



Review Article

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An introduction to flavor compound production in cheese

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ABSTRACT

Cheese, general name for dairy products which is produced through chemical changes in casein. Along with casein, a part of whey, fat and other nutrients obtain in clod. The main result of cheese production, keeping milk nutrients in non-spoiling conditions with flavor keeping and no reduction of its nutritional value .Lipolyse is the main factor of aroma production in cheese due to inactivation of natural lipase by pasteurization therefore the main reason of lipolysis is microbial enzymes. The main role of starters is lactose fermentation and converting it to lactic acid which reduces the pH and occurring of a peppery taste moreover in glycolysis other aroma compounds produced such as acetic acid, acetoin and diacethyl.

Key words: cheese, flavoring compounds, proteolysis, lipolysis

INTRODUCTION

Cheese a so-called product refers to a group of dairy products at which casein, fats and other milk nutritional compounds remains in clot. The real origin of cheese estimates over 7000 years ago (B.C.). The main goal of cheese production is keeping of nutrient compounds in non-spoiling conditions with keeping of desire flavor. In ancient era, simultaneous clotting of milk has been used in cheese making. Lactic coagulation occurs consequently after lactose fermentation. In order to provide high quality, it is necessary that consumed milk has had the best bacteriological and chemical quality (Moatsou et al, 2004).

Cheese flavor

Compounds participating in cheese aroma and flavor mostly produce in fermentation of lactose. Cheese flavor is an organoleptic feature and arise from an accurate balance among savory compounds (Sousa et al, 2001).

Cheese aging

The main goal of cheese making process is cheese aging; which refers to the events depending on the cheese type and consequently special flavors create (Sousa et al, 2001; Marilley Casey, 2004 ; Weimer,2007).

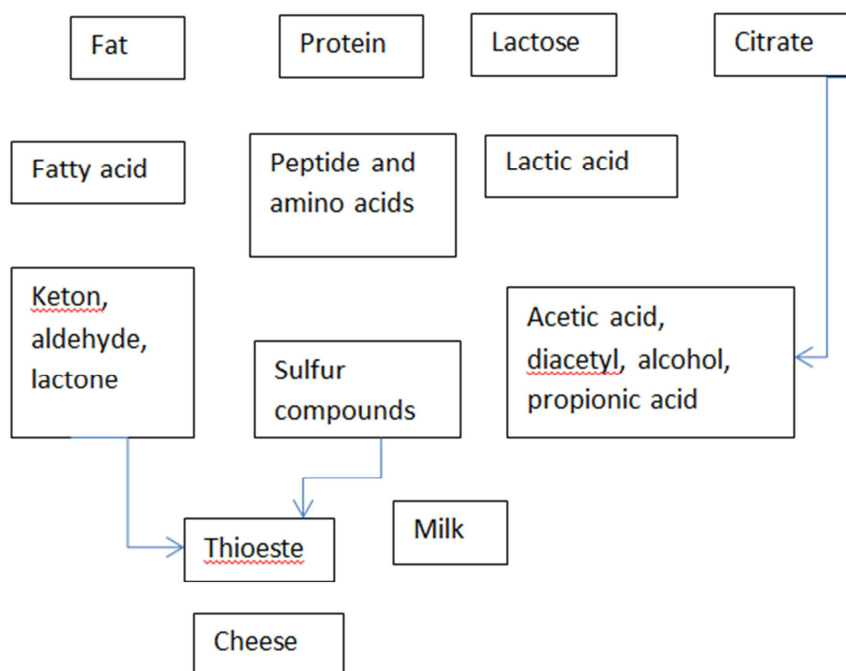


Figure 1: production of flavoring compounds in cheese

Cheese aging can considers in 3 basic biochemical respective stages including Glycolysis, Lipolysis, and Proteolysis.

Fermentations of Lactose and citrate occur in the beginning of cheese processing, exhibiting being partially quick reactions in comparison with other processes (Marilley Casey, 2004 ; Weimer,2007).

