

ORIGINAL  
RESEARCH

## Biogenic amines in Iranian white brine cheese: modelling and optimisation of processing factors

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The simultaneous effects of processing factors such as ripening time (25–75 days), ripening temperature (4–14 °C) and brine concentration (10–13%) on biogenic amines content, proteolysis and sensory score of Iranian white brine cheese were studied, in 12 cheeses. Response surface methodology (RSM) was used to minimise biogenic amines content. At low level of ripening time, biogenic amines content decreased with increasing levels of brine concentration but at high level of ripening time, brine concentration had inverse effect. Ripening time showed quadratic effect on biogenic amines content. Based on biogenic amines content and sensory score, the optimum conditions were 13% brine and ripening at 9–14 °C for 43–65 days.

**Keywords** Biogenic amines, Cheese ripening, Response surface methodology.

## INTRODUCTION

Biogenic amines are low molecular weight organic bases that possess biological activity and are mainly generated through enzymatic decarboxylation of amino acids by micro-organisms. These compounds include tyramine, histamine, putrescine, cadaverine, tryptamine and 2-phenyl-ethylamine and have been found in several types of cheese (Silla 1996).

Cheese represents an ideal environment for the production of biogenic amines but amine concentration differs widely and depends on several factors, such as, cheese variety, storage temperature, ripening time and microflora (Vale and Gloria 1997). The presence and accumulation of biogenic amines depend on many factors, such as, availability of free amino acids (level of proteolysis), pH, water activity, salt-in-moisture level, temperature, bacterial density and synergistic effect between micro-organisms (Gardini *et al.* 2001; Stratton *et al.* 1991).

The amine-producing abilities of various bacteria differ widely. The production of biogenic amines in cheese has often been linked to nonstarter lactic acid bacteria like *Enterobacteriaceae* (Novella-Rodríguez *et al.* 2002; Valsamaki *et al.* 2000; Halasz

*et al.* 1994). The presence of micro-organisms that have amino acid decarboxylase activity, such as lactobacilli, enterococci, micrococci and many strains of *Enterobacteriaceae*, are necessary for the production of biogenic amines (Suzzi and Gardini 2003; Edwards and Sandine 1981).

The presence of biogenic amines can cause several problems for susceptible consumers, such as nausea, respiratory disorders, hot flushes, sweating, heart palpation, headache, bright red rash, oral burning, hypo or hypertension, whose intensity is depend on quantitative and qualitative differences (Stratton *et al.* 1991).

Iranian white brined cheese is a major item in the diet in Iran. It is widely consumed all over the country (Alizadeh *et al.* 2006). At the industrial level, the ripening period is about 45–90 days (Azarnia *et al.* 1997). However, there are trends to reduce this time period for economic reasons. In Iran, white brine cheese production plants use different levels of processing variables. For example, brine concentration differs from 8% to 16%w/v or ripening temperature differs from 6 to 16 °C and so on (Alizadeh *et al.* 2006). This leads to nonhomogeneous quality and necessitates optimising of the process variables for attaining uniform quality characteristics.

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