

**Cheddar enzyme modified cheese:
Influence of protease and lipase on flavour**

by

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I declare the dissertation herewith submitted for the MInst Agrar (Food Processing) degree at the University of Pretoria, has not been previously submitted by me for a degree at any other University.

ABSTRACT

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Cheddar enzyme modified cheese (EMC) is a highly accelerated ripened cheese product made by the addition of enzymes and other additives to a slurry of curd or cheese and then ripened at elevated temperatures before heat treatment to make the product shelf stable. EMC is used as a cheese replacer in processed food products since it has many times the flavour of normal cheese for the same amount of substrate (curd).

Most EMCs are imported into South Africa since only one company produces EMC locally. No published work exists on producing an EMC in South Africa using local ingredients. To test the quality of an EMC it must be tested with sensory methods but there is no published literature of sensory work done on EMC since it is assumed that the studies that apply to cheese can also be applied to EMCs.

The major objective of this study was to successfully produce an EMC using local dairy ingredients and combinations of commercial lipase and protease preparations and to determine whether any modifications to the internationally established production methods are required. During the incubation, the free fatty acids (FFA) and free amino nitrogen (FAN) were measured as well as the microbiological safety. The EMCs were taste tested in a savoury soup using a taste panel and a standard set of flavour descriptors normally used for cheese characterisation.

The microbiological testing detected *Bacillus cereus* (a known pathogen) that would need to be eliminated before commercial production since hygiene legislature prohibits its occurrence in food.

The FAN increased for those EMCs made with added protease and the FFA increased for those EMCs made with added lipase. The FAN levels were about 10 lower than published values, and when diluted for taste testing the FAN levels were below the flavour threshold and so had no sensory effect. The FFA levels were at the right levels as compared to literature.

Sensory profiles of all EMCs, controls and standards were successfully carried out. Flavour wheel analysis and Principal Component Analysis of the sensory results confirmed that the FAN levels were too low and therefore only the FFA effects were evaluated during taste testing. The low FAN levels were caused by the recommended dosage of protease being too low. The development of good cheese flavour with no protease effects confirms that lipase effects are the most important in EMCs in contrast to cheese where protease effects are the most important.

UITTREKSEL

Cheddar ensiem gemodifiseerde kaas:
Die invloed van protease en lipase op geur
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Cheddar ensiem gemodifiseerde kaas (EGK) is 'n kaas produk waar die ryp-maak proses versnel word deur die byvoeging van ensieme en ander bymiddels by die wrongel-smeersel. Die produk is dan ryp gemaak onder verhoogde temperature. Die produk ondergaan hitte verwerking om dit rak stabiel te maak. EGK is gebruik as 'n kaas vervanger in vervaardiging van voedsel produkte omdat dit meer geur het as normale kaas vir dieselfde hoeveelheid substraat. In ander woorde, dit is meer gekonsentreerd as gewone kaas.

Die meeste EGK's word ingevoer omdat daar net een plaaslike vervaardiger is. Daar is geen gepubliseerde werk oor die vervaardiging van EGK's in Suid-Afrika met die gebruik van plaaslike bestanddele nie. Die kwaliteit van 'n EGK word getoets deur middel van sensoriese toetse. Daar is geen rekord van spesifieke sensoriese werk uitgevoer op EGK, want dit word aangeneem dat die studies wat op kaas toegepas word kan ook op EGK's toegepas word.

Die hoofsaaklike doel van hierdie projek was om suksesvol 'n EGK te vervaardig deur gebruik te maak van plaaslike suiwel bestanddele en kommersieel beskikbare lipase en protease en om dan te bepaal of die internasionale produksie metode aangepas moet word. Gedurende die ontwikkeling proses is die vry vettige suur (VVS) en vry amino stikstof (VAS) hoeveelhede gemeet. Die

mikrobiologiese veiligheid van die produk is ook getoets. Die EGK's is sensories gevalueer in 'n sop basis deur 'n paneel opgelei mense wat 'n standaard reeks van beskrywende woorde gebruik om die produkte te beskryf. Die reeks beskrywende woorde is dieselfde as wat gewoonlik gebruik word om kaas te beskryf.

