## Contents

Chapter	Title	Page No.		
1	Introduction	1-5		
2	Review of Literature	6-9		
3	Material and Methods	10-19		
3.1	Procurement of Rice	10		
3.2	Starch isolation	10		
3.2.1	Analysis of Proximate Compositions	11		
3.2.1.1.	Determination of moisture content	11		
3.2.1.2	Determination of total ash content	11		
3.2.1.3.	Estimation of crude fat content	12		
3.2.1.4	Estimation of protein by micro-kjeldahl method	12		
3.2.1.5	2.1.5 Amylose content 14			
3.2.1.6.	Acetyl content	14		
3.3	Modification of starch	15		
3.3.1	Acetylation	15		
3.3.2	Dual modification 15			
3.4	Functional properties 16			
3.4.1	Water binding capacity (WBC) 16			
3.4.2	Sediment past determination 16			
3.4.3	Swelling Power and Water Solubility 16			
3.4.5	Paste clarity	17		
3.4.6	Color determination	17		
3.5	Morphology properties and Rheological properties:	17		
3.5.1.	Scanning electron microscope (SEM) 17			
3.5.2.	X-ray diffraction method (XRD) 17			
3.5.3	Pasting properties using Rapid Visco Analyzer	18		
	(RVA)			
3.5.4.	Textural properties of rice starch paste	18		

3.6	Formation of rice starch-based biodegradable films	18
3.6.1	Film thickness	19
3.6.2	Tensile strength	19
4	Results and Discussion	20
4.1	Analysis of Native starch and Modified starch	20
4.2	Physico-chemical characteristics	20
4.2.1	Acetyl content and degree of substitution (DS)	20
4.2.2	Water binding capacity	21
4.2.3	Solubility	21
4.2.4	Swelling power	22
4.2.5	Paste clarity	23
4.2.6	Sedimentation volume	23
4.2.7	Color determination	23
4.3	Rheological characteristics	24
4.3.1.	Pasting properties using by Rapid ViscoAnalyer	24
	(RVA)	
4.4.	Morphological Characteristics	26
4.4.1	Scanning electron microscope	26
4.4.2	X-ray diffractometry	27
5.	Biodegradable film Analysis	28
5.1	Thickness of the film	28
5.2	Tensile strength	29
6	Conclusion	30
7	References	31-36

·

## List of tables

Table No	Title	Page No	
Table 1	Analysis of red rice starch	20	
Table 2	Acetyl content and degree of substitution (DS) of 21 modified starches		
Table 3	Physico-chemical characteristics of native and modified red rice starch	22	
Table 4	Effect of treatments on color values of native and modified red rice starch	24	
Table 5	Pasting properties of modified rice starches determined 25 by RVA		
Table 6.	Thickness of the film	29	

## List of Figure

Figure	Title	Page No	
No			
Figure 1	Flowchart showing the extraction process of Rice starch	10	
Figure.2	Flow diagram of starch based film formation	19	
Figure 3	Pasting properties of modified starches	26	
Figure 4	Scanning electron micrographs of native and modified rice starchsamples $(4,000 \text{ x}; \text{ scale bar} = 5  \mu\text{m})$ . (a) Acetylated (M1-M3) (b) Dual modification (M4-M6) and (c) Native.	27	
Figure 5	XRD data on native, acetylated starch and dual modified starch	28	

## List of Abbreviations

Abbreviations	Full name
NT	Native
M1, M2, M3	Acetylated
M4, M5, M6	Dual modified