

**ANTIBACTERIAL ACTIVITY AND PRESERVATIVE PROPERTIES OF  
PROBIOTIC *LACTOBACILLUS* SPECIES FROM FERMENTED DRINKS**

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**AUGUST, 2024**

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**BY**

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE  
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UNIVERSITY, OTA, OGUN STATE, NIGERIA**

**AUGUST, 2024**

## **ACCEPTANCE**

This is to attest that this dissertation is accepted in partial fulfillment of the requirements for the award of the degree of Master of Sciences in Microbiology in the Department of Biological Science, College of Science and Technology, Covenant University, Ota, Nigeria.

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## **DECLARATION**

**I, AZETA, JOY IZIEGBE (22PCQ02453)** declare that this research was carried out by me under the supervision of Dr. Olubukola Oziegbe of the Department of Biological Science, College of Science and Technology, Covenant University, Ota, Nigeria. I attest that the dissertation has not been presented either wholly or partially for the reward of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

**AZETA, JOY IZIEGBE**

**Signature and Date**

## **CERTIFICATION**

We certify that this dissertation titled “**ANTIBACTERIAL ACTIVITY AND PRESERVATIVE PROPERTIES OF PROBIOTIC *LACTOBACILLUS* SPECIES FROM FERMENTED DRINKS**” is an original research work carried out by **AZETA, JOY IZIEGBE (22PCQ02454)** in the Department of Biological Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria under the supervision of Dr. Olubukola Oziegbe. We have examined and found this work acceptable as part of the requirements for the award of Master of Science in Microbiology.

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## **DEDICATION**

I dedicate this work to Almighty God, for his grace, help and strength throughout my dissertation.

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# TABLE OF CONTENTS

<b>CONTENT</b>	<b>PAGES</b>
<b>COVER PAGE</b>	<b>i</b>
<b>TITLE PAGE</b>	<b>ii</b>
<b>ACCEPTANCE</b>	<b>iii</b>
<b>DECLARATION</b>	<b>iv</b>
<b>CERTIFICATION</b>	<b>v</b>
<b>DEDICATION</b>	<b>vi</b>
<b>ACKNOWLEDGEMENT</b>	<b>vii</b>
<b>TABLE OF CONTENT</b>	<b>viii</b>
<b>LIST OF FIGURES</b>	<b>xv</b>
<b>LIST OF TABLES</b>	<b>xvi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xvii</b>
<b>ABSTRACT</b>	<b>xvii</b>
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
1.1 Background of the study	2
1.2 Statement of the research problem	2
1.3 Research questions	2
1.4 Aim and objectives of the study	3
1.5 Justification for the study	3
1.6 Scope of the study	4
<b>CHAPTER TWO: LITERATURE REVIEW</b>	<b>5</b>
2.1 Fermented foods	5
2.2 Fermented drinks	7
2.2.1 Palm wine	8
2.2.1.1 Beneficial microorganisms found in palm wine	11
2.2.1.2 Nutritional contents of Palm wine	12
2.2.1.3 Health benefits of Palm wine	14
2.2.1.4 Cultural significance of Palm wine	15
2.2.2 Burukutu	16



