

**RIPENING ACCELERATION AND QUALITY IMPROVEMENT OF GOUDA  
 CHEESE WITH ADDING MILK SOMATIC CELLS  
 BY**

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**ABSTRACT**

*The* effect of adding proteolytic enzymes associated with somatic cells (SC) from healthy cows milk on Gouda cheese ripening and quality was studied. Gouda cheese treatments were made from normal mixed milk (cows and buffaloes, 1:1) to which SC was added at levels of  $\sim 2, 4$  and  $6 \times 10^5$  cells  $\text{ml}^{-1}$  (T2, T3 and T4, respectively), before pasteurization, compared with control without SC addition (T1). Coagulation time, yield, protein & fat recovery and chemical composition analysis of Gouda cheese treatments were slightly affected by addition of SC. A highly significant ( $p < 0.01$ ) increase were observed for proteolysis and lipolysis during ripening by adding SC as indicated by ripening indices (SN, SN/TN, soluble tyrosine & tryptophane and TVFA). Firmness values indicated that all cheese treatments with SC showed more desirable texture along ripening ( $p < 0.05$ ). Also, SDS-polyacrylamide gel electrophoretic patterns and sensory quality confirmed that proteolytic enzymes of SC were contributed directly to proteolysis of protein in cheese treatments (T4 followed by T3), which ripened within 60 days and enhanced the cheese quality.

**INTRODUCTION**

Gouda cheese is a semi-hard cheese with few eye-holes which should contain not less than 48% fat content in the dry matter and not more than 43% moisture content (Codex, 1966), it has been widely spread in many countries (Scott, 1998). Recently, this type of cheese has been increased in Egyptian local market. Nowadays, cheese making involves high capital investment, the running costs and interest charges involved in cheese storage represent a significant proportion of the total costs. The economic advantage of rapid development of more intense cheese flavour in shorter periods would be substantial. Maturation of cheese is a complex process involving the breakdown of protein and to a lesser extent of milk fat. Furthermore, impending legislation may impose mandatory pasteurization in some countries or heat treatments of milk to incorporate the whey proteins into cheese, with the consequence of slowing down the process of maturation. Thus, there is a need to identify an accelerated ripening process capable of producing a cheese with

characteristics equivalent to standard matured cheese (Trepanier *et al.*, 1992). Development of the flavours characteristics can occur partially, by bacteria and enzymes through different metabolic pathways, as well as, changes in the texture and body of the cheese matrix (Kamaly *et al.*, 1989). Adding proteolytic enzymes to cheese is an effective way to accelerate cheese ripening.

Normally, milk contains different amounts of SC, but in case of bacterial infection or other inflammation processes of mammary tissues (*i.e.* mastitis, stage of lactation, season, milk yield, and number of lactations), the number of SC in milk dramatically increases (Albenzio *et al.*, 2002 and Jaeggi *et al.*, 2003). This increase in SC count results from transfer of white blood cells from the blood into the milk (Pirisi *et al.*, 2000). Bastian *et al.* (1991) suggested that the flow of enzymes from blood into milk increases in early lactation.