

# TEFF (ERAGROSTIS TEFF) SUPPLEMENTED GLUTEN-FREE BREADS AS POTENTIAL PREVENTION OF IRON-DEFICIENCY ANAEMIA

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## Introduction.

Coeliac disease (CD) is a genetically based autoimmune enteropathy caused by a permanent sensitivity to gluten (Hamer et al, 2005) and very common food intolerance in the UK population (Coeliac, UK). Among common deficiencies associated with a gluten-free diet is iron deficiency occurring in 33% of men and 19% of women probably due to the predominant site of mucosal damage (Harper et al., 2007).

Teff (Figure 1) is a little-known gluten-free cereal grain traditionally grown in Africa with a rich source of bioavailable iron which may be attributed to its low phytate content (Umeta et al., 2005). Bread made with Teff, enjera contains around 30mg of iron per 100g and up to 35mg when the food is fermented. The prevalence of iron deficiency anaemia is relatively low in Ethiopia which may be attributed to Eragrostis tef forming a staple part of the diet.

The objective of this work was to develop gluten-free breads rich with iron by incorporating Teff flour and to study nutritional and sensory characteristics of the finished products.



Figure 1 Teff seeds

## Methods.

The new gluten-free recipe using wheat starch, skimmed milk powder, glucono-delta-lactone, sodium bicarbonate, soy flour, xanthan gum, egg whites and bread improver was developed and used as a control. Teff flour was added at the levels of 10 and 20% and its effect on nutrition (Net WISP 3), loaf volume (rapeseed replacement method), hardness (TA – XT2 texture analyser (Stable Micro Systems Ltd, Godalming, UK)), shelf life over eight days and consumer acceptance were studied. Five panellists from Manchester Coeliac Association, UK were asked to assess the control, 10 and 20% Teff breads in the terms of flavour, uniformity, mouth feel, moistness, aftertaste, and to mark 10 cm line in accordance with their opinion.

Table 1. Nutritional information for breads made with different levels of Teff

	0 % Teff	10 % Teff	20 % Teff
Crude Protein(g)	4.4	4.8	5.1
Fat(g)	6.8	6.6	6.4
Saturates (g)	3	2.9	2.8
Carbohydrate(g)	41.7	41.9	42.1
Energy kcal	240	245	250
Fibre(g)	0.8	1.1	1.4
Sodium(mg)	256	246	236
Potassium(mg)	186	196	205
Calcium(mg)	27	33	39
Magnesium(mg)	22	28	35
Phosphorus(mg)	95	109	122
Iron (mg)	1.17	1.44	1.69
Retinol(µg)	56	54	52
Vitamin D(µg)	0.06	0.06	0.06
Vitamin E(mg)	0.18	0.18	0.18
Thiamin (mg)	0.10	0.11	0.12
Riboflavin(mg)	0.10	0.10	0.11
Niacin(mg)	0.82	0.93	1.03
Vitamin B6(mg)	0.11	0.13	0.14
Pantothenic acid(mg)	0.25	0.28	0.30

## Results.

The results revealed that increasing Teff flour decreased loaf volume (Figure 2A, B). There was a significant ( $P < 0.05$ ) increase in staling for all the breads during the six but not at seven and eight days (Figure 2C). Compared to control and 10% Teff breads, 20% Teff breads showed significant ( $P < 0.05$ ) increase in staling while 10% Teff breads were comparable to control ones. The overall acceptability gave a mean score of 8.8 for control, 8.72 for 10% Teff and 7.7% for 20% Teff breads (Figure 2D). The addition of 20% Teff flour increased the level of iron for 45% comparing to the control sample (Table 1).