2.2.2.1	Nutritional contents of Burukutu	18
2.2.2.2	Health benefits of Burukutu	19
2.2.2.3	Cultural significance of Burukutu	20
2.3	Lactic Acid Bacteria	21
2.3.1	Taxonomic classification of Lactic Acid Bacteria	22
2.3.2	Niche or Habitat of Lactic Acid Bacteria	23
2.3.3	Common Lactic Acid Bacteria	23
2.3.3.1	<i>Lactobacillus</i>	25
2.3.3.1.1	Benefits of <i>Lactobacillus</i> in fermented drinks	25
2.3.3.2	<i>Lactococcus</i>	27
2.3.3.3	<i>Streptococcus</i>	29
2.3.3.4	<i>Leuconostoc</i>	31
2.4	Probiotic activity of <i>Lactobacillus</i>	32
2.4.1	Laboratory probiotic screening	32
2.4.1.1	Acid and Bile Tolerance	33
2.4.1.2	Adhesion to mucosal and epithelial surfaces	33
2.4.1.3	Bile Salt Hydrolase Activity	33
2.4.1.4	Inhibition Activity against Pathogenic Bacteria	34
2.4.2	Mechanism of Antibacterial Activity of Probiotic <i>Lactobacillus</i>	35
2.4.2.1	Production of Organic acids	35
2.4.2.2	Production of Antimicrobial compounds	36
2.4.2.3	Production of Enzymes and other compounds	36
2.4.2.4	Competition for Nutrients	37
2.4.2.5	Modulation of Immune system	38
2.4.2.6	Quorum Quenching	39
2.4.2.7	Barrier function	39
2.5	Preservative properties of <i>Lactobacillus</i>	40
2.5.1	Application of <i>Lactobacillus</i> strains on various food products	41

2.5.1.1 Dairy products	41
2.5.1.2 Fermented vegetables	42
2.5.1.3 Meat products	42
2.5.1.4 Beverages	42
2.5.1.5 Baked goods	43
2.6 Meat as perishable food	43
2.6.1 Significance of meat in human diet	44
2.6.1.1 Nutritional value	45
2.6.1.2 Culinary and cultural significance	46
2.6.2 Elements affecting the quality of meat	46
2.7 Meat spoilage	47
2.7.1 Causes of Meat spoilage	48
2.7.1.1 Microbial activity	48
2.7.1.2 Enzymatic activity	49
2.7.1.3 Chemical changes	49
2.7.1.4 Environmental factors	49
2.7.2 Spoilage bacteria associated with meat	50
2.8 Preservative approaches of meat	51
2.9 Factors affecting meat shelf life	53
2.10 Preservative property of <i>Lactobacillus</i>	57
2.11 Gaps in literature	62
<b>CHAPTER THREE: MATERIAL AND METHODS</b>	<b>63</b>
3.1 Materials	63
3.2 Equipment	63
3.3 Media	63
3.4 Reagents	63
3.5 Sample collection	63

3.6 Proximate analysis of the fermented drink samples	64
3.6.1 Total ash content	64
3.6.2 Carbohydrate content	64
3.6.3 Moisture content	65
3.6.4 Protein content	66
3.6.5 Crude fat content	67
3.7 Isolation and identification of <i>Lactobacillus</i> species	67
3.7.1 Enumeration of bacterial species	67
3.7.2 Identification of bacterial species	68
3.7.2.1 Gram staining	68
3.7.2.2 Catalase	68
3.7.2.3 Oxidase test	69
3.7.2.4 Triple sugar iron test	69
3.7.2.5 Analytical profile index (API)	70
3.8 Probiotic properties	70
3.8.1 Acid tolerance	70
3.8.2 Bile salt tolerance	71
3.8.3 Phenol tolerance	71
3.9 Safety evaluation	72
3.9.1 Antibiotic susceptibility	72
3.9.2 Hemolytic activity	72
3.10 Isolation and identification of spoilage organism from meat	72
3.10.1 Enumeration of spoilage organisms	72
3.10.2 Identification of bacterial isolate	73
3.10.2.1 Gram staining	73
3.10.3 API identification	74
3.11 Preparation of Probiotic <i>Lactobacillus</i> cell-free supernatant (PLCS)	74
3.12 Antibacterial assay of PLCS against spoilage organisms	75
3.12.1 Agar well diffusion assay	75
3.13 Antibacterial assay of <i>Lactobacillus</i> cell culture against spoilage organisms	75

