

**DEVELOPMENT OF A PLANTAIN DOUGH MACHINE FOR THE PREPARATION
OF FRESH PLANTAIN PULPS**

By

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(MATRIC NUMBER: 18PCM01997)**

MAY, 2021.

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OF FRESH PLANTAIN PULPS**

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE
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ENGINEERING, IN THE DEPARTMENT OF MECHANICAL ENGINEERING,
COLLEGE OF ENGINEERING, COVENANT UNIVERSITY, OTA.**

MAY, 2021

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfillment of the requirements for the award of Masters in Engineering in the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota.

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DECLARATION

I, **AKINOLA, AKINYEMI ADEDEJI (18PCM01997)** declare that this research was carried out by me under the supervision of Prof. Joshua O. Okeniyi of the Department of Mechanical Engineering, University, Ota. I attest that the dissertation has not been presented either wholly or partly for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

AKINOLA AKINYEMI ADEDEJI

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Signature and Date

CERTIFICATION

We certify that the dissertation titled “**Development of a Plantain Dough Machine for the Preparation of Fresh Plantain Pulps**” is an original work carried out by **AKINOLA, AKINYEMI ADEDEJI (18PCM01997)** in the Department of Mechanical Engineering, College of Engineering, Covenant University, Ota, Ogun State, Nigeria, under the supervision of **Prof. Joshua O. Okeniyi**. We have examined and found the work acceptable for the award of a Masters in Engineering in Mechanical Engineering.

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DEDICATION

This project is dedicated to the supreme God, a giver of knowledge and understanding. I thank HIM for HIS divine protection over my life and for HIS leading and guidance for the successful completion of the Master's program in Mechanical Engineering, and also to my lovely parents, family, and colleagues for their unflinching support.

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ABSTRACT

Plantain (*Musa Paradisiaca*) is one of the major staples which is largely cultivated and consumed in tropics and subtropics with Nigeria as one of the major producers in the world. Plantain dough is a meal common in the southern part of Nigeria with known pharmacological benefits which serve as antihypertensive, hypoglycaemic, anti-cholesterol, antioxidant, anti-allergic, and lots more as a result of its nutrients. Annual production of plantain suffers a great loss of over 50% to post-harvest resulting from the inefficient storage facility, lack of proper handling methods and materials, and also inadequate preparation machine. A plantain dough machine was designed and fabricated using locally sourced materials in order to facilitate the preparation of fresh plantain pulps. The machine consists of; Shaft, pulleys, an auger, an electric motor, and a framework to support it. The fabrication was successful using the GTAW welding process. The performance evaluation of the developed machine was carried out, three (3) trials of each processed number of plantain fingers were experimented to investigate variation in processing time. Results obtained were analyzed to determine the mean processing time and the standard error, the coefficient of determination, R^2 , obtained is 0.999 to indicate a good fit of the quadratic trend line and the standard error for each of the experimental treatments did not exceed 9.5, which is indicative of a natural variation occurrence during experimentation. The processing time for ten plantain pulps was less than twenty minutes indicative of a very adaptable time for the preparation of a dough meal. Mass production of the plantain dough machine will facilitate the preparation and also enhance the consumption of plantain dough which has more health benefits and hence reducing the annual loss of plantain. The plantain dough machine will help the fast food and eateries as production time is minimal.

