

## Use of date products in production of the thermophilic dairy starter strain *Streptococcus thermophilus*

Nabil Nancib<sup>a</sup>, Mostefa Ghoul<sup>a</sup>, Larbi Larous<sup>a</sup>, Aïcha Nancib<sup>a</sup>, Leila-zed Adimi<sup>a</sup>, Mouloud Remmal<sup>a</sup>, Joseph Boudrant<sup>b\*</sup>

<sup>a</sup>Department of Microbiology, Institut of Biology, University of Setif, Setif, Algeria

<sup>b</sup>LSGC-CNRS-ENSAIA, BP 172, 2, avenue de la forêt de Haye, 54505, Vandoeuvre-les-Nancy, France

Received 13 April 1998; revised 12 June 1998; accepted 17 June 1998

### Abstract

Date-coat sugar extract and date-seed hydrolysate were utilized as the main constituents of a medium for the production of a thermophilic dairy starter strain. Date-coat sugar extract was used as the carbon source, while date-seed hydrolysate was used as the nitrogen source. A suitable concentration of date-coat sugar was in the range of 50 mg sugar/ml. Addition of various amounts of date-seed hydrolysate as the sole nitrogen source in the medium showed that, in spite of a nitrogen insufficiency found in the hydrolysate, the production of the starter strain increased with date-seed hydrolysate (nitrogen) concentration, but the maximum production of biomass was less than that observed with other nitrogen sources. Therefore, various amounts of urea were added and a mixture of urea (6 mg/ml) and of date-seed hydrolysate (4.0 mg/ml) allowed an increase in the concentration of the biomass. The addition of date-seed ash as a mineral source, at a concentration of 1.0 mg/ml in the medium containing date-coat sugar extract, date-seed hydrolysate, and urea could substitute for MgSO<sub>4</sub> and MnSO<sub>4</sub> of the usual medium. This medium gave the maximum production of the thermophilic lactic acid bacteria (0.57 mg/ml) and lactic acid (2 mg/ml), very close to what was obtained with the Elliker broth medium. © 1998 Published by Elsevier Science Ltd. All rights reserved.

**Keywords:** Date products; *Streptococcus thermophilus*; Lactic acid; Culture

### 1. Introduction

Thermophilic lactic acid bacteria are widely used in the dairy industry for manufacturing cheeses (emmental and gruyere) and fermented milk products such as yoghurt (Martley, 1983). Industrial starters are currently produced in pure cultures. Mixtures of strains are then prepared to furnish the mixed starters regularly used (Stahouders and Leenders, 1984). In order to optimize starter production in fermentors, it is important to determine the effect of operating conditions on yield and kinetic parameters of the cultures. Many researchers have studied various factors, including chemical compounds of media, favouring the fermentative starter production, but none have utilized date constituents in such a production process.

As mentioned earlier (Nancib *et al.*, 1997), Algeria occupies a leading position among the countries producing dates. However, a large tonnage of mature

dates (60000 t/year) is unfortunately lost for various reasons. This waste date comes either directly from the palm grove or from the gap-conditioning station and is unfit for human consumption. Thus, date products might be considered as suitable agricultural materials for the production of different products, and some investigations have already been done on the production of oxytetracycline (Abou-Zeid *et al.*, 1993), and baker's yeast (Jalaluddin *et al.*, 1995; Nancib *et al.*, 1997). The value of date products lies in their content of materials such as sugars, amino acids and minerals.

Chemical analyses of some cultivars of dates have revealed that the fleshy date-coat contains large amounts of reducing sugars, mainly glucose, fructose and sucrose. The date-coat also contains protein, lipid, fibre mineral elements and some vitamins (Abou-Zeid *et al.*, 1991). Moreover, 16 amino acids are found in date-seed hydrolysate (Abou-Zeid *et al.*, 1991), and elements such as magnesium, iron, calcium, manganese, zinc and nickel are present in date-seed ash (Abou-Zeid *et al.*, 1983).

\*Corresponding author.