

**BIOCHEMICAL STUDIES ON RECYCLING OF
LEATHER AND OKARA WASTES**

By

RANIA HABIB EL-SAID SALEM JACOB

B.Sc. Agric. Sci. (Agric. Biochemistry), Fac. Agric., Cairo Univ., 2010

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APPROVAL SHEET

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APPROVAL COMMITTEE

Dr. AHMED EL-SAYED BASYONY.....
Professor of Biochemistry, Food Technology Institute, Agric. Res. Center

Dr. AMR AHMED MOSTAFA
Professor of Biochemistry, Fac. Agric., Cairo University

Dr. HAZEM MOHAMED MAHMOUD.....
Associate Professor of Biochemistry, Fac. Agric., Cairo University

Dr. ADEL SAYED AFIFY
Professor of Biochemistry, Fac. Agric., Cairo University

Date: 22 / 8 /2016

SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. ADEL SAYED AFIFY
Professor of Biochemistry, Fac. Agric., Cairo University

Dr. HAZEM MOHAMED MAHMOUD
Associate Professor of Biochemistry, Fac. Agric., Cairo University

Name of Candidate: Rania Habib El-Said Salem Jacob

Degree: M.Sc.

Title of Thesis: Biochemical Studies on Recycling of Leather and Okara Wastes

Supervisors: Dr. Adel Sayed Afify

Dr. Hazem Mohamed Mahmoud

Department: Agricultural Biochemistry

Approval: / / 2016

ABSTRACT

Because of the great effectiveness of amino acids as naturally chelates for minerals, the present study was carried out to recycling of leather and okara wastes into their protein hydrolysates (LPHs and OPHs) by alkaline (CaO or KOH) or enzymatic (alkaline protease or trypsin) hydrolyses. Results showed that LPHs obtained by alkaline hydrolyses had the highest values for degree of hydrolysis (DH%), Fe²⁺-chelating activity and total free amino acids content, especially with CaO which recorded 46.86%, 85.37% at 3 µl hydrolysate and 16.45 mg/ml hydrolysate, respectively, while LPHs obtained by enzymatic hydrolyses showed the highest values as antioxidant and Cu²⁺-chelating activity especially with alkaline protease which recorded 66.35% at 700 µl and 75.55% at 800 µl hydrolysate, respectively. OPH obtained by CaO also revealed the highest values for DH%, Cu²⁺-chelating activity and total free amino acids content (4.65%, 97.68% at 800 µl hydrolysate and 0.51 mg/ml hydrolysate, respectively), while OPH obtained by KOH hydrolysis possessed the highest value for Fe²⁺-chelating activity (78.63% at 3 µl hydrolysate). OPH/trypsin 1% revealed the highest value as antioxidant (95.14% at 700 µl hydrolysate). On the other hand, LPH/CaO was used to prepare metal-protein hydrolysate chelates (Cu²⁺-, Zn²⁺-& Fe²⁺-LPHCs). Metal-LPHCs had antibacterial activities against *E. coli*, *B. cereus* and *Micrococcus* spp. mostly with Zn-LPHC and Fe-LPHC. These complexes increased the growth characteristics and mineral absorption of spinach plants in hydroponic nutrient solution than that of mineral salts (CuSO₄, ZnSO₄ and FeSO₄). Cu-LPHC also increased the absorption of Cu (bioavailability) through everted gut sacs of broilers than of mineral salt (CuSO₄). Finally, it can be concluded that metal-leather protein hydrolysate complexes have many benefits as antimicrobial and micronutrients for plant and increase the bioavailability of mineral ions by ileam. The use of M-LPHCs supports the plant with micronutrients and is a natural source of organic nitrogen, as well as support the bioavailability of minerals in animals.

Key words: Leather protein hydrolysates, okara protein hydrolysates, metal-protein hydrolysate chelates, antioxidant, chelating activity, bioavailability

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LIST OF ABBREVIATIONS

AAA	Amino Acid Analyzer
ABTS	2,2-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid)
ATPS	Aqueous Two Phase Systems
CCLW	Chromium Containing Leather Waste
CSGH	Cobia Skin Gelatin Hydrolysate
CSPH	Chicken Skin Protein Hydrolysate
DH	Degree of Hydrolysis
DPPH	2,2-diphenyl-1-picrylhydrazyl
EDTA	Ethylene diaminetetraacetic acid
FeBC	Ferrous bis-glycine chelate
FRAP	Ferric Reducing Ability of Plasma
FTIR	Fourier Transform Infrared Spectroscopy
GSH	Glutathione
IC₅₀	Fifty-percent inhibitory concentration
LPHs	Leather Protein Hydrolysates
MDA	Malondialdehyde

OPHs	Okara Protein Hydrolysates
PV	Pyrocatechol violet
R_f	Retardation factor
SCR	Soybean Crud Residue
TKN	Total Kjeldahl Nitrogen
TLC	Thin Layer Chromatography
TNBS	2,4,6-trinitrobenzene sulfonic acid

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