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Charles, Christina N

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Development of a Natural Product Rich in Bioavailable Omega-3 DHA from Locally Available Ingredients for Prevention of Nutrition Related Mental Illnesses

Christina N. Charles, Hulda Swai, Titus Msagati & Musa Chacha

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Abstract

Objectives: Poor mental health remains a serious public concern worldwide. The most vulnerable individuals are children and adolescents in developing countries. Nutritional deficiency of long-chain omega-3 fatty acids, particularly docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), have long been recognized as a major contributing factor for mental health illnesses. Provision of ready-to-use natural product rich in preformed Omega-3 DHA and EPA could address this problem. However, most commonly used products are expensive and contain less or no preformed Omega-3 DHA and EPA, making them less suitable for prevention of mental illnesses in resource-poor countries. The main objective of this study was to develop a natural product rich in preformed Omega-3 DHA and EPA from locally available ingredients.

Methods: Linear programming (LP) was used to formulate a natural product rich in preformed Omega-3 DHA and other essential nutrients using locally available ingredients other than fish and dairy products. Laboratory analysis was then performed to validate the nutritional value of the LP-formulation using standard analytical methods. The relative difference between the LP tool calculated values, and the laboratory-analyzed values were calculated. Sensory testing was also done to evaluate consumer acceptance of the final product.

Results: Optimal formulation contained about 220 mg of preformed Omega-3 DHA + EPA, enough to meet the RDI for children aged 2-10 years. The LP analysis further showed that the cost of the developed product is USD 0.15/100 g, which is 50% lower than that of Plumpy'nut. Laboratory analysis revealed similar results as that of LP at $P = 0.05$.

Conclusions: These findings indicate that ready-to-use natural food rich in preformed DHA and EPA can be developed from locally available ingredients.

Keywords: preformed omega-3 DHA, locally available ingredients, microalgae, linear programming, nutrition related mental health