A Novel Self-Sustainable Kit to Combat Rural Vitamin A Deficiency During Pregnancy and Early Childhood

Tummala, Sanhita (School: Brookings High School)

Vitamin A deficiency (VAD) is a major global health crisis affecting approximately 19 million pregnant women and 30 million children under the age of five, with over 50% of cases from rural Africa and Southeast Asia.. This study developed a self-sustaining dietary fermentation kit using Blakeslea trispora, an edible microbe that produces ß-carotene, a vitamin A precursor. B. trispora was fermented using cassava flour. ß-carotene and total carotenoid levels in the fermented media were quantified via High-Performance Liquid Chromatography (HPLC) and a spectrophotometer, respectively. The production of ß-carotene was optimized by the addition of various supplements. Initial submerged-state fermentation of B. trispora in cassava yielded 11.32 ± 5.52 µg/g dry weight (DW) of ß-carotene. The addition of soybean oil didn't significantly increase the yield. However, supplementation with inorganic salts (KH_2PO_4, $MgSO_4$) and yeast extract increased production to 20.24 ± 0.42 µg/g DW. To further optimize, a Response Surface Methodology (RSM) using an Optimal Design (StatEase) was used to evaluate the interactions of five formulation factors: yeast extract, asparagine, glycerol, and soy peptone. The optimized medium (1.5% yeast extract, 0.5% asparagine, 0.1% glycerol, 0.1% soy peptone, 0.13% KH_2PO_4, and 0.4% $MgSO_4$) showed a 7-fold increase from the initial baseline (79.36 ± 10.66 µg/g DW). Furthermore, subculturing trials were conducted over three consecutive weeks to show the culture's viability and field practicality. In conclusion, this study developed a self-sustainable, at-home dietary kit to combat VAD.

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