TABLE OF CONTENT

CONTENTS	Page
ACCEPTANCE	iii
DECLARATION	iv
CERTIFICATION	v
DEDICATION	vi
ACKNOWLEDGEMENTS	vii
ABSTRACT	viii
TABLE OF CONTENT	ix
LIST OF FIGURES	xiii
LIST OF TABLES	xiv
LIST OF PLATES	xv
NOMENCLATURES	xvi
CHAPTER ONE	1
INTRODUCTION	1
1.1 BACKGROUND STUDY	1
1.2 PROBLEM STATEMENT	3
1.3 AIM AND OBJECTIVES	4
1.3.1 Aim	4
1.3.2 Objectives	4
1.4 SIGNIFICANCE OF THE STUDY	5
1.5 SCOPE OF STUDY	5
1.6 JUSTIFICATION OF STUDY	5
CHAPTER TWO	6
LITERATURE REVIEW	6
2.1 BRIEF HISTORY OF PLANTAIN	6
2.1.1 Taxonomy of Plantain (<i>Musa Paradisiaca</i>)	7
2.2 ECONOMIC IMPORTANCE OF PLANTAIN IN NIGERIA	12
2.3 NUTRITIONAL VALUE OF PLANTAIN	16
2.4 PHARMACOLOGICAL ACTIVITIES OF PLANTAIN.	18
2.4.1 Analgesic Activity	18
2.4.2 Antiulcerogenic Activity.	18
2.4.3 Antioxidant Activity	18
2.4.4 Wound Healing Activity	19

2.4.5	Diuretic Activity	19
2.4.6	Hypoglycemic Activity	19
2.4.7	Antihypertensive Activity	19
2.5	MEDICINAL AND HEALTH BENEFITS OF PLANTAIN	19
2.6	REVIEW ON STAINLESS STEEL	20
2.6.1	Types of Stainless Steel	21
2.6.1.1	Martensitic Stainless Steel:	21
2.6.1.2	Austenitic Stainless Steel:	23
2.6.1.3	Ferritic Stainless Steel:	23
2.6.1.4	Duplex Stainless Steel	24
2.6.2	Mechanical Properties of Stainless Steel	24
2.6.3	Physical Properties of Stainless Steel	25
2.7	REVIEW ON TUNGSTEN INERT GAS (TIG) WELDING	25
2.8	REVIEW OF EXISTING PLANTAIN PROCESSING MACHINE.	27
CHAPTER THREE		30
MATERIALS AND METHODS		30
3.1	MATERIALS	30
3.2	METHODOLOGY	30
3.3	DESCRIPTION OF THE PLANTAIN DOUGH MACHINE	31
3.4	OPERATING PROCEDURE OF THE PLANTAIN DOUGH MACHINE.	39
3.5	MATERIALS SELECTION	39
3.6	DESIGN ANALYSIS	39
3.6.1	Speed Ratio and Pulley Size.	39
3.6.2	Power Required To Shear Boiled Plantain	43
3.6.3	Velocity of Belt	45
3.6.4	Co-Efficient of Friction	46
3.6.5	Center Distance between Pulleys	46
3.6.6	Length of Belt	46
3.6.7	Angle of Lap on Small Pulley	46
3.6.8	Angle of Lap on Large Pulley	47
3.6.9	Torque Transmitted By Shaft	47
3.6.10	Centrifugal Force	47
3.6.11	Cross-Sectional Area of Belt	48
3.6.12	Stress Acting on Belt	48
3.6.13	Tension on the Tight Side	49
3.6.14	Belt Tension Ratio	49
3.6.15	Tension on the Slack Side	49
3.6.16	Power Transmitted by V-belt	50
3.6.17	Shaft Design	50
3.6.18	Shear Force and Bending Moment	50
3.6.19	Shear Force Acting on the Shaft.	52
3.6.20	Bending Moment	52

3.6.21	Minimum Diameter of Shaft	56
3.6.22	Volume of Shaft	57
3.6.23	Shaft Weight	57
3.6.24	Weight of Grinding Plate Mounted on the Shaft.	57
3.6.25	Development of the Hopper	58
3.6.26	Volume of Pot	59
3.6.27	Electric Motor Specifications	59
3.6.28	Electrical Power and Heat Requirements	59
3.6.29	Electric Heater Rating.	62
3.7	MACHINE FABRICATION	62
3.8	COST ANALYSIS	62
CHAPTER FOUR		67
RESULTS AND DISCUSSION		67
4.1	EXPERIMENTAL VALUES	67
4.2	PERFORMANCE EVALUATION OF THE MACHINE	67
CHAPTER FIVE		71
CONCLUSION AND RECOMMENDATION		71
5.1	SUMMARY	71
5.2	CONCLUSIONS	71
5.3	CONTRIBUTION TO KNOWLEDGE	71
5.4	RECOMMENDATIONS	72
REFERENCES		73
Appendix		80
Working Drawings		80
	Projection View	80
	Side View	81
	End view	82
	Side View	83
	Front View	84
	Isometric Projection	85
	Isometric Projection	86
	Exploded View	87
	Electric motor, control panel	88
	Heater plate, cooking pot, and turning handle	89
	Reservoir	90
	Pulleys	91
	Flange support	92
	Collector table	93

