ABSTRACT

*Koozh* is a popular fermented millet based food consumed in South India. This study is conducted to understand primary and secondary fermentation characteristics of *koozh* in order to standardize the process. Primary fermentation study was conducted with four different grains viz., Finger millet, Pearl millet, Maize and Sorghum. Microbial analysis revealed the presence of different bacterial groups occurring in succession. Starch hydrolysing bacteria and Lactic acid bacteria (LAB) were found to play major role during primary fermentation of finger millet and pearl millet. The predominant microbial groups bought significant changes in sugar concentration of the substrate and resulted in acid production. *Koozh* prepared from finger millet scored best hence finger millet was selected for secondary fermentation studies.

Secondary fermentation was initiated by survivors of thermal treatment, starch hydrolysing bacteria but as fermentation proceeded LAB became quantitatively dominant flora. Enterobacter was influenced by processing, storage and handling conditions. There was a constant increase in yeast population throughout the fermentation. Difference in proportion of microbial groups was observed between market and home prepared samples. In particular, enteropathogen population was more in market samples and pathogens identified from the substrate makes the safety of the product dubious and emphasized necessity for controlled fermentation process.

Some organic acids (Lactic acid and acetic acid) and ethanol production were observed during fermentation. Glucose and maltose were the major sugars formed during final hours of fermentation. Calorific value of the product remained unaltered during fermentation but increase in availability of minerals such as calcium and iron was noticed. There was a significant increase in phenol and flavonoid contents during 45 h of fermentation which resulted in the increase of reducing activities of millet. However, scavenging activities remained unaltered throughout the fermentation period. Various phenol groups such as gallic acid, vanillic acid and ferulic acid were identified from the extracts collected from different fermentation hours.

For starter culture development, isolates of predominant microbial groups occurred during fermentation process were identified. Starch hydrolyzing bacterial isolates of primary and secondary fermentation majorly belonged to *Bacillus* genus.
LAB isolates from primary fermentation belonged to Weisella genera whereas isolates from secondary fermentation belonged to four different genera of LAB. The representative LAB isolates of secondary fermentation were identified as Enterococcus durans, Enterococcus hirae, Enterococcus lactis, Enterococcus faecalis, Enterococcus faecium, Enterococcus sp., Pediococcus pentosaceus, Bacillus coagulans and Weisella confusa.

The identified LAB isolates were analysed for starter culture characteristics, probiotic properties and safety attributes. Based on the results obtained Pediococcus pentosaceus and Enterococcus durans were selected as starter cultures and were used as single and in combinations for koozh preparation. All starter culture treatments were effective in reducing fermentation time compared with control samples and safety of the product improved as shown by the less pathogen count. However Pediococcus pentosaceus inoculated samples showed three times higher shelf life than uninoculated control and the product was acceptable to panel members. Other starter culture treatments deteriorated close to control. The study proposes Pediococcus pentosaceus as single starter to improve the safety of the product and its commercial value.