

	Page
ACKNOWLEDGEMENTS	III
ABSTRACT	IV
LIST OF TABLES	XI
LIST OF FIGURES	XII
ABBREVIATIONS	XIV
CHAPTER I: INTRODUCTION	1
1.1 Statement and significance of the problem	1
1.2 Literature review	2
1.2.1 The radical nature of oxygen	2
1.2.2 Sources of reactive oxygen species (ROS)	4
1.2.3 Oxidative damage and degenerative diseases	4
1.2.4 Antioxidant defenses	7
1.2.5 Properties of some vitamins as an antioxidant	8
1.2.5.1 Vitamin C	8
1.2.5.2 α -Tocopherol and other vitamin E compounds	10
1.2.5.3 Trolox	12
1.2.6 Other antioxidants	12
1.2.7 Flavonoid	15
1.2.8 Flavonoid and antioxidant activity	18
1.2.9 Properties of some antioxidants derived from plants	19
1.2.9.1 Curcumin	19
1.2.9.2 Oligomeric proanthocyanidins	19
1.2.10 The calcium pump of the erythrocyte membrane	22

	Page
1.2.10.1 The role of calcium in biological system	22
1.2.10.2 The mechanism of calcium transport across erythrocyte	23
1.2.10.3 The plasma membrane Ca^{2+} ATPase	25
1.3 Experimental designs	28
1.4 Objectives	30
CHAPTER II: MATERIALS AND METHODS	31
1. Chemicals	31
2. Instruments	34
3. Preparation of tamarind seed-coat powder	34
4. Extraction of antioxidative substances from tamarind seed coat powder	34
5. Determination of total antioxidant activity	35
6. Preparation of peroxidase	37
7. ABTS/ H_2O_2 /Metmyoglobin	38
8. ABTS/ H_2O_2 / FeCl_3 method: Fenton reaction	39
9. NBT/HPX/XOD: Neotetrazolium method	40
10. Preparation of calmodulin-deficient erythrocyte membrane	41
11. Protein assay	42
12. Determination of the antioxidative effect of tamarind seed coat extract on erythrocyte membranes	44
13. Thiobarbituric acid-reactive substances (TBARS) measurement	45
14. Determination of the Ca^{2+} -ATPase activity	47

	Page
CHAPTER III: RESULTS	49
1. Extract of antioxidant compound from tamarind seed-coat powder	49
2. Characteristics of the tamarind seed-coat extract	52
3. Antioxidant properties of the dry extract from tamarind seed coats	61
4. Antioxidant activity of the extract in comparison to standard antioxidants	64
5. Prevention of lipid peroxidation in erythrocyte membrane by the extract	68
6. Protection of Ca^{2+} -ATPase activity in erythrocyte membrane by the extract	72
CHAPTER IV: DISCUSSION	74
CHAPTER V: CONCLUSION	79
REFERENCES	80
VITA	90

LIST OF TABLES

TABLE	Page
1 Structures of some antioxidants used in biology and food technology	13
2 Structures of some plant compounds with antioxidant activity in certain systems	14
3 Rf values of components in the hydrolyzed extract from tamarind seed coat separated on TLC chromatogram	55
4 Chemical screening tests for the presence of condensed tannin in the extract compared to OPC	58

LIST OF FIGURES

FIGURE	Page
1 The univalent pathway for oxygen reaction	3
2 Structures of vitamin E (Tocopherol), vitamin C and Trolox	9
3 Vitamin E and its reaction with vitamin C	11
4 Structures of some flavonoids: flavonols, flavanones, flavones and anthocyanidins	17
5 Structures of some known flavan-3-ols and proanthocyanidins	20
6 Calcium transporting system in eukaryotic cells	24
7 Proposed reaction cycle of the Ca^{2+} pump in plasma membrane and sarcoplasmic reticulum	27
8 Experimental designs for this study	29
9 The protein standard curve	43
10 The MDA standard curve	46
11 Antioxidative effect of fractions extracted from tamarind seed-coat	50
12 Specific antioxidant activity of fractions	51
13 TLC chromatogram of the hydrolyzed extract	54
14 Antioxidative effect of the hydrolyzed extract	56
15 Heat stability of the extract	57
16 Comparison of the absorption spectra of the extract and OPC	59
17 Comparison of IR spectra of the extract and OPC	60
18 Antioxidant activity of the residue extract of tamarind seed-coat from water fraction	62
19 Dose dependence and specific anti-peroxyl radical effect of the extract	63
20.1 Antioxidant activity of the extract against peroxyl radicals in comparison to vitamin E and curcumin	65

	Page
20.2 Antioxidant activity of the extract against peroxy radicals in comparison to Trolox and vitamin C	66
20.3 Antioxidant activity of the extract against hydroxyl radicals in comparison to vitamin E and curcumin	67
21.1 Prevention of lipid peroxidation of the extract	69
21.2 Prevention of lipid peroxidation of curcumin	70
21.3 Prevention of lipid peroxidation of vitamin E	71
22 Ca^{2+} -ATPase protection of the extract compared to curcumin and vitamin E	73

ABBREVIATIONS

Abs	Absorbance
Ca ²⁺	Calcium
°C	Degree of celcius
Cu	Copper
DNA	Deoxyribonucleic acid
Fe	Iron
g	Gram
HPETE	Hydroperoxyeicosatetraenoic acid
IR	Infrared
L	Liter
LDL	Low density lipoprotein
μg	Microgram
μl	Microliter
μM	Micromolar
mg	Milligram
ml	Milliliter
mM	Millimolar
M	Molar
min	Minute
NADH	Nicotinamide adenine dinucleotide (reduced form)
NADPH	Nicotinamide adenine dinucleotide phosphate (reduced form)
nm	Nanomater
OD	Optical density
PGG ₂	Prostaglandin G ₂
PGH ₂	Prostaglandin H ₂
%	Percent
RBC	Red blood cell

rpm	Revolution per minute
sec	Second
TLC	Thin layer chromatography
UV	Ultraviolet
v/v	Volume/volume
w/v	Weight/volume