3.13.1 Agar overlay techniques	75
3.14 Shelf life study	75
3.15 Gas chromatography mass spectrum (GCMS) analysis of the PLCS	76
Exhibiting antibacterial activity	
3.16 Statistical analysis	76
<b>CHAPTER FOUR: RESULTS</b>	<b>77</b>
4.1 Proximate analysis of the fermented drink samples	77
4.2 Total lactic acid bacterial count from fermented drink samples	77
4.3 Morphological and Gram stain reaction of lactic acid bacteria (LAB) isolate	77
From fermented drink samples	
4.4 Identification of <i>Lactobacillus</i> species using API	81
4.5 Probiotic activity	81
4.6 Safety evaluation	87
4.6.1 Antibiotic susceptibility test of the <i>lactobacillus</i> isolates	87
4.6.2 Hemolysis of <i>Lactobacillus</i> isolates	87
4.7 Identification of spoilage organisms from meat using API	87
4.8 Antibacterial assay of probiotic <i>Lactobacillus</i> spp. cell-free supernatant (PLCS)	87
4.8.1 Antibacterial activity of PLCS against isolated spoilage organisms	87
4.8.2 Antibacterial activity of PLCS against reference organisms	91
4.9 Antibacterial assay of probiotic <i>Lactobacillus</i> spp. cell culture	92
4.9.1 Antibacterial activity of probiotic <i>Lactobacillus</i> spp. cell culture against	92
Isolated spoilage organisms	
4.9.2 Antibacterial activity of probiotic <i>Lactobacillus</i> spp. cell culture against	92
Reference organisms	
4.10 Preservative potential and shelf life of the antibacterial activity of PLCS on meat	96
4.11 GCMS analysis of the PLCS exhibiting antibacterial activity	96

<b>CHAPTER FIVE: DISCUSSION</b>	99
<b>CHAPTER SIX: CONCLUSION AND RECOMMENDATION</b>	102
6.1 Summary	102
6.2 Conclusion	103
6.3 Contribution to knowledge	104
6.4 Recommendation	104
6.5 Limitation to study	105
6.6 Areas for further study	105
<b>REFERENCES</b>	106
<b>APPENDIX</b>	
<b>Appendix A</b>	128
<b>Appendix B</b>	129
<b>Appendix C</b>	132
<b>Appendix D</b>	133
<b>Appendix E</b>	134

## LIST OF FIGURES

FIGURES	LIST OF FIGURES	PAGES
2.1:	Examples of fermented foods	7
2.2:	Fermentation process of Palm wine	9
2.3:	Palm wine production process	10
2.4:	Fermented Palm wine	10
2.5:	Constituent of Palm sap	13
2.6:	Fermentation process of <i>Burukutu</i>	17
2.7:	<i>Burukutu</i> production process	18
2.8:	A micrograph of <i>Lactobacillus</i>	27
2.9:	A micrograph of <i>Lactococci</i>	29
2.10:	A micrograph of <i>Streptococci</i>	30
2.11:	A micrograph of <i>Leuconostoc</i>	32
2.12:	Inhibitory activity of Lactic Acid Bacteria	38
2.13:	Mechanism of inhibiting the pathogenic cells responsible for meat degradation	61
4.1:	pH Tolerance	83
4.2:	Bile Tolerance	84
4.3:	Phenol Tolerance	85
4.4:	Probiotic activity of the LAB isolates from Fermented drink	86

## LIST OF TABLES

TABLES	LIST OF TABLES	PAGES
2.1:	Commonly identified probiotic species	34
2.2:	Some common spoilage bacteria associated with meat and their spoilage characteristics	50
2.3	Gaps in knowledge	62
4.1	Proximate analysis of fermented drink samples	78
4.2	Total Lactic Acid Bacterial Count from fermented drink Samples	79
4.3	Morphological and Gram staining of Bacterial isolates From fermented drink sample	80
4.4	<i>Lactobacillus</i> species identification using API	82
4.6a	Antibiotic susceptibility test carried out on <i>Lactobacillus</i> Isolates from fermented drink samples	88
4.6b	Hemolysis of the <i>Lactobacillus</i> isolates from fermented Drink samples	89
4.7	API 50 CHL Identification of isolated spoilage bacteria From meat	90
4.8a	Inhibitory activities exhibited by <i>Lactobacillus</i> spp. CFS Against isolated spoilage organisms	91
4.8b	Inhibitory activities exhibited by <i>Lactobacillus</i> spp. CFS Against reference organisms	93
4.9a	Inhibitory activities exhibited by <i>Lactobacillus</i> spp. Cell Culture against isolated spoilage organisms	94
4.9b	Inhibitory activities exhibited by <i>Lactobacillus</i> spp. Cell Culture against reference organisms	95
4.10	Preservative properties and shelf life study of probiotic <i>Lactobacillus</i> cell-free supernatant	97
4.11	Volatile compounds with antimicrobial/antibacterial Activity Identified in CFS of <i>Lactobacillus</i> spp.	98