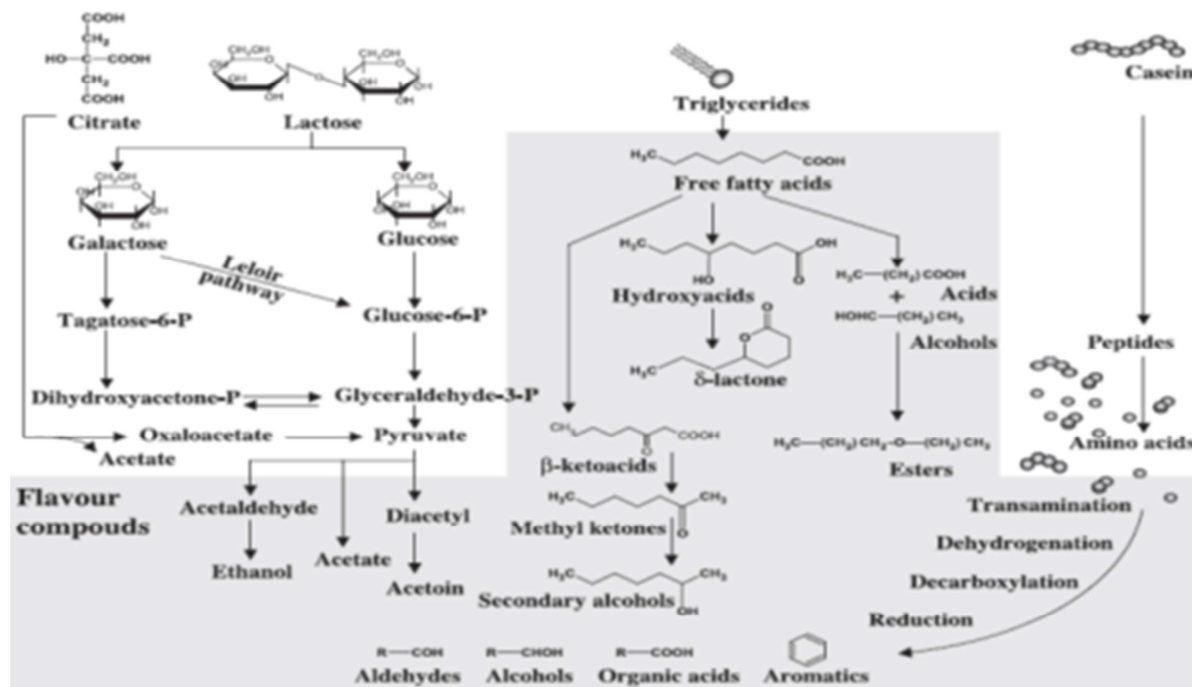


Figure 2. Cheese glycolysis

Glycolysis

Although %98 of lactose removes by whey, lactose metabolism is highly demanded in production of high nutritional product (Weimer, 2007). Conversion of lactose to lactic acid mostly process as lactic acid bacteria activities which

start from the beginning of cheese making up to complete fermentation of lactose. Reduction of pH due to lactose fermentation leads to prevent pathogens and deterioration of cheese. As production of acid lactic is along with other compounds like acetic acid, acetoin and diacetyl thus Glycolysis has an important role in cheese flavors as well (Sousa et al, 2001; Weimer, 2007).

Lipolysis

Lipolysis due to inactivation of natural lipases in pasteurization, considering as the main important factor in aroma creation, leading to concluding this fact that microbial lipases are lipolysis creators. Synthesized lipase by *P. Roquefort* plays an important role in production of aroma and increasing of free amino acids in Roquefort cheese i.e. lipolysis produces glycerols and fatty acids mostly low molecule with strong flavor & therefore remarkably effects on cheese flavor in low amounts. Some of these acids are more active in decomposition and produce compounds such as methyl keton, lactones and aldehydes with different affections on flavor and tastes (Sousa et al, 2001; Weimer, 2007).

Proteolysis affection on the cheese flavor production

Proteolysis contributes in production of flavor compound through decomposition of peptides and amino acids. Long chain peptides are incapable of direct-contributing in cheese flavor, but they hydrolyse by proteinases and convert to low chains peptides' participating in cheese taste, overall, cheese proteolysis is called "Background Flavor" and considers as not the main aroma producer in cheese.

Proteolyse

Origins of Proteolytic enzyme are;

- Adding cheese clot
- Present enzymes in milk
- Added microorganisms

All the proteases decompose not up to amino acid production, some process decomposition of first part i.e. protein hydrolyse and some process decomposition up to peptide. Animal cheese starter regularly produces large peptides and decomposition of these compounds occurs through microbial proteases.

