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بسم الله الرحمن الرحيم

مركز الشبكات وتكنولوجيا المعلومات

قسم التوثيق الإلكتروني



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التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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PRODUCTION OF BIO PLASTIC FROM AGRICULTURAL WASTES

By

AYA MOHAMED MAHMOUD ALI KOBASH

B.Sc. (Agricultural Engineering), Fac. of Agric., Ain Shams Univ., 2013

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ABSTRACT

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This study was conducted to reduce the accumulation of wastes by using Agricultural wastes “unmarketable potato tubers and banana peel” for producing biodegradable plastic films to be substitute of oil based plastics “OBP” which is often not biodegradable. Starch extracted from unmarketable potato tuber used to produce starch based plastic samples “SBP” with different of glycerol concentrations (5, 10, 15, 20, 25, 30, 99.5% v/v) as a plasticizer, by casting after gelatinization. Banana peel bio plastic “BBP” produced using glycerol 20 % only. The physical properties of SBP films samples including thickness; density, water absorption capacity, rate of weight loss, “biodegradability” were studied, as well as mechanical properties at (25 °C and RH 48 %) including tensile strength, modulus of elasticity, elongation %, firm force, and required energy for firm were also investigated compared with OBP samples. Based on the tests results, It was found that, the maximum value of extracted starch from unmarketable potato tuber was 13.5% obtained by blending potato tubers. As far physical properties, SBP films with elevated glycerol concentration increased the sample thickness but decreased its density. Glycerol 20% gave the best flexible compact structure SBP films. Average thickness and density of SBP film (20% glycerol) were 0.25 mm and 80.11 Kg/m³ respectively. Meanwhile, the average thickness and density for BBP films were 0.345 mm and 58.22 Kg/m³. On the other hand the corresponding values for OBP were 0.41 mm and 24.39 Kg/m³ respectively. The water absorption capacity for SBP and BBP films with 20 % glycerol were 83.33 and 55.5 % after 24 hour and the corresponding value for OBP was 35.11 %. The rate of weight loss of SBP and BBP films with 20% glycerol concentration was 72% and

82.3 % after 96 days and nearly to be 90 % after 103 day with BBP samples, while the rate of mass loss for OBP films with 15% HDPE not exceed 1.8 % and can be neglected. As far the mechanical properties of SBP; BBP 20% glycerol and OBP 15% HDPE films, the maximum values of tensile strength were (13.23, 1.73 and 1.12 MPa) respectively, modulus of elasticity were (1556.73, 96.36 and 44.97MPa), firm force were (0.916, 0.82 and 1.08 N), mean consumed energy for firm were (44.05, 54.45 and 31.06 N.mm), the optimum elongation were (100.77, 133.33 and 107.26 %) respectively. Although the high water absorption capacity of bio-plastic samples produced from potato starch or banana peels makes them unsuitable for using in the food service industry, they can be used with same additives in (one time use) packaging materials. Since it is biodegrade very fast, therefore, producing starch based biodegradable plastic from un-marketable potato tuber and banana peel can be used instead of the traditional oil based plastic.

Keywords: Municipal Solid Waste “MSW”, Agro waste, Starch based plastic “SBP”, Oil based plastic “OBP”, Unmarketable potato tubers, Banana peel and Biodegradability.

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CONTENTS

	Title	Page
1	INTRODUCTION	1
2	REVIEW OF LITRITURE	5
2.1	Municipal Solid Waste “MSW” Global status	5
2.2	MSW Current and Emerging Approaches	5
2.3	Sustainable Methodology for MSW Management	7
2.4	Agricultural waste (AW)	8
2.5	Egyptian MSW overview	11
2.6	Polymers and Plastics	13
2.6.1	Plastic history	14
2.6.2	Plastics current status globally	16
2.6.3	Plastics Structure, classification and their Uses	17
2.6.4	Types of plastic	19
2.6.5	Plastics Codes	21
2.6.6	Conventional plastic problems	22
2.7	Bio plastic	24
2.7.1	Bio-plastics definition	24
2.7.2	Bio plastics global capacity	26
2.7.3	Bio-plastics classification	27
2.7.4	Starch Plastic Technology	29
2.8	Starch based bioplastic applications	31
2.9	Bio plastic labeling	33
2.10	Bio plastic advantages	34
2.11	Bio-plastics’ Main Challenges	34
2.12	Egypt Bio plastics an imperative and a promising industry	36
2.13	Egyptian Agricultural wastes for producing bio plastics	36
2.13.1	Potato waste	36
2.13.2	Banana waste	37

3	MATERIALS AND METHODS	40
3.1	Potato tuber and Banana peel	40
3.2	Chemicals	40
3.3	Synthetic oil based plastic	40
3.4	Starch extraction	41
3.5	Bio plastic production steps from unmarketable potato tubers	43
3.6	Production of banana peel based plastic (BBP)	44
3.7	Test Variables	45
3.8	Test samples preparation	45
3.9	Measurements	46
3.9.1	Physical properties	46
3.9.2	Mechanical properties	48
3.10	Statistical Analysis	49
3.10.1	Equipment and Instrumentation	49
4	RESULTS AND DISCUSSION	53
4.1	Bio plastic from unmarketable potato	53
4.1.1	Starch extraction	53
4.1.2	Physical properties of starch based plastic “SBP” films	53
4.1.3	Mechanical properties	57
4.2	Bio plastic from Banana peel	63
4.2.1	Physical properties of banana peel bio plastic “BBP” films	63
4.2.2	Mechanical properties	66
5	SUMMARY & CONCLUSIONS	71
6	REFERENCES	73

