

Effect of Blending Ratio of Red Teff and Potato on the Sensory Quality of Injera

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Abstract

The objective of this study was to evaluate the effect of the blending ratio of Teff and Potato on sensory quality of injera. Four samples were prepared to evaluate the effect of blending ratio on color, taste; texture, mouthfeel and overall acceptability of Injera. The samples were prepared by blending 10% potato and 90% red teff, 15% potato, and 85% red teff, 20% potato and 80% red, and 100% teff. The highest score was observed in a sample made using 20% potato+80% red teff and the lowest in the control (100% red teff) for overall acceptability. There was no significant difference observed between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 15% potato+85% red teff and 20% potato+80% red teff ($P<0.05$) in overall acceptability. According to the study, the sample made using 20% potato+80% red teff was found the highest consumer acceptability. The present study showed that the increase in the amount of potato concentration was related to the highest score in all attribute.

Keywords: Red teff; Potato; Sensory quality; Injera

Introduction

Injera is made from flour, water and starter ersho [1]. Ersho is a fluid saved from the previously fermented dough. Teff Injera is getting popularity in Ethiopia as well as in the developed world because of its being a whole grain product and gluten free nature, the cause for the celiac disease. It is high in protein, carbohydrates, and fibre. The protein composition offers an excellent balance among the essential amino acids. The principal use of teff (*Eragrostis teff* (Zucc) Trotter) is in Injera production that constitutes the 70% of Ethiopians diet. Teff Injera is the most common and the main staple food in much of the central, western and northern highlands of Ethiopia as well as among the urban community [2-4]. Wherever the soil type and rainfall patterns are suitable for cultivation of teff, Injera from teff is more flavored than that from the other cereals [2,5].

Fermentation is one of the oldest and most economical methods of producing and preserving food [6]. It is found to destroy undesirable components, to enhance the nutritive value, flavor, and taste of the food, and to make the product safe from pathogenic micro-organisms [6]. In indigenous fermented foods, the microorganisms responsible for the fermentation are usually the microflora naturally present on the raw substrate [6]. Back slopping, that is, inoculation of the raw substrate with a small quantity of a previously performed successful fermentation is used to optimize spontaneous fermentation. This kind of a starter, which is a previously fermented product, is used not only to initiate the fermentation but also to accelerate the initial phase of fermentation and keep a uniform quality from batch to another.

Potatoes are one of the most popular major food items consumed throughout the world because of their high yield, relatively low cost of production and adaptability to a wide variety of soil and climate types [7]. Moreover, potatoes contribute significantly to the nutritive value of a meal as they contain good quality edible grade protein, dietary fiber, several minerals and trace elements, essential vitamins and little or negligible fat [8]. Potato products would benefit both growers and consumers, as it would help extend the storage life and serve as a means of increasing the supply in off-season [8]. It provides significant amounts of protein, with a good amino acid balance, vitamins C, B6 and B1, folate, the minerals potassium, phosphorus, calcium, and magnesium and the micronutrients iron and zinc. The potato is high in dietary fiber, especially when eaten unpeeled with its skin, and is rich in antioxidants

comprising polyphenols, vitamin C; carotenoids and tocopherols fresh potatoes are virtually free of fat and cholesterol. As a major food staple, the potato is contributing to the United Nation's Millennium Development Goals of providing food security and eradicating poverty. As a staple food and as a vegetable for table use, the potato needs to be cooked because of the indigestibility of its ungelatinized starch. Such cooking is frequently by baking, boiling, steaming, roasting, deep-fat frying or microwave cooking. Good appearance, texture, and flavor are important to the consumer and the subject of much research. Eating potatoes in mixed meals will further alter the Glycemic Index (GI) levels, and the nutritional benefits of potato indicate that they are generally a useful and nutritionally beneficial component of the human diet.

Materials and Methods

Description of site

The study was conducted at Hawassa University College of Agriculture in the laboratory of food microbiology and food chemistry.

Sample collection

Raw materials for the preparation of Injera were red teff and potato. The whole grain red teff and potato was bought from the local market in Hawassa. Both red teff and potato were cleaned and milled in the milling house in order to get appropriate sieve size powder.

Teff flour preparation

The red teff used was clean to remove stones, dust materials, glumes, stalks, winnowing, and sorting techniques will be applied. The red teff passed through sun drying till constant weight followed by milling and

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sieving at 500 µm (Axel, Kistner, London, England) in order to produce teff flour (Figure 1).

Potato flour preparation

Uniform sized potatoes having no signs of infection or infestation was thoroughly washed in running tap water and removed any adhering soil, dirt, and dust. Then the sliced tubers will be dipped in 2 g sodium Metha sulfite in one litter water solution for 30 minutes. After drained the water, the sliced potatoes will be dried by sunlight it friable to the mill. After completely dried, the slices will milled and passed through 80 mesh sieves to obtain fine flour of uniform size and finally weighted the flour and packed in airtight plastic containers until further use [8] (Figure 2).