Die mikrobiologiese toetse het die teenwoordigheid van "Bacillus cereus", 'n bekende patogeeniese organisme, ontdek. Volgens die gesondheids wet mag hierdie organisme glad nie teenwoordig wees in voedsel nie. Die kommersieel vervaardigings proses van EGK's sal aangepas moet word om te verseker dat die bogenoemde organisme verwyder word.

Die VAS het vermeerder in die EGK's wat met bygevoegde protease vervaardig is en die VVS het vermeerder vir die EGK's vervaardig met bygevoegde lipase. Die VAS vlakke aangeteken gedurende hierdie projek, is tien keer laer as die gepubliseerde VAS waardes. Die VAS vlakke aangeteken was laer as die geur drumpel met die gevolgtrekking dat hulle nie 'n sensories effek gehad het nie. Die VVS vlakke wat aangeteken is het goed vergelyk met die gepubliseerde waardes.

Die sensoriese profiel van alle EGK's, kontrole en standaard is suksesvol uitgevoer en aangeteken. Analise van die sensoriese uitslae het bevestig dat die VAS vlak te laag was en daarom was net die VVS beoordeel gedurende die sensoriese analise. Die laer vlak van VAS is waarskynlik as gevolg van die feit dat die aanbeveelde dosis van protease te laag was. Die vervaardiging van 'n goeie kaas geur met geen protease bevestig dat lipase baie belangrik is in EGK vervaardiging in vergelyking met die vervaardiging van kaas waar protease belangrik is.

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TABLE OF CONTENTS

ABSTRACT.....	ii
UITTREKSEL.....	iv
ACKNOWLEDGEMENTS.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	ix
LIST OF FIGURES.....	ix
LIST OF COLOUR PLATES.....	x
CHAPTER 1 - INTRODUCTION.....	1
1.1 STATEMENT OF THE PROBLEM.....	2
1.2 OBJECTIVES.....	3
CHAPTER 2 - LITERATURE REVIEW.....	4
2.1 INTRODUCTION.....	4
2.2 CHEDDAR CHEESE, IT'S HISTORY AND RELEVANCE TO THE FOOD INDUSTRY.....	4
2.3 CHEDDAR CHEESE FLAVOUR FORMATION.....	6
2.3.1 Glycolysis.....	7
2.3.2 Citrate metabolism.....	9
2.3.3 Proteolysis.....	9
2.3.4 Lipolysis.....	13
2.3.5 Other factors, including off-flavours.....	15
2.4 ENZYME-MODIFIED CHEESE.....	16
2.4.1 Enzyme modified Cheddar cheese chemistry.....	16
2.4.2 EMC technology.....	19
2.4.3 Factors affecting EMC quality.....	21
2.5 NON-SENSORY METHODS FOR DETERMINING CHEESE FLAVOUR QUALITY.....	22
2.5.1 Proteolysis.....	23
2.5.2 Lipolysis.....	23
2.5.3 Off-flavours.....	24
2.6 SENSORY METHODS FOR DETERMINING CHEESE FLAVOUR QUALITY.....	24
2.6.1 Expert panels.....	25
2.6.2 Consumer panels.....	25
2.6.3 Descriptive analysis taste panels.....	25
2.7 CONCLUSION.....	26
CHAPTER 3 - MATERIALS AND METHODS.....	29
3.1 PHASE 1 - EMC PRODUCTION.....	29
3.1.1 Enzymes and other additives.....	29
3.1.1.1 Enzyme Selection.....	29
3.1.1.2 Other additives.....	30
3.1.2 Substrate selection.....	30

