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Electrophoretic Pattern of Buffalo Milk Cheddar Cheese Made with Different Coagulants

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Electrophoresis-Polyacrylamide or starch gel has been used increasingly as the method of choice to study casein breakdown and the type of proteolysis in cheese during ripening. In our work, proteolytic changes as affected by the type of milk coagulants and the temperatures of ripening were studied on starch gel electrophoresis.

Fresh and 180 days old (ripened at 5-6° C and 12-13° C) buffalo milk cheddar cheese, made with different coagulants, namely, calf (C), meito (M), rennilase (R), calft+meito, 50:50 (CM), calf+rennilase, 50+50 (CR) meito: rennilase, 50:50 (MR) were investigated. The cheese samples were prepared according to the procedure of Weckx and Vanderpoorten (1973), whereas preparation of gel bed, application of sample, electrophoretic run and staining of gel were performed by the method of Ganguli and Majumdar (1967). Electrophoretic run was given on "SYSTRONICS" make horizontal electrophoresis apparatus.

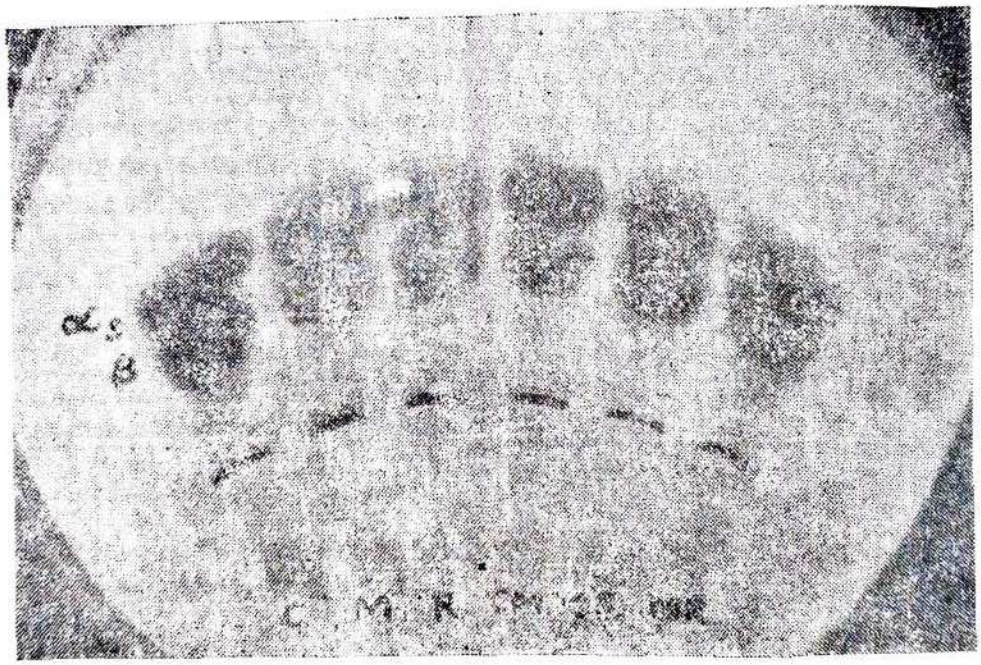

Fig. 1: Fresh Buffalo Milk Cheddar Cheese

The electropherograms of cheese proteins run on the starch gel are depicted in figures 1, 2 and 3 for fresh and cheese ripened for 180 days at 5-6° C and 12-13 °C respectively.

From the Fig. 1 it is observed that all the rennets in fresh buffalo milk Cheddar cheese acted almost identically on the three major components of milk proteins, namely, alphas, beta and kappa caseins, except in case of MR rennet. The action of different rennets was observed to have almost no effect on alphas and beta fractions. However, all coagulants changed the kappa fraction to parakappa casein, resulting in its migration to cathode. Further the MR rennet hydrolysed the kappa fraction to atleast four additional subfractions as can be seen from distinct bands appearing at cathode in Fig. 1. This could be ascribed to greater combined activity of the two rennets on buffalo kappa-casein.

Figures 2 and 3 show that ripening of cheese at 5-6 °C and 12-13 °C for 180 days, resulted in production of certain additional components as compared to fresh cheese with all rennets, higher temperature (12-13°C) resulted in appearance of additional components in greater number compared to lower temperature (5-6° C) of ripening. This revealed that at higher temperature of ripening, relatively more degradation of cheese protein had occurred. This observation is supported by the fact that irrespective of the type of rennet used, cheeses ripened at higher temperature had higher values for maturity index, tyrosine content, formol ripening index and shilovich index (Upadhyay, 1981).

