

ABSTRACT

Severe acute malnutrition (SAM) is an important cause of morbidity and mortality in Indian children below five years of age, where 9 million children are suffering from SAM. Upto 15% under five years' SAM children require inpatient management because of medical complications; remaining 85% of the SAM case can be taken care of by home care/diet management. There is a need to formulate and up-scale the technology for a low-cost, shelf stable, protein and energy dense ready-to-eat therapeutic food (RTE-TF) to treat SAM. In this work, a pilot scale process standardization and performance evaluations of machineries (processing and packaging) were undertaken. Major unit operations viz., roasting, de-skinning, grinding, mixing, homogenization, packaging, and cleaning in-place (CIP) were standardized. The raw ingredients were characterized for physicochemical attributes prior to the formulation of RTE-TF guided by experimental designs. The optimum operating parameters for grain roasting and cooling units were 165-170 °C for 14-15 min at 20 rpm drum speed and feed rate of 82.6 kg/h at 5 rpm, respectively. The optimum parameters to roast peanuts, maize, and soybean were 185-186 °C for 20-22 min, 189-190°C for 30-32 min, and 165-170 °C for 18-20 min, respectively. Roasted peanuts were best de-skinned at outlet opening and rotating speed of 4.6 - 9.6 mm and 1400 rpm, respectively. The feed rates of 17-18 and 16-17 kg/h gave PFY of 77 % and 85 %, respectively, during grinding of roasted maize and soybean. Optimum mixing condition was achieved when a batch of ingredients (wet: peanut paste, soybean oil, emulsifiers, stabilizers; dry: roasted maize and soybean flour, skimmed milk powder, sugar, vitamin-mineral premix) were mixed in ploughshare mixer for 40-45 min at 120 rpm. A homogenizer (colloidal mill) clearance of 190 µm resulted in a smooth RTE-TF (< 200 µm) with negligible oil separation upon standing. FFS machine when operated at 112 and 119 °C gave best for vertical and horizontal sealing strength, respectively. For CIP, treatment with hot-water (60 °C/40 min), alkali solution (1.56% w/v) (70°C/37 min), acid solution (1.12% w/v) (71 °C, 39 min), and per acetic acid solution (1.07%) (19.56 °C/ 15 min) gave satisfactory results. The shelf-life of RTE-TF packaged in AFL/MFL laminates was 120 days under accelerated conditions (40 °C, 90% RH).

Keywords: Ready-to-eat therapeutic food, Roasting, De-skinning, Grinding, Mixing, CIP