3.1.2.1	Curd production	31
3.1.3	Production method	31
3.1.3.1	Incubation method	31
3.1.3.2	Enzyme incubation	32
3.1.3.3	Microbiological safety	33
3.2	PHASE 2 - CHEMICAL ANALYSES	33
3.2.1	Measurement of FAN to assess degree of proteolysis	33
3.2.1.1	Spectrophotometer calibration	34
3.2.2	Measurement of FFA to assess degree of lipolysis	34
3.2.3	Statistics	35
3.3	PHASE 3 - SENSORY ANALYSIS	35
3.3.1	Base for taste testing	35
3.3.2	Taste Testing	35
3.3.2.1	Panellists	35
3.3.2.2	Developing descriptors	36
3.3.2.3	Sensory sheet	37
3.3.3	Calculations and statistics	38
3.3.3.1	Panellist consistency	39
3.3.3.2	Flavour wheel of flavour descriptor	39
3.3.3.3	Plot of descriptor error bars	39
3.3.3.4	Principal Components Analysis	39
3.4	COLOUR PLATES OF EXPERIMENTAL WORK	40
CHAPTER 4	- RESULTS	43
4.1	PHASE 1 - EMC PRODUCTION	43
4.1.1	Microbiological safety	43
4.2	PHASE 2 - CHEMICAL ANALYSIS	44
4.2.1	FAN plot	44
4.2.2	FFA plot	45
4.3	PHASE 3 - SENSORY ANALYSIS	46
4.3.1	Lexicon determination	46
4.3.2	Panellists consistency	47
4.3.3	Sensory profile	48
4.3.4	Plot of descriptor error bars	49
4.3.5	Principal component analysis	50
CHAPTER 5	- DISCUSSION	52
CHAPTER 6	- CONCLUSIONS & RECOMMENDATIONS	60
REFERENCES	62

LIST OF TABLES

Table 1 Comparison of different types of Cheddar cheese products	5
Table 2 Heat of formation of amino acids (Fox & Wallace, 1997 adapted from O'Callaghan, 1994) ..	13
Table 3 Volatile compounds important for Cheddar cheese flavour (Fox & Wallace, 1997).....	17
Table 4 Major categories of methods for accelerating cheese ripening (adapted from Law & Goodenough, 1995; Fox <i>et al.</i> , 1996).....	17
Table 5 Factors affecting the enzymatic hydrolysis of proteins (Kilara, 1985).....	22
Table 6 Parameters for a lipase and protease which typically are used to produce EMCs (BioCatalysts, 1996)	30
Table 7 Recipe of 'umami' soup for sensory analysis of EMC	36
Table 8 Sex and age details of taste panellists.....	36
Table 9 Final EMC sensory descriptors with their respective standards and dilutions (adapted from Heisserer & Chambers, 1993)	37
Table 10 Pathogen and total plate counts for a CEMC sample	43
Table 11 Flavour descriptors used by taste panellists to describe EMC samples diluted in a savoury base	46
Table 12 Mean standard error of panellist scores across all samples and descriptors	47
Table 13 Published free amino nitrogen values for Cheddar cheese and Cheddar enzyme modified cheese (wet basis).....	54
Table 14 Published free fatty acid values for Cheddar cheese and Cheddar enzyme modified cheese	56

LIST OF FIGURES

Figure 1 Formation of flavour compounds in Cheddar cheese (adapted from Fox <i>et al.</i> , 1996; Fox & Wallace, 1997).....	8
Figure 2 General pathways of microbial catabolism of amino acids during cheese ripening (Fox <i>et al.</i> , 1995a adapted from Hemme <i>et al.</i> , 1982).....	14
Figure 3 The panellist sensory marking sheet.....	38
Figure 4 Effect of lipase and protease addition on FAN production from Cheddar curd. Mean FAN concentrations including standard error bars are plotted against time.....	44
Figure 5 Effect of lipase and protease addition on FFA production from Cheddar curd. Mean FFA concentrations including standard error bars are plotted against time.....	45
Figure 6 Comparison of sensory profiles of EMCs made with added protease and lipase, diluted in an umami soup.	48
Figure 7 Comparison of the standard errors of the flavour descriptors used in the sensory profiling of EMCs made with added protease and lipase and diluted in an umami soup.....	49
Figure 8 Principal component analysis plot of flavour descriptor variance used in the sensory profiling of EMCs made with added protease and lipase and diluted in an umami soup.....	50

Figure 9 Principal component analysis plot of the flavour variance of EMCs made with added protease and lipase and diluted in an umami soup. 51

LIST OF COLOUR PLATES

Plate 1 Frozen curd	40
Plate 2 Curd slurry in liquidiser together with enzymes and other additives	40
Plate 3 Batches of EMC in incubator	41
Plate 4 TNBS-PTA-FAN solutions and spectrophotometer	41
Plate 5 FFA titrations	42
Plate 6 Taste testing samples, carrot, apple and sensory reference standards	42