With regard to degradation of alphas and beta-caseins by different coagulants at two different temperatures of ripening it is observed that at higher temperature (12-13° C) calf rennet (C)

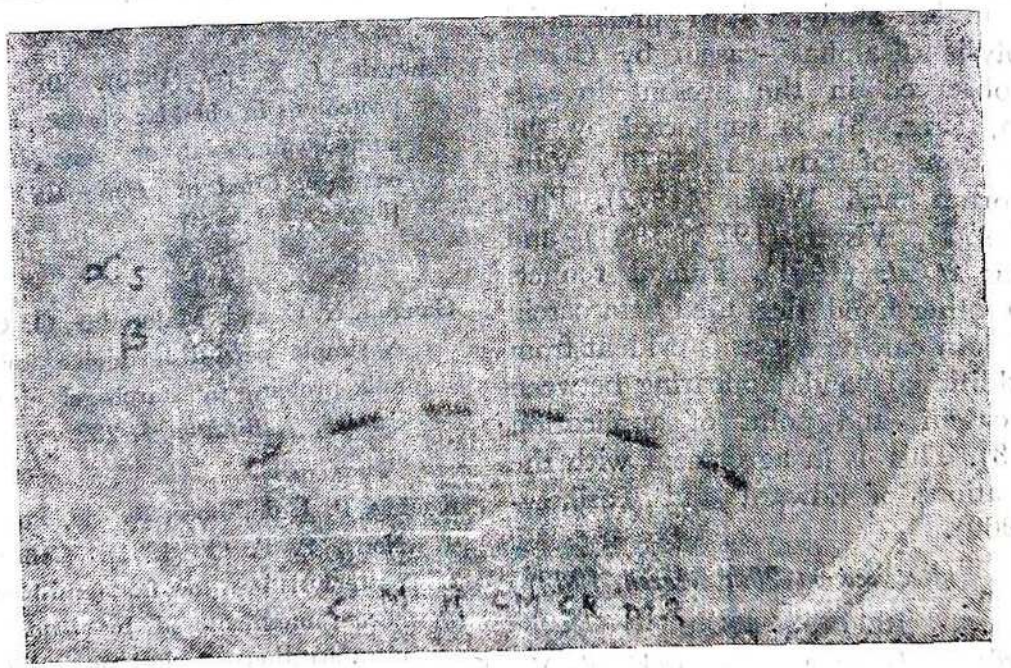

Fig. 2: Buffalo Cheddar Cheese Ripened at 5-6°C for 180 days.

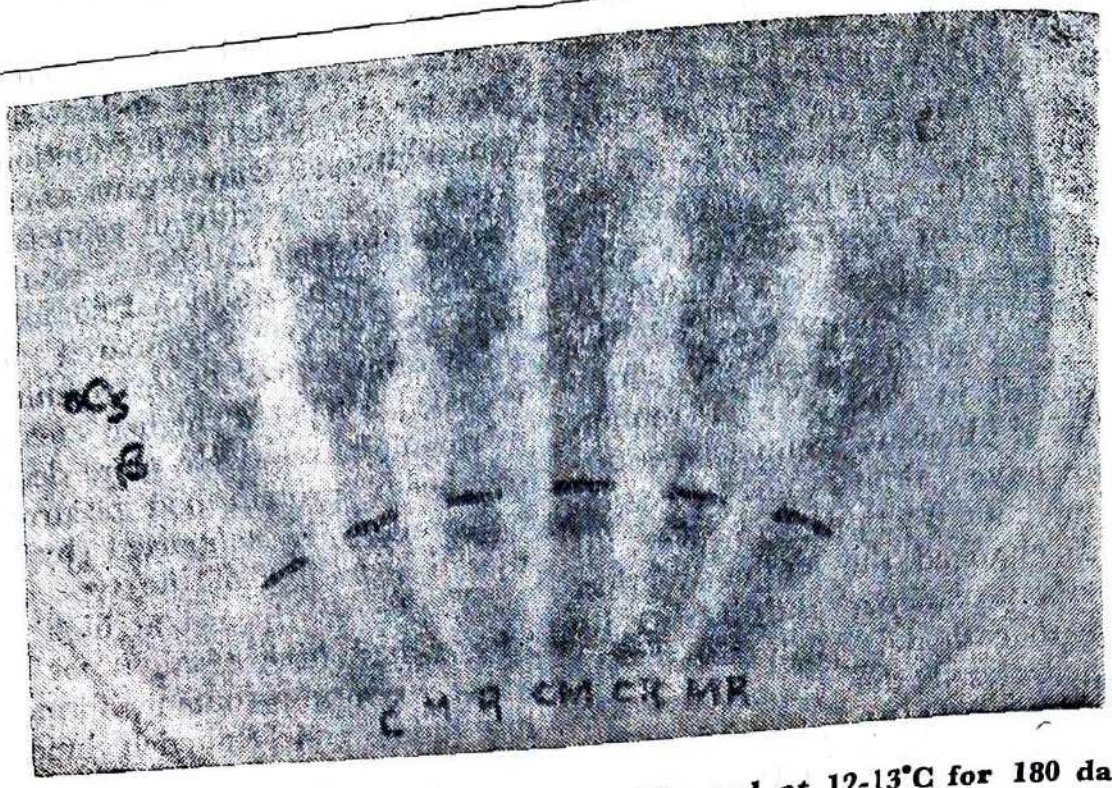

Fig: 3: Buffalo Milk Cheddar Cheese Ripened at 12-13°C for 180 days.

degraded alphas^{-}-casein much rapidly than the beta casein and this breakdown of alphas^{-}-fraction by C rennet was relatively more than other coagulants under study. Such preferential hydrolysis of alphas^{-}-casein by C rennet, observed in the present investigation, (Fig. 3), is supported by the observations of Edward (1970), Vanderpoorten and Weckx (1972), Phelan (1973), Visser (1977, 1981) and Koning *et al.* (1981). Fungal rennets on the other hand degraded beta casein faster than calf rennet as is evident from the additional bands appearing between beta casein and point of application (Fig. 3). This is in agreement with the observations of Edward and Kosikowski (1969).

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