Experimental design

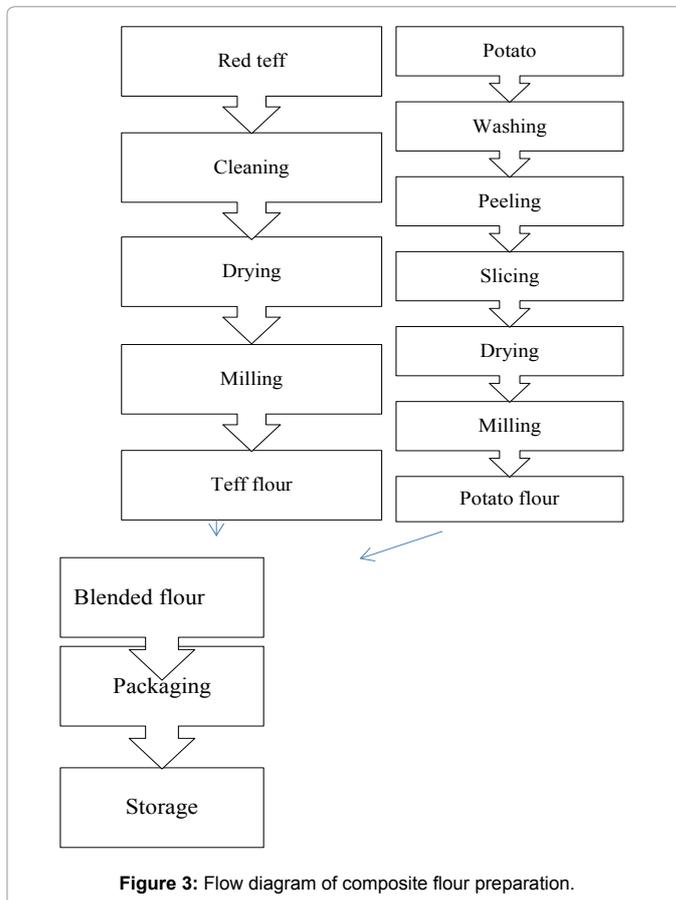
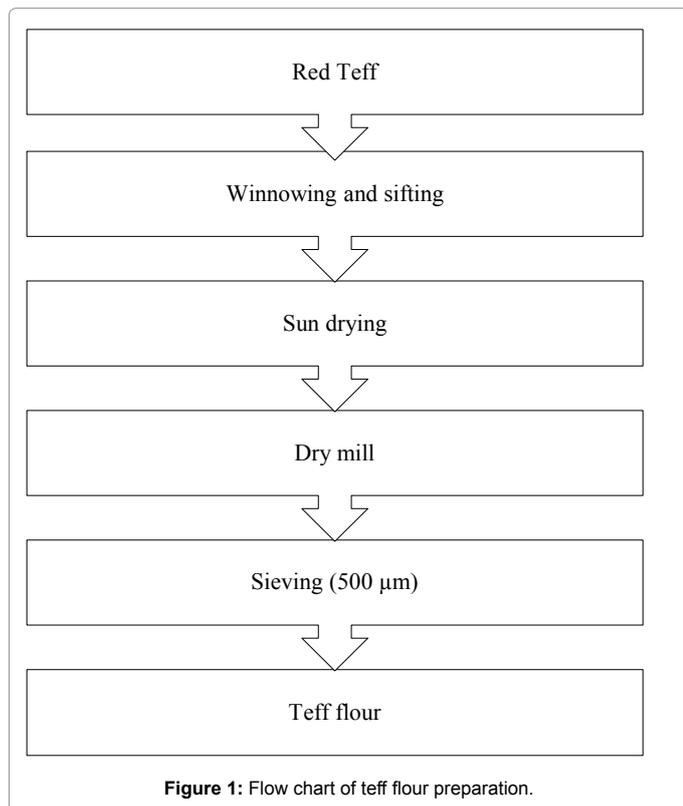
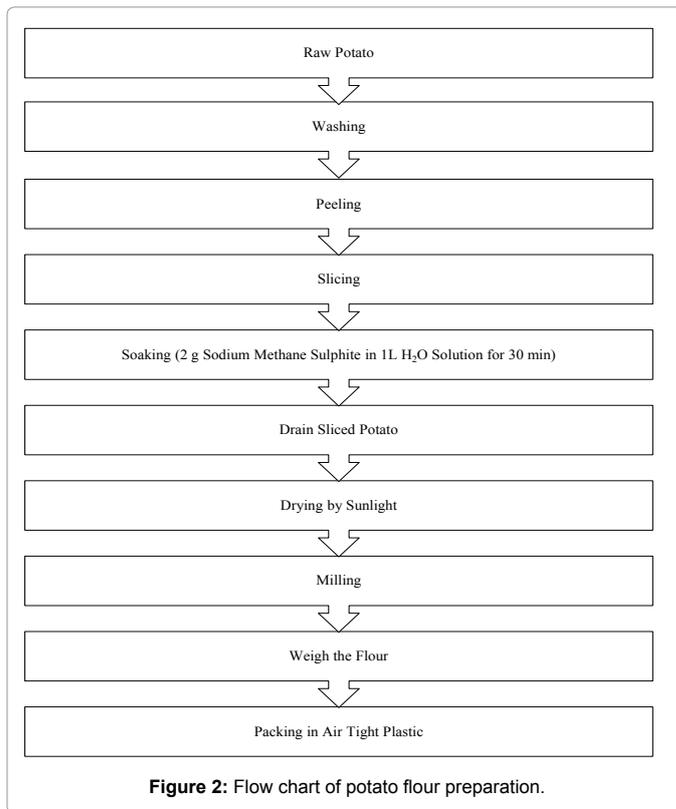
After all the necessary pre-treatment, teff and potato were processed to flour. Then the red teff flour and potato flour was blended at different ratio, (100:0, 90:10, 85:15 and 80:20), which was respectively named as control (100:0), sample one (90:10), sample two (85:15), and sample three (80:20). And the experiment was arranged in RCBD (Figure 3).

