	Title	
Chapter		Page No.
1.	Introduction	1 -5
	Review literature	6-21
2.	2.1 Plantain banana	6
	2.2 Traditional uses of planatain	7
	2.3 Nutritional and health benefits of planatain banana	8
	2.4 Osmotic dehydration of fruits and vegetables	10
	2.5 Optimization of osmotic dehydration process of food materials	13
	2.6 Osmotic dehydration of banana and plantain	14
	2.7 Study on diffusivity related to Osmotic dehydration	15
	2.8 Incorporation of plantain flour in food products	17
. ·	2.9 Development of instant mixes for food products	19
	Materials and methods	22 - 34
3.	3.1 Materials	
	3.2 Optimisation of osmotic dehydration of kachkal banana in sucrose syrup	22
	3.2.1. Experimental design3.2.2. Preparation of raw material and sugar syrup	·
	3.3 Determination of moisture diffusivity	25
	3.4 Preparation of kachkal (plantain flour)	26
	3.5 Optimization of formulation for malpua instant mix powder	27
	incorporated with kachkal flour	
	3.6 Preparation of malpua instant mix powder incorporated with	27
	kachkal flour	30
	3.7 Study of functional properties of malpua instant mix powder	
	3.7.1. Water absorption capacity	
	3.7.2. Oil absorption capacity	

TABLE OF CONTENTS

	3.7.3. Bulk density	32
	3.7.4. Solubility and swelling power	
	3.8 Analysis of proximate composition	
	 3.8.1. Total moisture 3.8.2. Total Protein 3.8.3. Total crude fat 3.8.4. Total Crude fiber 3.8.5. Total ash 	
	3.8.6. Total antioxidant activity	55
	4.6 Equilibrium relative humidity studies	
	4.6.1 Studies on moisture sorption isotherm models	
4.	Results and discussions	36- 59
	4.1 Optimization of process parameters for osmotic	36
	dehydration of kachkal banana in sucrose syrup	
	4.1.1. Water loss	
	4.1.2. Solid gain	
	4.1.3. Weight reduction	
	4.1.4 Optimization of Osmotic dehydration of kachkal banana	47
	4.2 Results on moisture and solute diffusion studies	53
	4.4 Studies on functional properties of malpua instant mix	54
	powder	55
	4.5 Studies on proximate composition	56
	4.6 Equilibrium relative humidity studies	58
	4.6.1 Studies on moisture sorption isotherm models	
	4.6.1 Studies on moisture sorption isotherm models	
5.	Summary and conclusion	61 - 62
6.	Reference	63
7.	APPENDIX I : Hedonic score card	
	APPENDIX II : One way ANOVA Table for analysis of	
	variance of sample sensory attributes.	

LIST OF TABLES

SL. NO.	CONTENT	PAGE NO.
2.1	Nutritional profile of plantain (kachkal) banana	9
3.1.	Coded levels for rotatable central composite design	23
4.1	Various responses for chosen dependent variables corresponding to different independent factors using CCRD	36
4.2	ANOVA results for water loss parameter during osmotic dehydration	37
4.3	ANOVA results for solid gain parameter during osmotic dehydration	39
4.4	ANOVA results for weight reduction parameter during osmotic dehydration	41
4.6	Moisture and solute diffusivities in plantain slices at different temperatures	47
4.7	scores obtained for various attributes for different formulations	52
4.8	Results of study on functional properties of instant mix powder	53
4.9	Results of proximate analysis of instant mix powder	55
4.10	Values of various isotherm model constants obtained in the experiment	59

