

NIGHTSHADE WITH STARTER CULTURES TO IMPROVE SAFETY AND QUALITY

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Abstract

Africa is endowed with rich varieties of indigenous leafy vegetables which can help to alleviate malnutrition among poor populations. Because of the warm and moist weather, vegetables are prone to faster spoilage. Therefore, proper method of food preservation that is cheap and can be locally available which also ensure product safety and quality is necessary. Fermentation of vegetables with lactic acid bacteria (LAB) has been reported across the world although it is not widely adopted in the fermentation of African indigenous leafy vegetables (AIV). Fermentation of AIV may help improving safety and quality. In this study, 2 different LAB starter cultures were used to ferment African nightshade leaves and their success on reducing background microbiota and to assess the effect of fermentation on nutrient composition. African nightshade (*Solanum scabrum*) was cultivated at MRI and JKUAT for 7-8 weeks. The leaves were harvested, washed, and dried. Fermentation of 1 kg leaves was performed in 5 l pots with the starter cultures *Lactobacillus plantarum* and *Lactobacillus fermentum* in the presence of 3 % salt and 3 % sugar at 25°C for 144 h. The lactate and sucrose concentration were determined after fermentation. Vitamin B₁ and B₂ vitamin C and vitamin E were determined by HPLC analysis while protein or raw nitrogen was evaluated by Kjeldahl method, and the ash determined by furnace method. To determine the success of the applied LAB starters during fermentation, different bacterial isolates were sampled at 0h, 48h and 144h of the experiment. Pure isolates were characterized phenotypically and genotypically with RAPD- PCR profiling and sequencing of 16S rRNA genes. Moreover, the effect of the starter cultures on the background microbiota was investigated by DGGE of DNA amplified using Eubacteria universal primer from the fermentation solution at 0h, 24h, 48h, 72h and 144h. Fermentation of nightshade leaves with LAB reduced the pH below 4 within 24h. The spoilage microorganisms were inhibited after 72 h. Sucrose was metabolized in both starter culture and control batches at 24h and after 48h. Lactate showed an increase after 24h and 72h in both starter culture and control batches respectively this was due to reduction in the pH and increase in LAB counts. While African nightshade had high amounts of vitamins, fermentation seem to reduce vitamin B₁ & B₂, C and protein while it increased ash contents. Comparison of

microbial composition during fermentation by DGGE showed the batch with starter cultures showed stable, continuous pattern while the control patterns appeared more diverse. This emphasizes that the use of LAB starters contributes to a more predictable quality and safety. Preliminary RAPD-PCR results showed the inoculated LAB had different gel profiles with most isolates obtained from starter culture and control batches. Therefore, PFGE strain typing technique will be used to establish clonal relatedness.

Keywords: Fermentation, lactic acid bacteria, safety, African nightshade, vegetables
