ABSTRACT

The aim of the present study was to develop vegetable based fermented juices by optimizing the fermentation processes with respect to starter culture and fermentation time on nutrients formation, establish shelf life and the evaluation of the developed product to create scientific evidence for health benefits. In the present study, two vegetables-ashgourd and bittergourd for which starter commercial cultures such as yeast and mixed lactic cultures were used for fermentation. Alcoholic fermentation was adopted for ashgourd fermented juice (beverage) and lactic acid fermentation was adopted for bittergourd fermented juice (beverage). The comparison of starter cultures from commercial and natural sources as well as standard cultures were compared for the functional, nutritional and quality parameters of the fermented beverages. The development of fermented beverages was achieved by statistically designing the experiments using Design expert® software (version 8.0.2). For the development ashgourd fermented beverage, starter culture from three different yeast sources such as dry yeast, wet yeast and, blue grape juice and fermentation time were optimised with the functional, nutritional and quality responses such as total phenols, antioxidant activity, vitamins- thiamine, riboflavin, niacin, pyridoxine, vitamin C, total volatiles, acidity, alcohol and overall acceptability. Ashgourd fermented beverage was developed by using the fourth yeast source, i.e., standard Saccharomyces cerevisiae RHONE 2226 culture and the functional, nutritional and quality parameters were studied. All the four ashgourd fermented beverages developed by different yeast sources were compared for the functional, nutritional and quality parameters and the results showed that vitamins formation was greater in natural culture fermentation, followed by wet yeast, dry yeast and standard culture. According to the uniformity of culture concentration, the relative efficiency of different cultures on nutrients formation clearly brought out that formation of vitamins both B series, except riboflavin and C were relatively higher in wet yeast fermentation followed by standard culture and very less in other two cultures. But total phenols and antioxidant activity was highest in standard culture followed by wet yeast. For bittergourd fermented beverage, starter culture of lactic acid bacteria from curd and fermentation time was optimised with the functional, nutritional and quality responses such as quinine, total phenols, antioxidant activity, vitamins- thiamine, riboflavin, niacin, pyridoxine, vitamin C. Bittergourd fermented beverage was
developed by using the second lactic acid bacteria source, i.e., standard *Lactobacillus sporogenes* (Sporlac) culture and the functional, nutritional and quality parameters were studied. Bittergourd fermented beverage developed by two different lactic acid bacteria sources showed that thiamine, riboflavin and vitamin C formation, and total phenols and antioxidant activity was higher in natural culture fermentation as compared to standard culture fermentation. According to the uniformity in culture concentration, standard culture showed higher nutrients formation than the natural culture. Fermentation process, in comparison with fresh juices of gourd vegetables showed increase in formation functional, nutritional and flavour components in both ashgourd and bittergourd fermented beverages, thereby indicating positive effect of fermentation process. For both the fermented beverages, methodology of in pack pasteurization processing in polypropylene bottles was optimized. The fermented beverages bottled and stored at 5°C, 15-34°C and 37°C were analyzed periodically for storage stability characteristics. The beverages packed in polypropylene bottles were found stable and acceptable for six months for ashgourd fermented beverage at ambient conditions and two months for bittergourd fermented beverage at 5°C based on functional, nutritional, quality, flavour and microbiological evaluations. Before supplementing the ashgourd fermented beverage to human population a safety test was carried out on male wister rats on the physical appearance, liver enzyme test and kidney functioning test and the results revealed that the values were within the limits of normal range and proved that the product was safe and fit for consumption. Ashgourd fermented beverage was supplemented to geriatric population and bittergourd fermented beverage was supplemented to diabetic subjects. The supplementation of ashgourd fermented beverage for 2 months on geriatric population showed significant improvement in BMI grades, reduced the blood glucose levels, improved the lipid profile status, heamoglobin levels in experimental group when compared with the control group. The supplementation of bittergourd fermented beverage on diabetic subjects showed significant improvement in reducing the symptoms of diabetes, reduced the fasting and post prandial glucose levels and helped to control the glucose levels when compared with the control group. The completion of the present study has brought out 3 research papers publication in international journals, 3 presentations in conferences both national and international, as well got recognitions in terms of 3rd best paper award.