LIST OF TABLES

Table No.		Page No.
2-1	Distribution of global plastics production in (2019)	16
2-2	Main types of polymers	21
2-3	Approximate amylopectin and amylose composition of various types of starch.	29
2-4	Agricultural statistics for potato and banana in Egypt.	39
2-5	Chemical composition and total solids content of potato cultivars Spunta (dry weight basis).	39
2-6	Chemical composition of banana peels cv. Maghrabi (dry weight basis).	39
3-1	Magnetic stirrer specifications.	50
3-2	Digital dial plywood board veneer Specification.	51
4-1	The statistical values (Maximum; Minimum; Average; standard deviation “SD” and coefficient of variation) of SBP and OBP samples thickness.	55
4-2	The statistical values (Maximum; Minimum; Average; standard deviation “SD” and coefficient of variation) of SBP and OBP samples Density.	55
4-3	The Statistical values (Max, Min, Average, SD and coefficient of variation) of BBP samples thickness with 20 % glycerol concentration	64
4-4	The statistical values (Max, Min, Average, SD and coefficient of variation) of BBP samples density with 20 % glycerol concentration.	64

LIST OF FIGURES

Fig. No.		Page No.
2-1a	Waste management hierarchy.	6
2-1b	Solid waste management: the Circular Economy	6
2-2	Global plastics waste generation, 1950 – 2015.	17
2-3	Areas of utilization for various plastics.	19
2-4	Plastic Identification Code.	22
2-5	Bio-plastics comprised of biodegradable plastics and bio-based plastics.	24
2-6	Three fundamental steps involved in polymer biodegradation in soils.	25
2-7	Global Production Capacities of Bio-Plastics in 2020 and expected till 2025.	26
2-8	Land use estimation for Bio-Plastics 2020 and expected till 2025.	26
2-9	Global production capacities of bio plastics in 2020 by market segment	31
2-10	Bio plastic labels currently in use.	34
3-1	Stages of Starch extraction process from unmarketable potato tubers.	41
3-2	Preparation steps of starch based plastic film samples from potato tuber.	43
3-3	Steps of production of bio plastic from banana peels. -	44
3-4	Magnetic stirrer Main parts.	50
3-5	Digital micrometer for plastic thickness.	51
3-6	Bench top materials testing machine.	52
4-1	The effect of potato slices thickness on the percentage of extracted starch.	53
4-2	Water absorption capacity % of starch based plastic films “SBP 20 % glycerol conc.” compared with oil based plastic “OBP 15 HDPE”.	56

4-3	Weight loss % “Biodegradability” of starch based plastic “SBP 20 % glycerol concentration” compared with oil based plastic “OBP 15 HDPE”.	57
4-4	Effect of glycerol concentration on tensile strength of starch based plastic “SBP” compared with oil based plastic “OBP” films “15 % HDPE”.	58
4-5	The effect of glycerol concentration on modulus of elasticity of starch based plastic “SBP” compared with oil based plastic “OBP” films.	59
4-6	Effect of glycerol concentration on elongation % of starch based plastic “SBP” compared with oil based plastic “OBP” films.	60
4-7	Effect of glycerol concentration on firm strength of starch based plastic “SBP” compared with oil based plastic “OBP” films.	61
4-8	The consumed firm energy of starch based plastic “SBP” samples 20 % glycerol conc	62
4-9	The consumed firm energy of oil based plastic “OBP” samples	62
4-10	Water absorption capacity % of Banana peels based bio plastic 20 % glycerol, compared with oil based plastic “OBP” 15% LDPE.	65
4-11	Weight loss % “Biodegradability” of banana peels based plastic 20 % glycerol, compared with oil based plastic “OBP” 15% HDPE.	66
4-12	The recorded value for tensile strength with banana peel based plastic "BBP" 20 % glycerol and oil based plastic "OBP "15 % HDPE.	67
4-13	The recorded value for modulus of elasticity with banana peel based plastic "BBP" 20 % glycerol and oil based plastic "OBP "15 % HDPE.	68

4-14	The recorded value for elongation % with banana peel based plastic "BBP" 20 % glycerol and oil based plastic "OBP "15 % HDPE.	69
4-15	The recorded value for firm force with banana peel based plastic "BBP" 20 % glycerol and oil based plastic "OBP "15 % HDPE.	69
4-16	The consumed firm energy of banana peel based plastic "BBP" 20 % glycerol	70

LIST OF ABBREVIATIONS

OBP	Oil Based Plastics
SBP	Starch Based Plastic
BBP	Banana Based Plastic
HDPE	High Density Poly Ethylene
MSW	Municipal Solid Waste
GHG	Global Greenhouse Gas
FW	Food Waste
AW	Agricultural Waste
Mt	Million Metric Tons
SWM	Solid Waste Management
MSWM	Municipal Solid Waste management
MSWMS	Municipal Solid Waste Management System
PW	Plastic Waste
USD	United State of Dollar
EGP	Egypt
FLW	Food Loss and Waste
NENA	Near East and North Africa
IUPAC	International Union of Pure and Applied Chemistry
EPI	Environmental Product Incorporation
SPI	Society of the Plastics Industry
BSI	British Standards Institution
ISO	International Standards Organization
PCL	Poly Capro Lactone
PBS	Poly Butylene Succinate
PE	PolyEthylene
NY11	Nylon 11
AcC	Acetyl Cellulose
PLA	Poly Lactide Acid
PHB	Poly Hydroxy Butyrate
HMF	Hydroxy Methyl Furfural