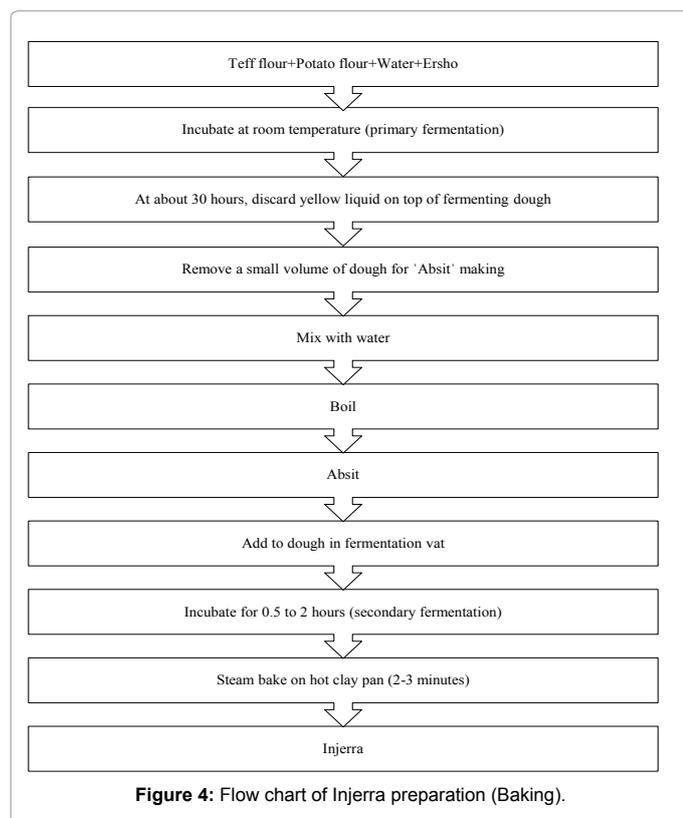
Injera preparation (baking)

The teff flour was mixed with the potato flour. The blended flour was blended with other baking ingredients in a mixer, kneaded and the dough placed in a pre-oiled baking oven. The dough was proofed at room temperature and baked for 2-3 minutes (Figure 4).

Sensory evaluation

Injera prepared from teff flour with different levels of potato flour ratio (100:0, 90:10, 85:15 and 80:20) was evaluated using 20 panelist's judges from Hawassa university students. The panelists were asked





to assign 5- point hedonic scale for mouthfeel, taste, texture, color, rollability, injera eyes, and overall acceptability. The score range will be from 5 indicates “like very moderately”, 4 indicates “like slightly” 3 indicates “neither like nor dislike”, 2 indicates “dislike slight” 1, indicates “dislike moderately 2 indicates “dislike moderately: Each panelist was provided with enough privacy to avoid biased assessment.

Statistical analysis

ANOVA was used to determine the effect of the different amount of potato flour on the sensory characteristics of Injera. Mean values were compared at $P < 5\%$ level of significance using Least Significance Difference (LSD). The data collected were analyzed using SAS.

Result and Discussion

Four samples were tested for color, taste, texture, mouthfeel, rollability and overall acceptability by 20 panelists using a 5- point hedonic scale. The samples were made using a different concentration of red teff potato combination.