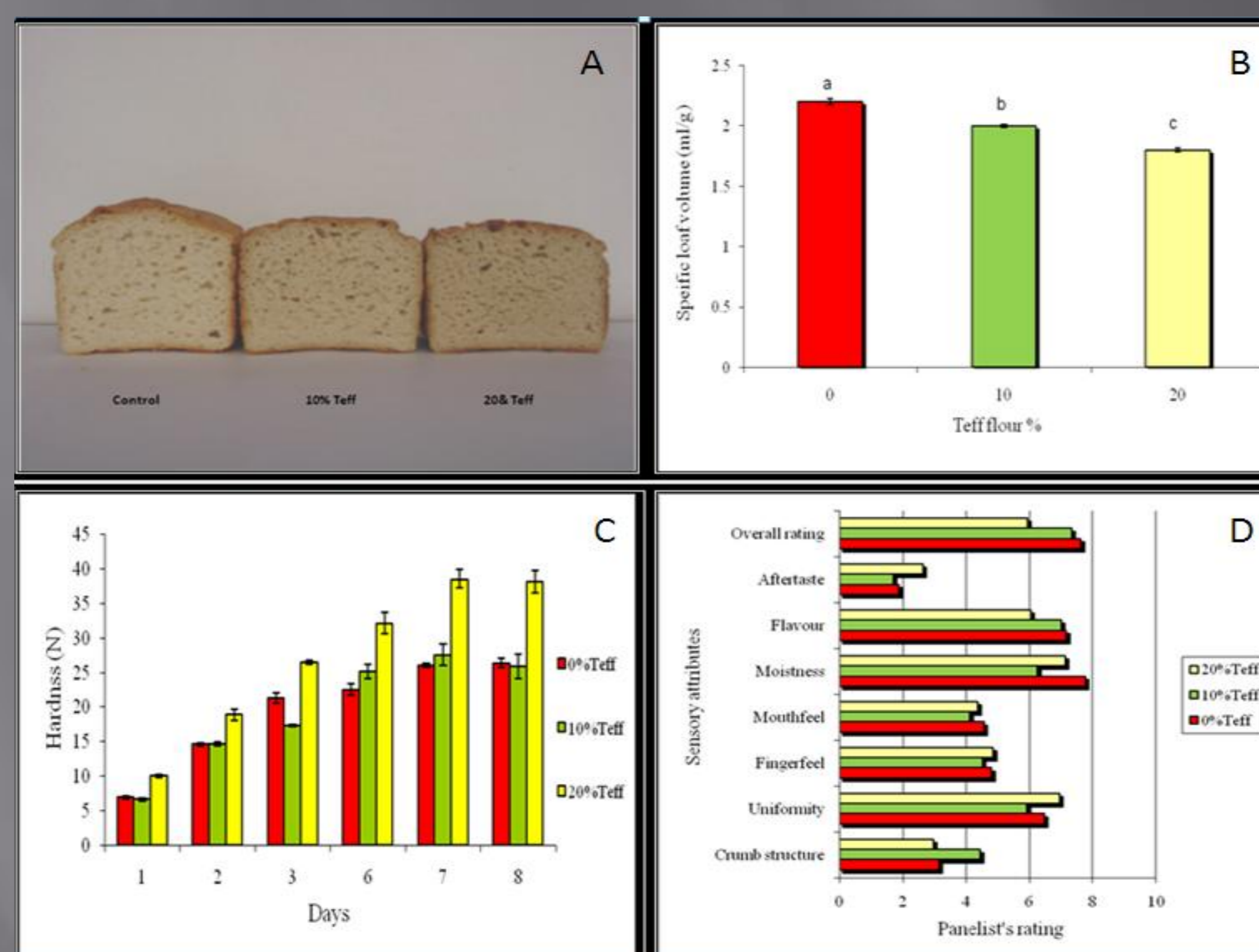


Figure 2. Some textural characteristics (loaf volume - B, shelf life – C and sensory evaluation - D) of gluten-free Teff breads - A, made with 0, 10 and 20% Teff flour

## Conclusion.

Iron-deficiency anaemia is a very common symptom of coeliac disease. Teff (Eragrostis tef) is a gluten-free cereal rich with iron. New Teff supplemented gluten-free breads with improved dietary iron level have been developed in this study. The results revealed that up to 20% Teff flour could be incorporated in breads formulation resulting with the good texture and structure of baked breads.

## References.

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