## LIST OF ABBREVIATIONS

AHLs	Acyl-homoserine lactones
API	Analytical profile test
BAs	Biogenic amines
CFS	Cell-free supernatant
LAB	Lactic acid bacteria
LA	Lactic acid
MRS	De Man, Rogosa and sharpe
QQ	Quorum quenching
QS	Quorum sensing
SCFAs	Short chain fatty acids
TSI	Triple sugar iron test



## ABSTRACT

Fermented beverages such as Palm wine (*Elaeis guineensis*) and *Burukutu* (*Sorghum bicolor*) are integral to the Nigerian diet and are often associated with health benefits due to beneficial bacteria like *Lactobacillus*. This study evaluated the antibacterial activity and preservative properties of probiotic *Lactobacillus* sp. isolated from fermented drinks. Six locally fermented drink samples (palm wine=3 and *burukutu*=3) were purchased in Ota, Nigeria. The nutritional contents of the fermented drinks were determined by analysing the protein, carbohydrate, and lipid contents. *Lactobacillus* species were isolated and identified using morphological, biochemical, and Analytical Profile Index (API 50 CHL). The antibacterial activity of the cell-free supernatant (CFS) of the screened probiotic *lactobacilli* was tested against spoilage and pathogenic bacterial isolates. Also, the preservative potential and bioactive profiling of the selected *Lactobacillus* CFS were determined. The result showed that the ash (5-24%), carbohydrate (25-29%), and moisture content (37-93%) of *Burukutu* and Palm wine samples was significantly high in all the fermented drink samples ( $P > 0.05$ ). A total of six *Lactobacillus* spp. including *L. plantarum* (BB05), *L. acidophilus* (B006), *L. plantarum* (PB03), *L. fermentum* (BA01), *L. fermentum* (BB06), *L. acidophilus* (PA03) were isolated from the fermented drink samples. The probiotic activity of *Lactobacillus* sp. showed that isolates PB03, BO06, and BB06 exhibited a high survival rate (109-187%) pH 2, bile (1.0%), and phenol (1%), respectively, indicating the isolates' ability to tolerate low pH and bile salts in the gastrointestinal tract. For the antibacterial activity of *Lactobacillus* spp. cell cultures against isolated spoilage bacteria, BBO6, PB03, and BA01, showed significant inhibition (7-25mm%), against *P. putida* ( $p > 0.05$ ), while for *Lactobacillus* spp. CFS BB06 showed significant inhibition against all isolated spoilage bacteria and PA03 except for *P. fluorescens* ( $p > 0.05$ ). All *Lactobacillus* CFS isolates showed substantial inhibitory activity against *E. coli* ( $p > 0.05$ ). PB03, BA01, and BB06 showed significant zones against all reference strains. Meat treated with *Lactobacillus* CFS showed delayed spoilage and maintained quality for up to 48 hours at room temperature (BB06, BA01, PB03, and BO06), contrary to the untreated control at room temperature. The metabolites detected in the CFS of *L. fermentum*, *L. plantarum*, and *L. acidophilus* were 2,4-Di-tert-butylphenol, Benzoic acid, 4-nitroso-, ethyl ester, and n-Hexadecanoic acid. Hence, *Lactobacillus* species from fermented drinks could be an effective source of antibacterial metabolites with preservative ability for food products.

**Keywords:** *Fermented beverages, Probiotics, Lactobacillus species, Antibacterial activity, Preservative properties*