BIOCHEMICAL STUDIES ON PEPPERS AS SPEICIFIC FOODSTUFFS

By

SHAIMAA GAMAL SAYED ABDEL SALAM
B.Sc. Agric. Sci. (Biochemistry), Fac. Agric., Cairo Univ., 2010

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APPROVAL SHEET

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Title of Thesis: Biochemical Studies on Peppers as Specific Foodstuffs

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ABSTRACT

In the current study, two cultivars of pepper fruits (sweet fruits of *Capsicum annuum* and hot chilli fruits of *Capsicum frutescens*) at two maturity stages (green and red) were used to determine the antioxidant, antibacterial and anticancer activities of their ethanolic and aqueous extracts in both fresh and heat-treated forms (dried and boiled). Proximate analyses of the tested samples were determined, and the resulted data showed that ash, crude protein, crude fat and total carbohydrate increased after drying treatment but they were declined as a result of boiling treatment except crude fat and total carbohydrate. Total phenolic content, total flavonoid and antioxidant activities were also evaluated in fresh pepper. These parameters increased under the effect of both heat processes and the ethanolic extracts had high contents compared to aqueous extracts. Twenty six phenolic and aromatic compounds, twelve flavonoid compounds and eleven organic acids were detected by using of HPLC fractionation. Vitamin C, β-carotene, vitamin E and capsaicin were also estimated by HPLC and the obtained data showed that all of those components were lowered by both heat treatments. The antibacterial activity of all extracts (ethanolic and aqueous) and capsaicin standard was also tested against both Gram-positive and Gram-negative pathogenic bacteria. Only, ethanolic extracts partially inhibited all of the tested organisms except, *Bacillus cereus* which was completely inhibited by both ethanolic and aqueous extracts. Finally, the potential anticancer activity of aqueous extracts of dried pepper samples and capsaicin was tested against prostate (PC-3) and breast (MCF-7) carcinoma cell lines *in-vitro*. The results showed that sweet peppers had a higher anticancer activity against PC-3, in contrast, hot peppers had a higher cytotoxicity against MCF-7.

Key words: Hot pepper, Sweet pepper, *Capsicum*, Capsaicin, Oven-drying, Boiling, Bioactive compounds, Antioxidant activities, Antibacterial activity Anticancer activity.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my mother, my father and my husband Amgad for all the support they lovely offered along the period of my post graduation.

Lastly, I dedicate this work to whom my heart felt thanks; to my sister Nourhan and my friend Mai Mahmoud.

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LIST OF ABBREVIATIONS

AA	Ascorbic acid
ABTS	2,2-azinobis-3-ethylbenzothiazoline-6-sulfonic acid
ADP	Adenosine diphosphate
AOAC	Association of official analysis chemists
AP-1	Activator protein 1
ATCC	American type culture collection
Bcl-xL	B-cell lymphoma protein
BHI	Brain-heart infusion
BHT	Butylated hydroxytoluene
CAP	Capsaicin
CFU	Colony Forming Unit
CGRP	Calcitonin gene-related peptide
COX-2	Cyclooxygenase-2
CPG	Creasing pepper (green)
CSSN	Capsaicin-sensitive sensory nerves
DMSO	Dimethyl sulfoxide
DPPH	2,2-diphenyl-1-pricrylhydrozyl
DSM	Diagnostic and statistical manual of mental disorders
DW	Dry weight
EDTA	Ethylenediamine tetraacetic acid
EGFR	Epidermal growth factor receptor
ERK	Extracellular signal-regulated kinases
FCR	Fructus capsici (red)
FDA	Food and Drug Administration
FRAP	Ferric reducing antioxidant power
FW	Fresh weight
GAS	Gastric acid secretion
HER2	Human epidermal growth factor receptor 2
IKK	IKB kinase (Inhibitor of kappa B)
IRS	Intermediate ripening stages
JNK	c-Jun N-terminal kinases

LIST OF ABBREVIATIONS (Continued)

LDL	Low density lipoprotein
LPG	Longline pepper (green)
LPPR	Long-point pepper (red)
MAPK	Mitogen-activated protein kinases
MCF-7	Michigan cancer foundation-7
MIC	Minimal inhibitory concentration
ND	Not detected
NF-kB	Nuclear factor kappa-light-chain-enhancer of activated B cells
p53	Tumor suppressor protein
PARP	Poly (ADP-ribose) polymerase
PKB	Protein kinase B
PPR	Point-pepper (red)
PSA	Prostate specific antigen
RAE	Retinol activity equivalent
RDA	Recommended daily administration
ROS	Reactive oxygen species
RSA	Radical-scavenging activity
RTX	Resiniferatoxin
SHU	Scoville heat unit
SRB	Sulfo-Rhodamine B
STAT3	Signal transducer and activator of transcription 3
TA	Titritable acidity
TCC	Total carotenoid content
TE	Trolox equivalents
TEAC	Trolox equivalent antioxidant capacity
TNF	Tumor necrosis factor
TPC	Total phenolic content
TRPV-1	Transient receptor potential vanilloid subfamily-1
TSS	Total soluble solids

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