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بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

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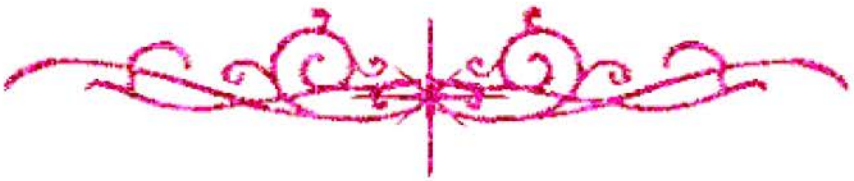
التوثيق الالكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

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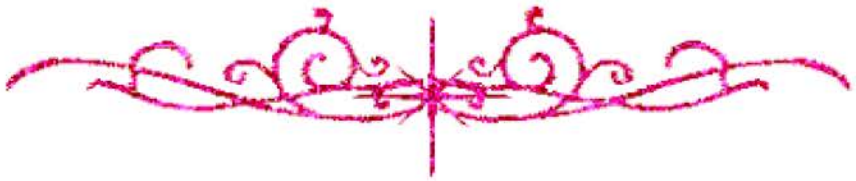

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شبكة المعلومات الجامعية

بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

STUDIES ON PRODUCTION AND UTILIZATION OF BIODEGRADABLE FILMS AS A FOOD PACKAGING MATERIAL.

BY

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M.SC. AGRIC. SCI. (FOOD TECH.), FAC. OF AGRIC., CAIRO UNIV., 1997

THESIS

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Faculty of Agriculture
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APPROVAL SHEET

STUDIES ON PRODUCTION AND UTILIZATION OF BIODEGRADABLE FILMS AS A FOOD PACKAGING MATERIAL .

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Ph.D. Agric. Sci. (Food Tech.), Fac. Of Agric., Cairo Univ., 2003

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Date ٣١ / ٨ / **2003**

Committee in Charge

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2003

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بسم الله الرحمن الرحيم

* قالوا سبحانك لا علم لنا الا ما علمتنا انك انت العليم الحكيم *

صدق الله العظيم
سورة البقرة(٣٢)

CONTENTS

Name of Candidate : Sabria Abou-zeid Mohamed ..... **Degree :** Ph.D. degree.....
Tile of Thesis: Studies on production and utilization of biodegradable films as a food packaging materials.
Supervisors : *Prof. Dr.* Salwa B. Magoli.....*Dr.* Yahia I. Sallam .....
Department : Food SCI.....
Branch : Food TECH.....**Approval:**.....

ABSTRACT

Twenty eight kind of biodegradable plastic films from corn protein (zein) with two different plasticizing agents (25% and50% glycerin and 25% and 50% oleic acid) and three different cross-linking agents as (6% citric acid , 10% oxidized starch and 10% potato starch) at two different processing temperature (60° C and 90° C) and solvents (aqueous solution pH: 2 and ethanol 80% were produced. The physical and mechanical properties of produced films were studied. The most permeable films for oxygen with lower water vapor permeability were chosen and were used as a coating of, mature and pre mature tomatoes and mature oranges. The physical and chemical properties of these coated, packaged and control samples were studied during the cold storage period. The results showed that the films contain starch have higher thickness than those containing citric acid as cross-linking agents. Meanwhile, using ethanol 80% as solvent made the films thickness very thin. The addition of oleic acid had bad effect on oxygen transmission rate and good effect on water vapor permeability of all films, the glycerin addition had the opposite effect. The OTR increased when the plasticizer concentration was increased and also with ethanol (80%). Meanwhile, oxidized starch addition and higher processing temperature decreased the OTR Glycerin, oxidized starch, higher processing temperature and using of ethanol as solvent improved the mechanical properties of all biodegradable films. Starches, higher processing temperature and oleic acid reduced the light transmission % with increasing of the film's darkness. Using of Oxidized starch and citric acid in some films increased the resistance of enzymatic and soil biodegradation Meanwhile, this resistance decreased at high processing temperature and with the increasing of the plasticizer concentration. Glycerin made the films completely degraded after 4 weeks compared to 5 weeks with oleic acid. The microscopic study of films surface showed that films surface containing oxidized starch as cross-linking agents or glycerin as plasticizing agents or ethanol 80% as solvent was homogenous and smooth. Meanwhile, using oleic acid created cracks and pours on the surface. Generally the coating or packaging had no effect on extending orange shelf life. Meanwhile, the coating and packaging extended the shelf life of the green and colored tomatoes one-week over compared to the unpackaged ones. During cold storage weight loss, density, pH and total soluble solids increased and the total acidity and firmness decreased in all fruits, but these changes were low or non significant in coated fruits compared to the other treatments. The coating and packaging of orange increased their lightness and yellowness. Meanwhile, the control orange revealed some brown pieces on their surface. Coating of green tomatoes delayed the development of their color, as they need 3 weeks for completed their color and needs one week when packaged in polypropylene film or without packaging (control). Coating and packaging of red tomatoes reduced their red color with increasing of their lightness. The control samples kept their color.

Salwa El-Magoli

Use Other Side if Necessary

INTRODUCTION

I. INTRODUCTION

Packaging protects food from their environment. In multicomponent food, quality and shelf life are also reduced when moisture, aromas, and lipids migrate from food component to packaging materials or inversely. Food packaging, however, has become a central focus of waste reduction efforts. Plastic packaging represents approximately 30 % of municipal solid waste (MSW) and occupies close to two-thirds of trash can volume due to its bulk **(Hunt et al., 1990)**. If the plastic packaging were replaced with alternative materials the weight of synthetic films waste, volume and packaging cost would increase by 400%, 250%, and 200% respectively **(Fleming, 1992).** Utilization of agricultural wastes in the production of edible and biodegradable films will replace other synthetic material, which cause high pollution to environment.

In general the biodegradable plastic films need 2-3 years for complete decomposition as compared to 300 years for synthetic polymers. The edible polymer films are defined as a thin layer of edible material formed or preformed as a coating for fresh food. Meanwhile the biodegradable films (not edible) are defined as the materials which must be degraded completely by microorganisms (under a warm, moisture environment with acceptable rang of pH, nutrients and oxygen) in a composting process by only natural compounds such as carbon dioxide, water, methane and biomass. The main functions of these biodegradable films are: (1) Improve the mechanical integrity or handling characteristics of the fresh foods. **(2)** As a carrier for some ingredients as antioxidants, antimicrobials, flavor and colors. **3)** Inhibitory effects of moisture, oxygen, carbon dioxide, aroma, and lipid migrations of packaged fresh foods. The biodegradable films are preformed or formed as a coating materials by dipping, spraying, or