Studies on Safety and Quality Characteristics of Some Meat and Poultry Products Produced by Using Nanotechnology Technique.

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Amany Ahmed Abd-El Halim Mohamed

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B.Sc., Agric. Sci. (Food Technology), Fac. of Agric., Fayoum University, 2015
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Thesis
Submitted in Partial Fulfillment of
the Requirements for the Degree of
Doctor of Philosophy
In
Agricultural Science
Food Technology

Food Science and Technology Department
Faculty of Agriculture, Fayoum
Fayoum University
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Supervised by:

1. Prof. Dr. Nabil El-Sayed Hafez.
Prof. of Food Science and Technology (Emeritus), Faculty of Agriculture, Fayoum University.
Signature:……. ……...

2. Prof. Dr. Khalil Ibrahim Khalil.
Associated Prof. of Food Science and Technology (Emeritus), Faculty of Agriculture, Fayoum University.
Signature:……. ……...

3. Prof. Dr. Samah Ahmed Abd-El Tawab.
Associated Prof. of Food Science and Technology, Faculty of Agriculture, Fayoum University.
Signature:……. ……...

4. Prof. Dr. Rehab Khalid Mahmoud.
Prof. Department of Chemistry, Faculty of Science, BeniSuef University.
Signature:……. ……...

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Approved by:

1- Prof. Dr. Mohamed Shahat Salem.
Professor of Food Science and Technology (Emeritus), Faculty of Agriculture - AL- Azhar University.
Signature: …….

2- Prof. Dr. Awad Abd El -Tawab Mahmoud Awad.
Professor of Food Science and Technology (Emeritus), Faculty of Agriculture Fayoum University.
Signature: ……

3- Prof. Dr. Khalil Ibrahim Khalil.
Associated Professor of Food Science and Technology (Emeritus), Faculty of Agriculture, Fayoum University.
Signature: …… ……...

4- Prof. Dr. Nabil El-Sayed Hafez.
Professor of Food Science and Technology (Emeritus),Faculty of Agriculture, Fayoum University.
Signature:…… ……...

Date: / / 2025.

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ABSTRACT

Studies on Safety and Quality Characteristics of Some Meat and Poultry Products Produced by Using Nanotechnology Technique.

The current study was carried out to investigate the safety and quality characteristics of some meat products by using nanotechnology technique. The study included two of the processed meat products; chicken burger and beef kofta. To maintain safety and improving quality properties of the processed meat products, some chemical and synthetic ingredients are used. Sodium nitrite is an important food ingredient that is necessary used to prevent spoilage and growth of the pathogenic microorganisms and preserving good color.

Instead of using the chemical and synthetic preservatives, some natural extracts were prepared from plant sources. In Chicken burger onion peel extract (OPE) and pomegranate peel extract (PPE), as well as their encapsulated forms in chia seed nanoparticles (CSNPs), were used. Nanotechnology has been increasingly considered as an attractive technology in the food sector.

High-performance liquid chromatography (HPLC) analysis identified phenolic compounds in onion peel and pomegranate peel extracts. Chlorogenic acid, quercetin, syringic acid, gallic acid, catechins, ellagic acid and methyl gallate were the highest concentrations identified which are known for their antioxidant and antimicrobial properties.

The results indicated that nanoencapsulated extracts, particularly those loaded with onion peel extracts and pomegranate peel extracts could serve as effective antimicrobials. The study confirmed the inhibitory effects of the OPE, PPE, OPE-CSNP and PPE-CSNP and nanoparticles against bacterial strains; *Staphylococcus aureus* and *Bacillus cereus,* and fungal and yeast strains such as *C. albicans* and *A. niger*.

Effects of the different treatments on the chemical compositions and physical properties of chicken burgers were determined. Amino acid contents of chicken burgers as affected by the different treatments were determined. Effects of pH value, thiobarbituric acid and total volatile basic nitrogen as well as the microbiological examination were followed up during frozen storage for 6.0 months of chicken burger.

For the preparation of beef kofta, red cabbage and beetroots were analysed for their chemical compositions, total phenolic and flavonoid compounds and the antioxidant scavenging activities. The characterization of zinc oxide nanoparticles (ZnO NP), red cabbage zinc oxide nanoparticles (RC ZnO NP), and beet root zinc oxide nanoparticles (BR ZnO NP) were studied. Zinc oxide nanoparticles (ZnO NP) exhibited a concentration-dependent antibacterial activity, with an increase in inhibition zone diameter against all the tested strains as the concentration increased. Beef kofta samples treated with ($NaNO_2$), (RC), BR, (ZnO NP), (RC ZnO NP) and (BR ZnO NP) were analysed for chemical composition, physical properties and microbiological examinations during refrigerated storage for 21 days.

Key words: Zinc oxide nanoparticles, beef kofta, red cabbage, beetroots, nanoencapsulated, onion peel extracts, pomegranate peel extracts, Chicken burger,Chia seed nanoparticles.