EFFECT OF VACUUM PACKAGING AND STORAGE CONDITIONS ON GRAIN CHARACTERISTICS OF SELECTED RICE VARIETIES



By

H.G. SAJITH CHATHURANGA GUNARATHNA



DEPARTMENT OF AGRICULTURAL CHEMISTRY FACULTY OF AGRICULTURE EASTERN UNIVERSITY SRI LANKA 2018

PROCESSED Main Library, EUSI

ABSTRACT

Rice (*Orvza saliva* L.) is the staple food of Sri Lanka and achieved self-sufficiency in rice production. Diversification of rice-based product will enable the consumer to have a wide range of products. A wide range of rice varieties are being cultivated under different agroclimatic conditions in Sri Lanka. These different varieties having compositional differences, contribute to the diversity of physico-chemical properties. A study was carried out to effect of vacuum packaging and storage conditions on grain characteristics of selected rice varieties. An experiment was conducted in the Grain Quality Division, Rice Research and Development Institute, Bathalagoda, Sri Lanka

The varieties treatments were V₁ - Bg 300, V₂ - Bg 352, V₃ - At 311, V₄ - Suwendel, V₅ - Suduheenati. Packaging methods treatment were P₁ - vacuum packaging, P₂ - nonvacuum packaging and storage conditions were S₁ - room temperature storage, S₂ - cold storage. This experiment was laid out in the three-way factorial experimental design and consisted with two replications.

Popularly grown Sri Lankan rice varieties namely Bg 300, Bg 352, At 311, Suwendel, and Suduheenati were used for the present study. Physiological and Physico-chemical properties of the rice varieties were investigated throughout storage period. Five rice samples; each variety were investigated for their physical and physico-chemical characteristics. Investigations showed that milling quality of rice grain had highest total milled rice percentage 74.73% in Bg 352 and minimum 69.06% for Suduheenati. Total milled rice percentage many varieties varied between from 70-75%. Although head rice percentage of many varieties ranged from 65-84% and highest percentage of head rice was recorded 83.34% in Suwendel and minimum 50.94% for At 311. Highest broken rice percentage was recorded 12.0 in At 311 and minimum 1.0 in Suwendel. The highest

I

length had 6.98 mm in At 311 and minimum 4.47 mm for Suwendel. Kernel length of many varieties varied between from 5-7 mm while many varieties categorized under intermediate class except At 311 and Suwendel. Highest width had 2.92 mm in Bg 352 and minimum 1.92 mm for At 311 while highest length and width ratio had 3.64 in At 311 was categorized slender in shape.

Physico-chemical properties of rice had shown a wide variation among different rice varieties. Moisture content (MC) varied from 11-13%, Amylose content (AC) varied from 14-38%, Protein content (PC) varied from 7-10% and Fat content (FC) varied from 1-5% among all interaction. Gelatinization temperature (GT) of Bg 300, At 311, Suwendel and Suduheenati were observed commonly intermediate GT among all interaction except Bg 352 throughout storage period. GT was differed significantly (p<0.05) among varieties throughout storage period.

Vacuum packaging has been found to be a superior technology in preserving the grain quality of selected rice varieties tested for up to three months when compared to nonvacuum packaging. Both cold and room temperature storage vacuum packed had gained better protection than non-vacuum in both cold and room temperature storage grain. Physical properties and physiochemical properties were secured on vacuum packed but it was slightly disrupted on non-vacuum packed. But cold storage vacuum packed had gained better performance than other treatments.

Ш

TABLE OF CONTENT

Title and No. P	age No.
ABSTRACT	I
TABLE OF CONTENT	V
LIST OF TABLES	VIII
LIST OF PLATES	X
LIST OF FIGURES	XI
ABBREVIATIONS	.XII
CHAPTER 1 INTRODUCTION	1 1
CHAPTER 2	8
LITERATURE REVIEW	8
2.1 Cereal grains	8
2.2 Rice	10
¹ 2.2.2 Taxonomy	12
2.2.3 Origin and Distribution	13
2.2.4 Geographical Distribution of Rice Cultivation	13
2.2.5 Rice Cultivation in Sri Lanka	14
2.3 Characteristics of Rice	16
2.3.1 Physical Characteristics	16
2.3.1.1 Milling Characteristics	17
2.3.1.2 Length and Width of Rice Grain	19
2.3.1.3 Grain Dimension	19
2.3.1.4 Head or Whole Rice	20
2.3.1.5 Grain Quality	21

2.2.2 Classical Characteristics of Rice	23
2.3.2 Chemical Characteristics of Rice	22
2.3.2.1 Nutritional Composition	25
2.3.2.2 Gelatinization Temperature (GT)	25
2.3.2.3 Amylose and Amylopectin	25
2.4 Effect of Packaging on Rice Grain Quality	26
2.5 Storage Containers on Longevity of Rice Grain	28
2.6 Vacuum Packaging	30
2.6.1 Effects of Vacuum Packaging on Quality of Other Agricultural Produ	ice
	34
	39
CHAPTER 3	30
MATERIALS AND METHODS	20
3.1 Location and General Description	39
3.2 Vacuum Packaging of Different Rice Samples	42
3.2.1 General Description of Vacuum Packaging Machine	42
3.2.2 Setting Up of the Machine	43
3.2.3 Packing of Seeds in Bags	.44
3.3 Observations Recorded During the Experimental Period	.44
3.3.1 Physical Characteristic of Rice Grain	.45
3.3.1.1 Milling Characteristics	.45
3.3.1.2 Milled Grain Length and Length to Width Ratio	.47
3.3.1.3 Chalkiness and Translucency	.48
3.3.2 Chemical Characteristic of Rice Grain	.49
3.3.2.1 Moisture Content	.49
3.3.2.2 Amylose Content	.49
3.3.2.3 Determination of Protein	.51
3.3.2.4 Determination of Fat Content	52
3.3.2.5 Determination of Gelatinization Temperature	54

3.4 Statistical Analysis55
CHAPTER 4
RESULTS AND DISCUSSION
4.1 Initial Grain Quality Parameters Before Storage of Rice Varieties56
4.1.1 Initial Physical Properties of Grain
4.1.1.1 Milling Characteristics
4.1.1.2 Dimensions and Shape57
4.1.2 Initial Chemical Properties of Grain
4.1.2.1 Initial Moisture Content
4.1.2.2 Initial Gelatinization Temperature59
4.1.2.3 Initial Fat Content60
4.1.2.4 Initial Protein Content
4.1.2.5 Initial Amylose Content
4.2 Chemical Parameters After Storage of Rice Varieties
4.2.1 Moisture Content62
4.2.2 Amylose Content
4.2.3 Protein Content
4.2.4 Fat Content
4.2.5 Gelatinization Temperature (GT)
CHAPTED 5
CONCLUSIONS 80
CONCLOSIONS
SUGGESTIONS FOR FUTURE WORK AND STUDIES
REFERENCE

APPENDICES