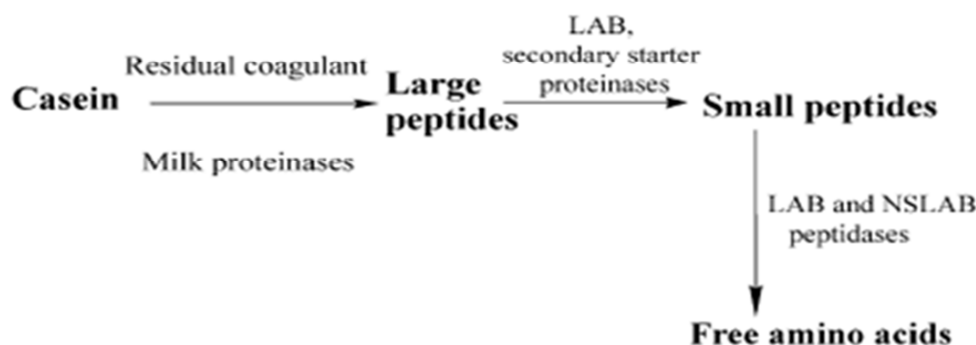


Figure3: proteolysis in cheese maturing

Part of cheese maturing processes by enzymes secreting from microorganism. The origin of those enzymes can be arisen from incidental contamination. But in most cases, enzymes secrete from starter cultures (Sousa et al, 2001; Weimer, 2007).

Proteinases and peptidases produced from *Lactococcus* and *Lactobacillus*

Starters commonly use in cheese making including mesophile *Lactococcus* and *Leuconostoc* and varieties of thermophilic *Lactococcus* and *Streptococcus thermophilus*. From the viewpoint of proteolytic, lactic acid bacteria are weak, but they contain wide proteinase and peptidase systems which are able to decompose oligopeptides to small peptides and amino acids (Sousa et al, 2001; Weimer, 2007).

The most peptidolytic and sterolytic activities is related to Thermophil cocci (Areti Asteri et al, 2009).

Cheese spoilage

Cheese spoilages categorizes in two groups

- 1) Mold spoilage (mold, yeast)
- 2) Bacterial spoilage

Mold spoilage

Molds is being found in cheese spoilage are;

- 1) Cladosporium: its different varieties create black spots in cheeses
- 2) Penicillium: These molds commonly create green spots.
- 3) Monilia spp: Creating black spots in hard cheeses.

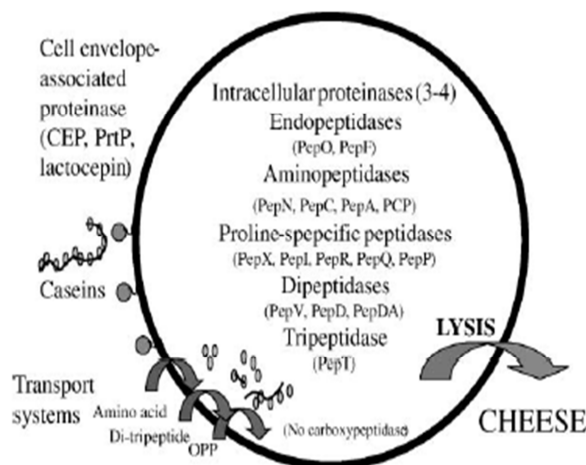


Figure 4: formation of flavor compounds arose from casein decomposition

Yeasts

Growth of some of the yeasts can produce a fermentation smell in swelled cheese. Yeasts rarely cause a bitter taste and mostly produce fruit sweet taste.

Bacteria spoilage**Bitterness**

Bitterness occurring in cheese can take place by a group of Coliforms, Micrococcus and rarely yeasts.

In clot, a group of bacteria including Pseudomonas, enterobacter, Acinetobacter along with mold and yeast are responsible for this kind of spoilage in cheese.

RESULTS

1. Cheese as an ever-interesting product contains high nutritional value and consumption so as one of the important foodstuffs regards.
2. With respect to microorganism in production of flavor, there are different types of products can be expected.
3. Regarding the complexity and mostly being unknown of mechanisms, studies must be propelled in the field of their detection

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