ABSTRACT

Yoghurt is a semi solid fermented milk product obtained by the activity of a symbiotic blend of *Streptococcus salivarius* subsp. *thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*. Its nutritional and therapeutic values are well established. Formulations that incorporate additional healthful ingredients such as dietary fiber, natural vitamins and folic acid are gaining importance. Natural sweeteners can be easily incorporated in yoghurt by blending cattle milk with fruit pulps like mango. Buffalo milk mixed with soymilk make a good medium for yoghurt bacteria to multiply in. Supplementation of buffalo milk with soymilk and mango pulp leads to poor textural characteristics and higher syneresis in yoghurt which can be taken care of with stabilizer addition. Yoghurt has a short shelf life and is maintained under refrigerated condition during its marketing and distribution which adds to its cost. This can be taken care of by drying. Thus, there was a need to develop a suitable technology for production of shelf stable free flowing yoghurt powder.

Experiments were conducted for production of mango soy fortified yoghurt (MSFY). Effects of fat content (0.48 to 5.52 %) in buffalo milk and proportions of soymilk (2.39 to 27.61 %) and mango pulp (1.2 to 13.8 %) in the blend on physico-chemical, textural, sensory characteristics and culture counts were studied. The sensory data was analyzed using fuzzy mathematics and the blend was optimized by using response surface methodology. This optimized blend was used in further studies. Three stabilizers were added at three levels and samples were evaluated for different quality parameters. Sorption behaviour of MSFY was found out which was used in drying and storage studies. MSFY samples were dried in recirculatory convective air dryer, conditioned and grounded into free flowing powder. The drying process parameters were optimized. The drying data were analyzed for studying the drying behaviour and effective moisture diffusivity during MSFY drying. Changes in quality of MSFY powder packaged in aluminium laminated polyethylene (ALP) and high density polypropylene (HDPP) during accelerated storage was studied and shelf life was assessed.

Soymilk (8.2 % TS) and mango pulp (18 % TS) was blended with buffalo milk (2.95 % fat, 9 % SNF) up to 14.7 % and 7.1 % (w/w) levels respectively for manufacture of MSFY. The MSFY prepared using this blend compares well with the yoghurt prepared from buffalo milk of 6 % fat in physical, chemical, textural, microbiological and sensory characteristics. Gelatin when added in the blend at the rate of 0.4 % w/w proves to be beneficial in improving sensory characteristics, hardness of MSFY and in retarding syneresis. The MSFY, thus prepared, was successfully converted into free flowing powder by subjecting it to recirculatory convective air drying for 8.5 h using hot air temperature 45 °C, air velocity 2.5 m/s and sample thickness in the drying tray 3 mm, followed by cooling and conditioning for 1.5 h under an environment of 10 °C and 10 % RH and grinding. Drying behaviour of MSFY followed the typical trend of food drying curves and drying rate and diffusivity increased with increase in hot air temperature. From 1 kg of mango pulp - soymilk - buffalo milk blend, 0.98 kg MSFY (87.9 % mc, wb) was obtained which was subsequently converted into 0.13 kg free flowing MSFY powder (4 % mc, wb). The MSFY powder contained 1.73×10^8 cfu / g *S. thermophilus*, 1.27×10^8 cfu / g *L. bulgaricus* in it and retained 43.7 % acetaldehyde content. It had 55.9 % dispersibility and 1.35 colour change value. This could be reconstituted well into set yoghurt or beverage within 10 min using lukewarm (40 °C) water. The MSFY powder had predicted shelf life of 45 and 54 days in HDPP and ALP pouches respectively under accelerated storage condition (38 ± 1 °C and 90 ± 1 % RH). The yoghurt bacterial count decreased below 10^6 cfu/ g after 49th storage days. Therefore, on the basis of culture counts, the MSFY powder had shelf life of 49 days under accelerated storage condition (38 °C and 90 % RH). The MSFY powder stored in ALP had 9.8×10^4 cfu / g *S. thermophilus*, 3.7×10^4 cfu / g *L. bulgaricus*, 99.33 μ equiv./ g FFA, 0.2 (OD at 532 nm) TBA, 567 μ mol/ kg HMF, 26.27 colour change after 49 days of accelerated storage.

Key words: Yoghurt, Mango, Soymilk, Texture profile analysis, Fuzzy, Response surface methodology, convective drying, Powder, Storage