LIST OF FIGURES

SL. NO.	CONTENT	PAGE NO.
Fig 3.1	Fresh kachkal banana	22
Fig 3.2	Kachkal banana slices	22
Fig3.3	Osmotic dehydration of plantain slices in incubator shaker	24
Fig 3.4	Osmodried kachkal slices	24
Fig 3.5	Preparation of malpua batter for drying	28
Fig 3.6	Tray drying of malpua batter	28
Fig 3.7	Plain malpua mix powder	28
Fig 3.8	Kachkal incorporated malpua mix powder	28
Fig 3.9	Rehydrated malpua mix powder	29
Fig 3.10	Deep frying of malpua batter	29
Fig 3.11	Malpua made from plain mix	30
Fig 3.11	Malpua made from kachkal mix	30
Fig 4.1(a)	Effect of time and temperature on water loss	43
Fig 4.1(a)	Effect of sucrose conc. and temperature on water loss	43
Fig 4.1(b)	Effect of syrup: fruit ratio and temperature on water loss	43
Fig 4.1(c)	Effect of sucrose conc. and time on water loss	43
Fig 4.1(d)	Effect of syrup: fruit ratio and time on water loss	43
Fig 4.1(e)	Effect of syrup: fruit ratio and sucrose conc. on water loss	43
Fig 4.1(f)	Effect of time and temperature on solid gain	44

Fig 4.1(g)	Effect of sucrose conc. and temperature on solid gain	44
Fig 4.1(h)	Effect of syrup: fruit ratio and temperature on solid gain	44
Fig 4.1(i)	Effect of sucrose conc. and time on solid gain	44
Fig 4.1(j)	Effect of syrup: fruit ratio and time on solid gain	44
Fig 4.1(k)	Effect of time and temperature on solid gain	44
Fig 4.1(l)	Effect of sucrose conc. and temperature on weight reduction	45
Fig 4.1(m)	Effect of syrup: fruit ratio and temperature on weight reduction	45
Fig 4.1(n)	Effect of sucrose conc. and time on weight reduction	45
Fig 4.1(o)	Effect of syrup: fruit ratio and time on weight reduction	45
Fig 4.1(p)	Effect of time and temperature on weight reduction	45
Fig 4.2	Moisture ratio vs. time graph at different temperatures.	48
Fig 4.3	Solute ratio vs. time graph at different temperatures.	48
Fig 4.4(a)-4.4(e)	Plot of -ln(Mr/A) vs. time at different temperature	49
Fig 4.5(a)-4.5(e)	Plot of -ln(Sr/A) vs. time at different temperatures	50 .
Fig 4.6(a)	ln(Deff) vs.1/T graph for moisture loss	51
Fig 4.6(b)	ln(Deff) vs. 1/T graph for solute gain	52
Fig 4.7	Equilibrium moisture uptake curve of malpua instant mix powder as a function of water activity at 40°C	56
Fig 4.8(a)	GAB model	59
Fig 4.8(b)	Oswin model	59
Fig 4.8(c)	Peleg model	59
Fig 4.8(d)	Iglesias – Chirife model	59

LIST OF ABBREVIATIONS AND ACRONYMS

1	USDA	United States Department Of Agriculture
2.	RDA	Recommended dietary allowance
3.	OD	Osmotic dehydration
4.	GAB	Guggenheim-Anderson-de Boer
5.	F _{ow} & F _{os}	Fourier's number for moisture and solute diffusion
6.	q _n	constant
7.	m_{∞}	Equilibrium moisture content
8.	m _t	Moisture content at any given time
9		Initial moisture content
10	M _r	Moisture ratio
11.	S _∞	Solute concentration at equilibrium point
12.	S ₀	Solute concentration at initial point
13.	s _t	Solute concentration at any given time.
14.	S _r	Solute ratio
15.	α	Fruit : syrup ratio
16.	M _w	Moisture content (% dry basis)
17.	a _w	Water activity
18.		Temperature (°C)
19.	x _t	Immersion time (min)
20.	x _{sc}	Sucrose concentration (°Brix)

•

--•(`

.

21. x	SFR	Syrup: fruit ratio.
22.	Y _{WL}	Moisture loss (g/g fresh matter)
22.	Y _{SG}	Solid gain (g/g fresh matter)
23. Y	Y _{WR}	Weight reduction (g/g fresh matter)
24. 1	D _{ew}	Moisture diffusivity (m^2/s)
25.	D _{es}	Solute diffusivity (m^2/s)
26. <i>L</i>	Deff	Effective diffusivity
27.	Ea	Activation energy (Joule / mole)
28.	RH	Relative humidity
29. D	PPH	2,2 – diphenyl-1- picrylhydrazyl
30. R	CCD	Rotatable centre composite design
31. V	WAI	Water absorption index
32. 0	DAP	Oil absorption power