

Development of Pasteurized Milk Incorporated with Ginger, Turmeric and Pomegranate Peel Extracts

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The aim of this study was to develop value added pasteurized milk with *Zingiber officinale* (Ginger), *Curcuma longa* (Turmeric) and *Punica granatum* (Pomegranate) peel extracts with acceptable sensory properties and evaluate proximate composition, physicochemical properties and microbial acceptance. Ethanolic extracts of selected herbal ingredients were incorporated in order to enhance immune responses while providing several health benefits due to active compounds of plant extracts. In order to identify active compounds of plant extracts, GCMS analysis was conducted and several pharmacologically important compounds were identified. Best formulation for the product was selected through a sensory evaluation by a 5 point hedonic scale. The formulation of 300 ppm of ginger, 100 ppm of turmeric and 300 ppm of pomegranate was found to be the best formulation from all sensory attributes significantly ($p < 0.05$). Proximate composition, antioxidant activity and gallic acid equivalent phenolic content of milk samples and plant extracts were determined at first days of the shelf life. The total plate count, coliform content and yeast and mold content were evaluated at 1st day, 3rd day and 5th day of storage. Further, the pH and titratable acidity of milk samples were checked every day in shelf life period. When considering physicochemical properties of the final product, antioxidant activity (40.615 ± 0.447) and gallic acid equivalent total phenolic content (0.532 ± 0.004) were significantly higher ($p < 0.05$) in the newly developed product. Antimicrobial properties of plant extracts were checked using a garwell diffusion method against *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Candida albicans*. All 3 extracts have shown inhibition towards selected pathogenic bacteria and fungi. Final product possesses antimicrobial properties, high antioxidant activity and total phenolic content. Thereby, it can be concluded this product has a considerably improved medicinal value than normal milk as it was incorporated with ginger, turmeric and pomegranate peel extracts.

Keywords: Antimicrobial Activity, Ginger, Milk, Pomegranate, Turmeric