

# Preparation of Sweet Potato based Ready-to-Eat Therapeutic Food Paste for Severely Acute Malnourished Children

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## ABSTRACT

Malnutrition is the major cause for the death of about 50% of the children under the age of five. In India, 8.1 million children are estimated to suffer from severe acute malnutrition (SAM). Up to 15% under-5 children with SAM require inpatient management because of medical complications. The remaining 85% can be managed through a community- and/or home-based care approach. Ready-to-eat therapeutic food (RTE-TF) has greatly eased the difficulties associated with providing a suitable high-energy, nutrient-dense food with adequate micronutrients for the treatment of SAM children. Serious concerns have been raised over the use of peanut in RTE-TF due to its mycotoxin, high phytate to zinc ratio, salmonella contamination and allergic reactions. This demands the necessity of exploring alternative formulations from other locally available ingredients. Accordingly, a sweet potato (extruded) based RTE-TF along with skimmed milk powder, soy protein isolate, icing sugar and soybean oil was formulated using linear programming (LP) in MATLAB keeping the cost minimization as the objective function and protein & fat content, palatability, maximum ingredient level and texture as constraints. Extrusion cooked sweet potato had nutritional properties similar to that of boiled sweet potato with respect to proximate composition, trypsin inhibitor activity and *in-vitro* starch digestibility. The formulation of sweet potato based RTE-TF obtained using LP included 8 – 9 % sweet potato flour, 7.5 – 8.5 % soy protein isolate, 23 – 26 % skimmed milk powder, 22 – 25 % ground sugar and 34 – 36 % soybean oil. Vitamin and mineral premix of dosage (2-3% w/w) for the developed formulation was designed according to the norms of WHO/UNICEF for SAM children. Mixing of RTE-TF at optimum mixing speed (330 rpm), mixing time (60 min) and particle size (125 $\mu$ ) along with optimal level of soy lecithin (0.35 %) and mono-di glycerides (0.75 %) was found to significantly improve the stability of the RTE-TF by minimizing oil separation. The oxidative stability of the developed RTE-TF was enhanced by adding optimum amounts of antioxidants like mixed tocopherols (8.54 ppm) and ascorbyl palmitate (7.06 ppm) which gave minimum values for PV ( $9.81 \pm 0.18$  mg Eq.O<sub>2</sub>/ kg), AV ( $6.31 \pm 0.05$ ) and maximum values for IP ( $13.5 \pm 0.41$  h). The developed RTE-TF is a smooth paste and contains 15.5 % protein, 35% fat, 2.2 % moisture,  $0.8 \pm 0.21$  fiber, 43.1 % carbohydrates, 3.4 % mineral content and 543 kcal per 100g. The RTE-TF, designed to provide the required nutrition to treat a SAM child at home, have the required quantity of essential amino acids, necessary amounts of fatty acids with acceptable sensory properties and a protein efficiency ratio (PER) 1.2. The developed RTE-TF paste is stable at room temperature and have the shelf life of 322 (10.7 months) and 145 days (4.83 months) under ambient (22 - 33 °C; 58 - 78 % RH) and accelerated conditions (40 °C and 90% RH), respectively

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