Optimization of nutritional, cooking, textural, and sensorial qualities of macaroni supplemented with tef (*Eragrostis tef* (Zucc.) Trotter) and chickpea flours

Tamrat Kore[1,2], Workineh Abebe[2], Paulos Getachew[1]

[1]Center for Food Science and Nutrition, Addis Ababa University, P. O. Box: 1176, Addis Ababa, Ethiopia.
[2]Debrezeit Agricultural Research Center, Ethiopian Institute of Agricultural Research, P.O. Box: 32, Bishoftu, Ethiopia.

Abstract

Durum wheat semolina is the preferable ingredient for pasta products preparation. However, it has low protein quality, micronutrient and fiber composition. In this study, response surface methodology was applied to optimally formulate a macaroni by supplementing durum wheat semolina with tef (0 to 40)% and chickpea (0 to 15)% flours. The aim was improving the nutritional quality of the product while maintaining the cooking quality. Supplementing the durum wheat semolina (S) with tef (T) and chickpea (C) flours improved the Water Absorption Capacity and Index (WAC and WAI) and nutrient quality significantly ($p < 0.05$). Among the 11 flour blending ratios of S:T:C, (60: 40: 0)%, (85: 0: 15)%, (60: 25: 15)%, (68: 28: 4)% improved the WAC and WAI of the semolina flour by (36, 8)%, (25, 7)%, (32, 9)%, (31, 3)%, respectively. With the same blending ratios, the cooking weight and the WAC of the control macaroni increased by (15, 15)%, (10, 19)%, (17, 18)%, and (22, 23)%, respectively ($p < 0.05$). Interestingly, these blending ratios significantly reduced the wet gluten content of the semolina by 58%, 28%, 53%, and 42% ($p < 0.05$). With higher tef and chickpea incorporation, the macaroni had lower and higher firmness. The macaroni prepared with incorporation of chickpea (3.5-15)% appeared to have better color and comparable overall acceptability score with control. The optimum formulation of macaroni for desirable sensorial and cooking quality (better firmness, lower stickiness and cooking loss) was 73.46 g/100g semolina, 11.55 g/100g tef flour and 14.25 g/100g chickpea flour.

Keywords: macaroni, semolina, tef, chickpea, cooking and textural property