



Tropentag, September 20-22, 2017, Bonn

“Future Agriculture:
Socio-ecological transitions and bio-cultural shifts”

Fermentation and Addition of Malt to Improve Physicochemical and Sensory Properties of Complementary Foods Prepared from Starchy Grains

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Abstract

Inadequate complementary feeding, like constantly feeding young children with bulky starchy complementary foods (CFs) as it is practised in sub-Saharan African countries like Ethiopia, is an immediate cause of child malnutrition. Yet, there are several modification techniques that can improve chemical, physical and sensory properties of starchy foods. This study was conducted to evaluate the combined effects of fermentation duration and malt concentration on physicochemical and sensory properties of starchy cereals commonly used for making CFs in Southwest Ethiopia.

Three fermentation times (0, 24 and 48 hours), three malt concentrations (0, 2 and 5 %) and three cereal flour types (oats, barley and teff) were combined in a factorial arrangement. The samples were analysed for proximate, mineral and anti-nutritional factors compositions, physical and sensory properties. Treatments were compared using analysis of variance and Tukey's studentized range test, at 5 % level of significance.

The proximate composition and calorific value ranged between 3.67 – 6.17 %, 1.75 – 2.71 %, 8.12 – 16.82 %, 1.63 – 4.55 %, 1.58 – 5.96 %, 71.20 – 78.18 % and 359.33 – 380.26 kcal for moisture, ash, protein, fat, fiber, carbohydrate and energy, respectively. The calcium, iron and zinc contents ranged between 46.9–143.85 mg/100g, 2.97 – 31.39 mg/100g, 1.59 – 2.86 mg/100g, respectively. The anti-nutritional factors ranged between 18.63 – 175.07 mg/100g for phytate and 0.84 – 42.89 mg/100g for tannin. The viscosity, water absorption capacity and bulk density values ranged between 235.00 – 1016.33 cP, 61.33 – 143.12 % and 0.66 – 0.99 g ml⁻¹, respectively. Interaction of fermentation duration and malt concentration resulted in a significant ($p < 0.01$) reduction in crude fiber, crude fat, total carbohydrate, phytate, tannin, bulk density and viscosity in all the three cereals. In the contrary, crude protein and calorific value were significantly ($p < 0.01$) increased by the interaction effect. Ash and mineral contents were not affected. Gruel samples prepared from 48 hours fermented cereal flours were ranked lowest by the sensory panelists. Whereas, gruels made from 24 hour fermented and unfermented cereals were ranked favourably for appearance, aroma, taste, mouth feel and overall acceptability.

Addition of 5 % malt and fermentation for 24 hours appear to have a promising synergistic effect in improving chemical, physical and sensory qualities of fermented starchy staples commonly used making CFs. Further research on storability of these products is recommended.

Keywords: Amylase, complementary foods, fermentation, starch, upgrading