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ORIGINAL RESEARCH

Phenotypic and genotypic characterisation of Lactobacilli isolated from camel cheese produced in India

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Thirty-two Lactobacilli strains were isolated from four samples of camel cheese collected from Bikaner, India. These isolates were identified based on phenotypic and genotypic characteristics. Sequencing of 16S rDNA was performed for species identification and diversity analysis. Lactobacillus delbrueckii *and* Lb. fermentum *were found to be dominant species followed by* Lb. plantarum *and* Lb. casei. *On evaluation of technological properties of these isolates, 20 isolates were observed to be good acid producers, eight were found positive for citrate utilisation and 11 showed presence of Prtp gene. Isolates obtained can be potential for development of defined strain starter for camel cheese.*

Keywords Camel cheese, *Lactobacillus*, 16S rDNA.

INTRODUCTION

The camel is capable of surviving in extreme climatic conditions and is geographically distributed throughout the tropical and subtropical dry zones of North Africa, western Asia and north-west of India (Wilson *et al.* 1990). The Indian single-humped camel, *Camelus dromedarius*, is the third most prevalent in world population (Ramet 2001) and has diversified uses ranging from its use as draught animal, sports, transport, agricultural operations, national security and also for the production of commodities like hair, milk and meat (Mehta *et al.* 2007). Indian camel milk contains moisture 87.6–88.5%, total solids 8–11%, fat 2.9–4.1%, SNF 9.5–10.1%, protein 2–4%, lactose 4.7–5.4%, ash 0.7-0.95%, pH 6.5–6.7 (FAO 1982). The protein content is relatively low as compared to that of other breeds. Camel milk has been reported to have antidiabetic activity because of insulin-like activity and immune-modulatory functions of B-cells. Beg *et al.* (1986) reported amino acid sequence of camel milk protein, which showed superficial similarity with insulin family peptide. Although camel milk is generally consumed fresh, it is also consumed when slightly sour or strongly soured. Camel milk is processed into a number of fermented dairy products such as *Gariss* from Sudan (Abdelgadir *et al.* 2008), *Chal* or *Shubat* from Kazakhstan (Serikbayeva *et al.* 2005), *Suusac* from Kenya (Lore *et al.* 2005), *Shmen* from Sahara (Mourad and Nour-Eddine 2006).

Although preparation of camel cheese is a process of preserving milk, yet it has other advantages as well. Camel cheese is composed of moisture 59.6–58.7%, fat 11.5–11.7%, protein 29.1–22.1%, total solid 40.4–41.2% and ash 4.9–6.1% (El Zubeir and Jabreel 2008). Camel cheese is high in vitamins especially vitamin C (Farah *et al.* 1992), low in cholesterol and low in lactose, making it suitable for people who suffer from lactose intolerance and are allergic to other dairy products (Inayat *et al.* 2003). Commercialisation of camel cheese is limited owing to the low yield of cheese from milk.

Lactobacilli have been found to be dominant microbiota in cheese (Wouters *et al.* 2002). Pure cultures isolated from complex ecosystems of traditionally fermented foods exhibit a diversity of metabolic activities that diverge strongly from the comparable strains used as industrial bulk starter

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