

Effect of eggshell powder fortification on injera quality

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ABSTRACT

There is a serious problem with calcium nutrient deficit in Ethiopia. Cereals and eggshell powder (EP), a waste product with high calcium content, are suitable carriers for food fortification. In order to increase the Ca content of injera, an Ethiopian flatbread made from the teff cereal, and to determine its impact on quality indicators, EP was added to the injera in the current study. Teff flour was made into injera by adding 4.5% and 9% EP (injera I4.5 and I9.0, respectively). Bioavailable calcium rose dramatically as a result of the fortification,

rising from 16.1 mg/100 g (control) to 742.7 mg/100 g (I4.5) and 1743.1 mg/100 g (fortified) (I9.0). An adult could consume 200 g of injera and satisfy 60% of the RDA for calcium from I4.5 and 140% of the RDA for calcium from I9.0. Eggshell powder addition had an impact on pH, titratable acidity, colour, and texture. The moisture content, aw, viscosity, microbiological quality, and ocular properties, however, were not significantly impacted. According to recent research, adding EP to injera could make it a good source of total and bioavailable calcium without significantly harming the injera's essential physico-chemical quality factors.

Key Words: Calcium nutrient; Food fortification; Injera; Eggshell powder

INTRODUCTION

Being essential for the body's normal operation, calcium is one of the essential micronutrients. This vitamin plays an important role in the body's physiological processes and forms a significant portion of bones and teeth [1]. Ca also has a significant impact on the prevention of chronic illnesses like high blood pressure. Ca shortage results in rickets in children and osteoporosis in adults .Excellent sources of calcium are milk and dairy products [2]. However, achieving Ca requirements from dietary sources is exceedingly challenging in areas where there is famine and drought which hinder the production of cattle and their products in nations like Ethiopia [3]. As a result, the children's intake of calcium was lower than what was advised. Similar findings from other researchers indicated that both men and women were not getting enough calcium .Fluorosis is a frequent disease in Ethiopia's Great Rift Valley regions because of the high fluorine content of the water. Fluorosis patients have weak bones and weak, discolored teeth. Studies have showed that consuming enough calcium would help prevent fluorosis [4].

It has been demonstrated that adding Ca to food can boost consumption. Since they are taken in large quantities and can therefore have a larger quantity of Ca added, cereal-based foods are typically the intended item to be fortified with Ca to the diet. CaCO₃ is a typical Ca source for food fortification in cereal-based foods since its addition typically has little to no impact on the final food product's flavour and appearance [5]. Flat bread, or injera, is a staple

dish that is enjoyed by two thirds of Ethiopians and is equally popular across all age groups. Teff, also known as *Eragrostis tef* (Zucc.) Trotter, is a cereal that resembles grass and is used to make injera. Teff has a similar nutritional profile to other cereals, despite having higher iron and calcium concentrations. Additionally, because teff is a whole grain, injera has a high fiber content, which hinders the absorption of nutrients. Consumers evaluate the quality of teff injera based on its look and flavor. Aspects of its quality such as colour, texture, and eyes (a honeycomb structure on top of injera) are essential for their acceptance. Injera that is sour, soft, cohesive, and light in colour is in great demand.

High levels of bioavailable calcium in the form of CaCO₃ are present in eggshell. It was determined that 97% of EP was made up of solids, 98% of which were CaCO₃. 360–400 mg of Ca are present in one gramme of EP. According to studies, the bioavailable calcium level of EP was around 45%. Studies on animals revealed that EP has more absorbable calcium than conventional CaCO₃. According to research, eggshell powder was added to foods like bread, sausage, pizza, spaghetti, and stew to increase their calcium content. Even though the items' texture quality was compromised, the sensory assessment revealed that the products were generally acceptable. The majority of Ethiopian families have easy access to eggshell, a waste product that can be exploited as a cheap supply of calcium while simultaneously promoting a circular economy.

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Although micronutrient deficiencies are among the most significant nutritional issues in Ethiopia, there is currently no law requiring food fortification as a way to address the issue. By fortifying injera with eggshell powder (EP), the Ca deficiency issue could be addressed and Ethiopians' health could be improved. The goal of this study was to fortify injera with eggshell powder and evaluate the impact on physicochemical, physical, microbiological, and nutritional quality criteria. As far as we are aware, no studies have been done in the past on the production of fortified injera with EP and its impact on injera quality.

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