

CONTENTS

1. Introduction	1
2. Review of Literature	5
2.1. Method of production of churpi	5
2.2. Proximate composition of churpi	6
2.3. Food texture terminology	6
2.3.1. Specific textural characteristics	6
2.3.2. Sensory texture profile	7
2.3.3. Objective texture profile	7
2.4. Instrumental measurement of food texture	7
2.4.1. Compression testing with Instron	9
2.4.1.1. Test conditions	9
2.4.1.1.1. Sample size and shape	10
2.4.1.1.2. Size of compressing unit versus sample	10
2.4.1.1.3. Percent compression	11
2.4.1.1.4. Crosshead speed	11
2.4.1.1.5. Temperature	12
2.4.1.1.6. Number of bites	12
2.5. Sensory measurement of food texture	12
2.5.1. Perception of texture	13
2.6. Interrelationship between instruments and sensory assessment of food texture	14
2.7. Texture of heat and acid coagulated Indian milk products	17
2.7.1. Texture of chhana	17
2.7.2. Texture of paneer and soybean curd	17

2.8.	Different process parameters used in heat and acid-coagulated Indian milk products	18
2.9.	Cooking of raw paneer	20
2.10.	Quantum and duration of pressure in paneer making	21
2.11.	Drying characteristics of some foods	21
3.	Materials and Methods	23
3.1.	Reagents used	23
3.2.	Experimental	24
3.2.1.	Survey on churpi	24
3.2.2.	Collection of market samples	25
3.2.3.	Physico-chemical analysis of market churpi	25
3.2.3.1.	Reflectance	25
3.2.3.2.	Chemical analysis	25
3.2.3.2.1.	Moisture	25
3.2.3.2.2.	Total fat	26
3.2.3.2.3.	Free fat	26
3.2.3.2.4.	Free fatty acid	27
3.2.3.2.5.	Total protein	27
3.2.3.2.6.	Water-dispersible protein	28
3.2.3.2.7.	Tyrosine value	28
3.2.3.2.8.	Lactose and glucose-galactose	29
3.2.3.2.9.	Lactic acid	30
3.2.3.2.10.	pH	30
3.2.3.2.11.	Titratable acidity	30
3.2.3.2.12.	Ash	31
3.2.3.2.13.	2-Thiobarbituric acid	31
3.2.3.2.14.	5-Hydroxymethylfurfural (HMF)	32
3.2.3.2.15.	Para-dimethylaminobenzaldehyde reactivity	32

3.2.3.2.16. Energy value	33
3.2.4. Sensory evaluation of churpi	33
3.2.5. Instrumental evaluation of churpi	33
3.2.6. Preparation of laboratory samples	34
3.2.6.1. Materials	34
3.2.6.1.1. Milk	34
3.2.6.1.2. Skim-milk powder	34
3.2.6.1.3. Coagulants	35
3.2.6.2. Processing conditions	35
3.2.6.2.1. Standardization	35
3.2.6.2.2. Heating of milk	36
3.2.6.2.3. Coagulation	36
3.2.6.2.4. Cooking	36
3.2.6.2.5. Pressing	36
3.2.6.2.6. Drying	36
3.2.7. Optimization of process parameters	36
3.2.7.1. Fat level	36
3.2.7.2. Temperature of coagulation	37
3.2.7.3. Method of straining	37
3.2.7.4. Strength of citric acid	38
3.2.7.5. Type of coagulant	38
3.2.7.6. Cooking of green curd	38
3.2.7.7. Pressing condition	39
3.2.7.8. Drying behaviour as effected by size of churpi	39
3.2.8. Consumer response to laboratory-made churpi	39
3.2.9. Changes in sensory attributes and physico-chemical parameters during manufacturing churpi	40

- 3.2.10. Cost of churpi production 40
- 3.2.11. Statistical analysis 40

4. Results 42

- 4.1. Survey on traditional methods of churpi preparation 42
- 4.2. Analysis of market churpi 42
 - 4.2.1. Chemical analysis 42
 - 4.2.2. Sensory analysis 43
 - 4.2.3. Instrumental analysis 44
 - 4.2.4. Relationship between sensory attributes and intrinsic parameters 44
 - 4.2.5. Relationship between chemical composition and Instron parameters 46
 - 4.2.6. Relationship between sensory textural descriptors and instron texture profile 47
- 4.3. Optimization of process parameters in the manufacture of churpi 49
 - 4.3.1. Fat level in milk 49
 - 4.3.2. Temperature of coagulation of milk 50
 - 4.3.3. Method of straining 51
 - 4.3.4. Strength of citric acid 52
 - 4.3.5. Type of coagulant 52
 - 4.3.6. Cooking of green curd 54
 - 4.3.7. Pressing condition 55
 - 4.3.8. Drying behaviour as effected by size of churpi 57
- 4.4. Consumer response to laboratory-made churpi 58
- 4.5. Changes in sensory attributes and physico-chemical parameters during manufacturing churpi 58
- 4.6. Cost of production of churpi 60

5. Discussion	61
5.1. Survey on traditional methods of churpi preparation	61
5.2. Analysis of market samples of churpi	61
5.2.1. Physico-chemical analysis	61
5.2.2. Relationship between sensory attributes and intrinsic parameters	64
5.2.3. Relationship between chemical composition and instron parameters	66
5.2.4. Relationship between sensory textural descriptors and instron texture profile parameters	68
5.3. Optimization of process parameters	70
5.3.1. Fat level in milk	70
5.3.2. Temperature of coagulation of milk	71
5.3.3. Method of straining	71
5.3.4. Strength of citric acid	72
5.3.5. Type of coagulant	72
5.3.6. Cooking of green curd	73
5.3.7. Pressing condition	74
5.3.8. Drying behaviour as effected by size of churpi	75
5.4. Consumer response to laboratory-made churpi	76
5.5. Changes in sensory attributes and physico-chemical parameters during manufacturing churpi	77
5.6. Cost of production of churpi	78
6. Summary	79
7. Bibliography	82