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.
UITREKSEL

Cheddar ensiem gemodificeerde kaas:

Die invloed van protease en lipase op geur
deur

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Cheddar ensiem gemodificeerde 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 gekonsentreer 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 toets. 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 kommersiëel 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 sensorsies 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 patogenese organisme, ontdek. Volgens die gesondheids wet mag hierdie organisme glad nie teenwoordig wees in voedsel nie. Die kommersiële 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 lae as die geur drumpel met die gevolgtrekking dat hulle nie 'n sensorsies effek gehad het nie. Die VVS vlakke wat aangeteken is het goed vergelyk met die gepubliseerde waardes.

Die sensorsiese proef van alle EGK's, kontrole en standaarde is suksesvol uitgevoer en aangeteken. Analise van die sensorsiese uitslae het bevestig dat die VAS vlak te laag was en daarom was net die VVS beoordeel gedurende die sensorsiese analyse. Die lae 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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