Cooking plan	94
Framework	96
Bearings and flanges	97

LIST OF FIGURES

Figures	Title of Figures	Page
2.1:	Generic Classification of Musa Seed	10
2.2:	Schematic Representation of a TIG Setup	29
3.1(A):	Machine Assembly	40
3.1(B):	Full Assembly Exploded View with Parts	41
3.1(C):	Isometric Projection	42
3.2	Load Diagram	51
3.3:	Shear Force Diagram	54
3.4:	Bending Moment Diagram	55
4.1:	Performance Characteristics of the Plantain Dough Machine.	70

LIST OF TABLES

Tables	Title of Tables	Page
2.1:	Plantain Taxonomy	11
2.2:	Nutritional Value of Musa Paradisiaca Per 100 kg	17
2.3:	World Stainless Steel Production	22
3.1:	Specification of the Electronic Scale Model Sf-803	33
3.2:	Data Obtained from Plantain Samples	34
3.3:	Cost of Fabricating the Machine.	66
4.1:	Experimental Values Obtained from the Performance Evaluation of Machine	69

LIST OF PLATES

Plates	Title of Plates	Page
2.1(a):	Morphological representation of <i>Musa sapientum</i>	8
2.1(b):	Morphological representation of <i>Musa Paradisiaca</i>	9
2.2:	A typical plantain product for commercial purposes.	14
2.3:	Locally produced Plantain flour sample	15
3.1:	Plantain samples	32
3.3(a):	Weighting of plantain sample using Electronic scale Model SF-803.	36
3.3(b):	Measuring the diameter of sample	37
3.3(c):	Measuring the length of plantain sample using measuring tape	38
3.4:	Fabrication stages of the plantain dough machine	63
3.5(a):	Front view of the fabricated plantain dough machine	64
3.5(b):	Side view of the fabricated plantain dough machine.	65

NOMENCLATURES

a	Acceleration (m/s ²)
ω	Angular speed (rad/sec)
A	Area (m ²)
ASS	Austenitic Stainless Steel
$\Delta\theta$	Change in temperature (°C)
CRES	Corrosion resistance steel
D	Diameter (mm)
D ₂	Diameter of Driven (mm)
D ₁	Diameter of Driver (mm)
DSS	Duplex Stainless Steel
FSS	Ferritic Stainless Steel
F	Force (newton)
f	Frequency (Hz)
GTAW	Gas Tungsten Arc Welding
GDP	Gross Domestic Product
L	Length (m)
MSS	Martensitic Stainless Steel
m	Mass (kilogram)
\bar{x}	Mean
Mt.	Metric tonnes
M	Moment (Nm)
AA	Musa Acuminata colla
BB	Musa Balbisiana colla
M. Paradisiaca	Musa paradisiaca
M. Sapientum	Musa sapientum
n	Number of sample(s)
%	Percentage
RDA _s	Percentage dietary allowances
P	Power (Watts)

H	Quantity of heat (J)
r	Radius (millimeter)
R _B	Reaction at "B" (kN)
rpm	Revolutions per minute
N	Shaft speed (rpm)
τ	Shear force (N/m ²)
SMAW	Shield Metal Arc Welding
C _p	Specific heat capacity (kJ/KgK)
SS	Stainless Steel
σ	Stress (Nmm ²)
Σ	Summation
T	Temperature (°C)
k	Thermal conductivity (w/m°C)
t	Time (s)
TIG	Tungsten Inert Gas Welding
v	Velocity (m/s)
V	Voltage (volts)