

Evaluation of Viability of Probiotic Cultures and Growth Inhibition of *Listeria monocytogenes* in Milk Based European Cranberrybush Fruit Juice Added Functional Drink

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Phenolic compounds may not only act as antimicrobial agent for pathogens, but also lead to tolerate or promote of growth of probiotic cultures depend on structure and concentration of phenolic compounds and microbial strain. European cranberrybush fruit (*Viburnum opulus* L.) contain high amount of phenolic compounds, known for their beneficial health effects such as antioxidant and antimicrobial activities. *Listeria monocytogenes* is one of the most important foodborne pathogen that responsible for foodborne illness with high mortality rate of listeriosis. In this study, microbial safety of freshly squeezed European cranberrybush (ECB) juice added whole milk based drink fermented with probiotics, *Lactobacillus plantarum* Lp-115 and *Streptococcus thermophilus* St-21, was investigated by challenging the product with pathogenic *L. monocytogenes* ATCC 15313. Firstly, growth and cell viability of *L. plantarum* Lp-115, *S. thermophilus* St-21 and *L. monocytogenes* ATCC 15313 were monitored by assessing optical density at 600 nm at 37 °C for 48 h with microplate reader in MRS for *L. plantarum*, M17 for *S. thermophilus*, and BHI for *L. monocytogenes*, supplemented with different concentrations of freshly squeezed ECB juice (100, 50, 25, 12.5, 6.25, 3.13, 0.78, and 0.39 %) to determine optimum ECB juice concentration for functional drink composition. For preparation of drink, pasteurized whole milk, ECB juice (10%), and glucose (2%) were mixed and then pH was adjusted to 6.0 before fermentation. Probiotic cultures (0.1%, 10^9 cfu/ml) and *L. monocytogenes* (10^5 cfu/ml) were added at the same time both in the presence and absence of ECB juice, and samples were held at 37°C until the pH value of the drink reached to 4.5. Samples were then stored at 4°C for 14 days to evaluate storage period of the drink. The change in the numbers (cfu/ml) of *L. plantarum* Lp-115, *S. thermophilus* St-21 and *L. monocytogenes* ATCC 15313, and pH values were monitored during fermentation (0, 1, 2, and 3 h) and storage period (1, 7 and 14 days) on selective growth media MRS, M17 and Oxford agar for *L. plantarum* Lp-115, *S. thermophilus* St-21 and *L. monocytogenes* ATCC 15313, respectively. Addition of 10 % ECB juice was found as optimum concentration according to optical density values obtained from microplate reader in growth medium of each bacteria. The numbers of probiotic cultures in the presence and absence of ECB juice added samples were similar and did not change significantly during fermentation and even after 14 days of storage. On the other hand, the pH of the samples decreased around 4.27 to 4.17 at the end of storage in the presence and absence of ECB juice. Even though presence of 10 % ECB juice in medium inhibited *L. monocytogenes* growth, neither significant increase nor inhibition was observed in the presence of ECB juice added milk drink during fermentation and storage time suggesting that food matrixes might have different complexities with respect to growth medium, thus behavior of microorganisms can be affected differently. Protein and/or fat molecules in milk could bind bioactive compounds and/or form a protective coating around bacterial cells by reducing their availability for antimicrobial activity. In further studies, the antimicrobial properties of ECB juice on pathogens in different growth environment will be evaluated.

Keywords: European cranberrybush fruit juice, *Listeria monocytogenes*, microbial food

safety, functional milk based drink