

Development of a Miniature Laboratory Lactic Goat Cheese Model to Study the Expression of Spoilage by Pseudomonas Spp. In Cheeses

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Abstract : Cheeses are often reported to be spoiled by Pseudomonas spp., responsible for defects in appearance, texture, taste, and smell, leading to their non-marketing and even their destruction. Despite preventive actions, problems linked to Pseudomonas spp. are difficult to control by the lack of knowledge and control of these contaminants during the cheese manufacturing. Lactic goat cheese producers are not spared by this problem and are looking for solutions to decrease the number of spoiled cheeses. To explore different hypotheses, experiments are needed. However, cheese-making experiments at the pilot scale are expensive and time consuming. Thus, there is a real need to develop a miniature cheeses model system under controlled conditions. In a previous study, several miniature cheese models corresponding to different type of commercial cheeses have been developed for different purposes. The models were, for example, used to study the influence of milk, starters cultures, pathogen inhibiting additives, enzymatic reactions, microflora, freezing process on cheese. Nevertheless, no miniature model was described on the lactic goat cheese. The aim of this work was to develop a miniature cheese model system under controlled laboratory conditions which resembles commercial lactic goat cheese to study Pseudomonas spp. spoilage during the manufacturing and ripening process. First, a protocol for the preparation of miniature cheeses (3.5 times smaller than a commercial one) was designed based on the cheese factory manufacturing process. The process was adapted from "Rocamadour" technology and involves maturation of pasteurized milk, coagulation, removal of whey by centrifugation, moulding, and ripening in a little scale cellar. Microbiological (total bacterial count, yeast, molds) and physicochemical (pH, saltinmoisture, moisture in fat-free)analyses were performed on four key stages of the process (before salting, after salting, 1st day of ripening, and end of ripening). Factory and miniature cheeses volatilomewere also obtained after full scan Sift-MS cheese analysis. Then, Pseudomonas spp. strains isolated from contaminated cheeses were selected on their origin, their ability to produce pigments, and their enzymatic activities (proteolytic, lecithinasic, and lipolytic). Factory and miniature curds were inoculated by spotting selected strains on the cheese surface. The expression of cheese spoilage was evaluated by counting the level of Pseudomonas spp. during the ripening and by visual observation and under UVlamp. The physicochemical and microbiological compositions of miniature cheeses permitted to assess that miniature process resembles factory process. As expected, differences involatilomes were observed, probably due to the fact that miniature cheeses are made usingpasteurized milk to better control the microbiological conditions and also because the little format of cheese induced probably a difference during the ripening even if the humidity and temperature in the cellar were quite similar. The spoilage expression of Pseudomonas spp. was observed in miniature and factory cheeses. It confirms that the proposed model is suitable for the preparation of miniature cheese specimens in the spoilage study of Pseudomonas spp. in lactic cheeses. This kind of model could be deployed for other applications and other type of cheese.

Keywords : cheese, miniature, model, pseudomonas spp, spoilage

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