DEVELOPMENT OF NANOPARTICLES ENTRAPPED THANAKHA'S (Naringi crenulata) BARK AND ALOE'S (Aloe vera) GEL EXTRACT FOR APPLICATION IN SUNSCREEN PRODUCT

WEERAYUT MUANGTON

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Science Degree
in Pharmaceutical Sciences (International Program)
October 2010

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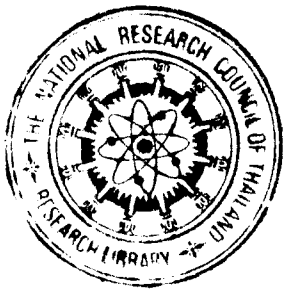

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This thesis entitled "Development of nanoparticles entrapped thanakha's (*Naringi crenulata*) bark and aloe's (*Aloe vera*) gel extract for application in sunscreen product" by Weerayut Muangton in partial fulfillment of the requirements for the Master of Science Degree in Cosmetic Sciences (International Program) is hereby approved.

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ABTRACT

This study was aimed to develop nanoparticles entrapped *Naringi crenulata* bark and *Aloe vera* gel extract for application in sunscreen product.

The *N. crenulata* bark was extracted using methanol while that of the *A. vera* gel was precipitated protein with 35% ammonium sulfate saturation at 4 °C, respectively. Subsequently, *N. crenulata* bark extract was examined the antioxidant activity by comparing with vitamin E (α-tocopherol) based on DPPH assay. The obtained EC_{50} value of *N. crenulata* bark extract was 146.1±1.1 μg/mL while vitamin E, a well known as anti-oxidative substance, provided EC_{50} of 11.1±1.1 μg/mL. *A. vera* gel extract was examined the anti-inflammatory activity by comparing with prednisolone based on inhibitory TNF-α production released from RAW 264.7 macrophage cell lines with LPS activating. The results revealed that *A. vera* gel extract could inhibit production of TNF-α by LPS induced macrophages with IC_{50} of 71.3±1.5 μg/mL while prednisolone had IC_{50} of 25.6±1.2 μg/mL. In addition, the cytotoxic test of *N. crenulata* bark extract and *A. vera* gel extract on viable human keratinocyte cell lines (HaCat cells) was investigated by XTT assay kit. The results showed that the toxic effect of *N. crenulata* bark extract on cell viability of HaCat cells was in the dose-dependent manner while that of *A. vera* gel extract showed toxic dose at high concentration.

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ABBREVIATIONS

A. vera	=	*Aloe vera*
α	=	alpha
BCC	=	basal carcinoma
BSA	=	bovine serum albumin
CC	=	carcinoma
°C	=	degree celsius
CHS	=	contact hypersensitivity
CI	=	confident interval
CPD	=	cyclobutane pyrimidine dimers
CV	=	coefficient of variation
Cont.	=	continued
DCs	=	dendritic cells
DMEM	=	Dulbecco's Modified Eagle's Medium
DNA	=	deoxyribonucleic acid
DPPH	=	1,1- diphenyl-2-picrylhydrazyl radicals
EC_{50}	=	half maximal effective concentration
EI	=	erythema index
ELISA	=	Enzyme-linked immune-sorbent assay
g	=	gram
FBS	=	fetal bovine serum
hr	=	hour
IC_{50}	=	half maximal inhibitory concentration
IL	=	interleukin
IPD	=	immediate pigment-darkening reaction
IR	=	infrared
kDa	=	kilo dalton
µl	=	micro liter
LCs	=	langerhan cells

ABBREVIATIONS (CONT.)

LPS	=	lipopolysaccharide
LUV	=	large unilamellar vesicles
MED	=	minimal erythema dose
mg	=	milligram
MI	=	melanin index
min	=	minute
mL	=	milliliter
MLV	=	multi lamellar vesicle
MM	=	malignant melanoma
mon	=	month
MW	=	molecular weight
N. crenulata	=	*Naringi crenulata*
NSMC	=	non-melanoma skin cancer
PAF	=	platelet activating factor
PC	=	phosphatidyl chlorine
pg	=	picogram
pH	=	power of hydrogen ion concentration
PI	=	polydispersity index
REV	=	relative erythema value
RMV	=	relative melanin value
rpm	=	revolutions per minute
ROS	=	radical oxygen species
S.D.	=	standard deviation
SDS	=	sodium dedocyl sulfate
SEM	=	scanning electron microscopy
SLNs	=	solid lipid nanoparticles
SPF	=	sun protection factor

ABBREVIATIONS (CONT.)

SUV	=	small unilamellar vesicle
TEM	=	transmission electron microscopy
TLC	=	thin layer chromatography
UCA	=	urocanic acid
UV	=	ultraviolet
UVA	=	ultraviolet A
UVB	=	ultraviolet B
v/v	=	volume by volume
w/v	=	weight by volume
w/w	=	weight by weight
XTT	=	sodium 3'-[1-(phenylamino carbonyl)-3,4-tetrazolium]-bis(4-methoxy-6-nitro) benzene sulfonic acid hydrate