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Ain Shams University
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The Antiproliferative Effect Of Origanum Majorana On Hepatocarcinoma Cell Line

A Thesis
Submitted for the degree of Master of Science As a Partial fulfillment for requirements of the master of Science

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DECLARATION

I declare that this thesis has been composed by myself and the work of which it is a record has been done by myself. This thesis has not been submitted for a degree at this or any other university.

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DEDICATION

I dedicated this thesis to my family who has always supported me. Thanks to my mother who has always been so loving and caring. Thanks to my father for making me always strive for better. Thanks to my husband for his help.

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ABSTRACT

Randa Mohamed Abd Elhady. The antiproliferative Effect Of Origanum Majorana On Hepatocarcinoma Cell Line. Department of Biochemistry, Faculty of Science, Ain Shams University.

Hepatocellular carcinoma (HCC) is one of the most common cancer types with a high prevalence and it is the leading cause of cancer deaths worldwide. This study aimed to investigate the antiproliferative effect of water and ethanol extracts of *Origanum majorana* leaf on human hepatocellular carcinoma (HepG2) cell line through incubation of various concentrations of *Origanum majorana* extracts with HepG2 at different time intervals. The effects of water and ethanol extracts of *O. majorana* on HepG2 cell viability, nuclear factor kappa B (NF-kB) gene expression were examined. The results of the cell viability assays showed that water and ethanol extracts exhibited a highly significant inhibitory effect on HepG2 cell proliferation which was evidenced by a reduction in viable cell count. The results were confirmed by microscopical examination of cell morphology. Furthermore, the *O. majorana* extracts suppressed the activity of NF-kB gene expression of HepG2 cells compared to the control. The conclusions from this study suggest that marjoram extracts exhibit anti-proliferative effect against HCC through suppressing the activity of NF-kB gene expression.

Key words: HepG2, *Origanum majorana*, antiproliferative effect ,cancer , hepatocellular carcinoma, nuclear factor kappa B.

LIST OF ABBREVIATIONS

Abb.	Full term
AFB1	Aflatoxin B1
ANOVA	One-way analysis of variance
BAFF	B-cell activating factor
CO_2	Carbon dioxide
COX	Cyclooxygenase
dCTP	Deoxy cytadine triphosphate
dGTP	Deoxy guanine triphosphate
dTTP	Deoxy thymidine triphosphate
DDR	DNA damage response
DEN	Diethylnitrosamine
DEMSO	Dimethyl sulfoxide
DNA	Deoxy nucleic acid
EDTA	Ethylene diamine tetraacetic acid
EtOH	Ethanol
FBS	Fetal bovine serum
GJIC	Gap junctional intercellular communication
HBV	Chronic hepatitis B
HBsAg	Chronic hepatitis B antigen
HCC	Hepatocellular carcinoma
HCV	Chronic hepatitis C virus
HCV-Ab	Hepatitis C antibodies
HepG2	Human hepatoma cell line
H_2O_2	Hydrogen peroxide
ICAM	Intercellular adhesion molecule
IKB α	I Kappa B alpha
IKK α	I Kappa kinase alpha
IKK β	I Kappa kinase B beta
IL-1	Interleukin 1
IL-6	Interleukin 6
iNOS	Inducible nitric oxide synthase
LPS	Lipopolysaccharides

MAPK	Mitogen-activated protein kinase
MMP-2	Matrix metalloproteinases -2
MMP-9	Matrix metalloproteinases -9
NAFLD	Non-alcoholic fatty liver disease
NASH	Non alcoholic steatohepatitis
NEMO	Nuclear factor of kappa B essential modulator
NF-kB	Nuclear factor of kappa B
NIK	Nuclear factor of kappa B inducing kinase
NO	Nitric Oxide
NSAID	Non-steroid anti-inflammatory drugs
O.M	*Origanum majorana*
PBS	Phosphate buffer saline
PCR	Polymerase chain reaction
PI3K	Phosphoinositide 3-kinase
RDA	Recommended dietary allowance
RNA	Riboxy nucleic acid
RelA/p65	Rel-like domain-containing proteins
RelB/p52	Rel-like domain-containing proteins
ROS	Reactive oxygen species
RT-PCR	Real time polymerase chain reaction
SD	Standard deviation
SOD	Superoxide dismutase
TNF	Tumor necrosis factor
uPA	Urokinase plasminogen activator receptor
VEGF	Vascular endothelial growth factor