

# Fermented cheese-like vegan product: scale up from a domestic preparation to an industrial production

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Given the impossibility of the consumption of food from animal origin, the vegan diet is looking for substitutes that could enrich its supply. Among these substitutes, there are cheese-like products obtained from soy (such as tofu) or nuts. In particular, these “nut vegan cheeses” are fermented foods made from different types of nuts (i.e. cashews, macadamias, almonds etc.) obtained after soaking, mincing and water addition. The mass undergoes a natural fermentation and then is added with other ingredients (spices, herbs, lemon juice, salt etc.) depending on the recipes. These spontaneous fermentations lead to the symbiotic development of several species and a great deal of strains, ensuring the overall efficiency of the ecosystem and achieving product organoleptic and qualitative characteristics [1].

Although other fermented vegetable products (i.e. olives, sauerkraut, pickles etc.) have been deeply characterized, there are no data about the fermentative processes typical of a nut-based fermented product and the microbial consortia able to colonize these habitats are not yet characterized.

In this context, the aim of this study was the characterization of a cheese-like vegan product obtained by cashew nut (*Anacardium occidentale* L.) and hand-made prepared under domestic conditions. Lactic acid bacteria (LAB) responsible for the natural fermentation process were isolated, typed with RAPD-PCR and identified by amplification and sequencing of the 16S rRNA gene. To our knowledge, this is the first microbiological study regarding this kind of product.

The predominant microflora of domestic produced vegan “cheese” was represented by LAB, with counts of 8 log cfu/ml already after soaking. After 24 hours they reached levels of about 9 log cfu/ml and remained stable during the following steps. RAPD-PCR showed a high biodiversity and identification results revealed that the spontaneous fermentation of this product is mainly due to heterofermentative LAB such as *Leuconostoc mesenteroides* and *Weissella* spp. After 24 and 48 hours of fermentation, also *Pediococcus pentosaceus* was detected, suggesting the succession of hetero- and homo-fermentative LAB, as reported for other raw or spontaneously fermented vegetables and fruits [2].

Successively, some autochthonous LAB strains, isolated from the domestic vegan “cheese”, were employed for a pilot-scale fermentation in order to reproduce the domestic product. All the samples (domestic and lab-scale productions) were analyzed to determine pH, aw, microbiological counts, chemico-physical analysis and aromatic profile during process steps and during storage at refrigerate temperature. Two trials were performed, which differed from type of strains and inoculum level employed. The products obtained were similar to the domestic one as far as their aroma profiles, characterized by the presence of acetic acid, ethyl alcohol, ethyl acetate and benzaldehyde. Moreover, microbiological hazards have been prevented through proper and rapid acidification, enhancing safety features of pilot scale produced vegan “cheese” with respect to domestic ones, avoiding the risk of a possible growth of *Listeria monocytogenes*.

**Keywords:** vegan product; spontaneous fermentation; lactic acid bacteria; scale-up

## References

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