levels of BAP levels on shoot multiplication on MS and	
WPM incorporated with 0.2 mg/l NAA and 1 g/l activated charcoal or	
without activated charcoal	88

4.17 Effect of different IAA and IBA combinations on rooting	92
4.18 Effect of different IAA and IBA levels on number of root formation	94
4.19 Effect of different IAA and IBA levels on root length	94

LIST OF COLOR PLATES

Plate	Page
2.1 Botanical parts of P. santalinus	19
2.2 Mature tree of P. santalinus	20
2.3 Wood of P. santalinus	21
2.4 Leaf of P. santalinus	22
2.5 Inflorescence of P. santalinus	23
2.6 Fruit (pod) of <i>P. santalinus</i>	24
2.7 Seeds of <i>P. santalinus</i>	24
2.8 Red sandalwood powder	30
2.9 Red sandalwood dye	31
2.10 Wood carvings of red sandalwood	32
2.11 Seedling of P. santalinus	37
3.1 Red sandalwood pods used for the experiment	48
3.2 Red sandalwood seeds used for the experiments	49
3.3 External diameter of red sandalwood pods	51
3.4 Categorization of Red Sandalwood pods according to the highest	
external diameter	52
3.5 Seeds germination on MS medium with activated charcoal	55
3.6 Culture room used for the experiments	60
4.1 Contamination of red sandalwood seeds by fungi	65
4.2 Germinated P. santalinus seed	74
4.3 In-vitro seedlings on the presence of activated charcoal in the medium (a)	
and without (b)	76
4.4 In-vitro root development in different culture conditions	
(a) 1 g/l activated charcoal in the medium (b) without activated charcoal	77

4.5	Stages of seed germination in red sandalwood in the medium incorporated	
	with 1 g/l activated charcoal	79
4.6	Growth of red sandalwood seedling in WP medium + 1 g/l activated charcoal	84
4.7	Proliferation of red sandalwood in 4 mg/l BAP and 0.2 mg/ NAA in	
	MS medium	88
4.8	Single shoot elongation from nodal cuttings in MS+1 g/l activated	
	charcoal + 0.1 mg/l IAA	93
4.9	Rooting of red sandalwood nodal cuttings in 0.5 mg/l IAA and 0.5 mg/l IBA	93
4.10	0 Direct and indirect rooting (a) direct rooting, (b) rooting through	
	callus formation	95