Color

The result of color evaluation by panelists showed that there was a significant difference ($P < 0.05$) among the treatments. The finding showed that the highest score of color was observed in the sample made using 20% potato+80% red teff, but the lowest score was observed in the sample prepared using 15% 100% red teff. Significant difference was observed between the control and the sample made using 15% potato+85% red teff and between the control and 20% potato+80% red teff in color ($P < 0.05$), but no difference was observed between 15% potato+85% red teff and 20% potato+80% red teff, and between 10% potato+95% red teff and 15% potato+85% red teff ($P < 0.05$).

Taste and texture

Both taste and texture results evaluated by panelists showed that there was a significant difference ($P < 0.05$) among the treatments. The sample made using 20% potato+80% red teff had the highest taste and texture score and the lowest score was found in the sample made using 100% red teff. There was no significant difference between the sample prepared using 10% potato+90% red teff and the control and between 10% potato+90% red teff and 15% potato+85% red teff in taste ($P > 0.05$). but, no significant difference was observed between 15% potato+85% red teff and 20% potato+80% red teff in texture ($P > 0.05$), but no difference was observed between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 15% potato+85% red teff and 20% potato+80% red teff in texture ($P < 0.05$).

Mouth feel and overall acceptability

Both mouthfeel and overall acceptability also showed that there was a significant difference ($P < 0.05$) among the treatments. The highest score of both mouthfeel and overall acceptability was observed in the samples made using 20% potato+80% red teff and the lowest score was observed in the sample made using 100% red teff. There was no significant difference between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 10% potato+90% red teff, 15% potato+85% red teff and 20% potato+80% red teff ($P < 0.05$) in mouthfeel. In the case of overall acceptability, no significant difference was observed between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 15% potato+85% red teff and 20% potato+80% red teff ($P < 0.05$).

Rollability and injera eyes

Both rollability and injera eyes also showed that there was a significant difference ($P < 0.05$) among the treatments. The highest score of both rollability and injera eyes was observed in the samples made using 20% potato+80% red teff and the lowest score was observed in the sample made using 100% red teff (Table 1). There was no significant difference between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 10% potato+90% red teff, 15% potato+85% red teff and 20% potato+80% red teff ($P < 0.05$) in rollability. In the case injera eyes, no significant difference was observed between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 15% potato+85% red teff and 20% potato+80% red teff ($P < 0.05$).

From the result, the sensory quality of injera such as color, taste, texture, mouthful, rollability, injera eyes and overall acceptability showed that there was a significant difference among the treatment. The highest score was observed in the sample made using 20% potato+80% red teff and the lowest score was observed in the sample 10% potato+90% red teff, 15% potato+85% red teff and the sample made using 100% red teff. The lowest score results showed that the concentration of potato low while the highest score results showed that the concentration of potato is high so that addition of potato concentration results increase the color, taste, texture, mouthful, rollability, injera eyes and overall acceptability. From the results the sample made using 20% potato+80% red teff was found the highest consumer acceptability and furthermore, the results showed that the increase in the amount of potato concentration was related to the highest score in all attribute

Treatments	Attributes					Rollability	Injera eye
	Color	Taste	Texture	Mouth feel	Overall acceptability		
10% potato+90% red teff	4.25 ^{bc}	4 ^{bc}	4.15 ^b	4.35 ^{ab}	4.2 ^b	4.31 ^b	4.33 ^b
15% potato+85% red teff	4.45 ^{ab}	4.55 ^{ab}	4.5 ^{ab}	4.65 ^{ab}	4.75 ^{ab}	4.73 ^{ab}	4.66 ^{ab}
20% potato+80% red teff	4.75 ^a	4.80 ^a	4.82 ^a	4.83 ^a	4.855 ^a	4.87 ^a	4.84 ^a
100% red teff (control)	4.1 ^c	4.13 ^c	4.16 ^c	4.12 ^c	4.15 ^c	4.17 ^c	4.19 ^c
CV (%)	11.86	10.08	10.09	10.98	7.78	8.78	10.05
LSD (5%)	0.93	0.83	0.84	0.95	0.65	0.68	0.72
P-Value	0.0051	0.182	0.0137	0.1589	0.0128	0.0512	0.0191

Means with the same letter (s) are not significantly different (P<0.05)

Table 1: Mean score of the treatments.

Conclusion

The present study investigated the effect of different concentration of potato on the sensory attribute of red teff. Four samples were prepared at different concentration (10%, 15%, and 20%) of potato to examine color, taste, texture, mouthfeel, rollability, injera eyes and overall acceptability. The experimental result showed that the addition of potato at different concentration had an effect on the sensory attributes of red teff. It was observed that the increase in the amount of potato concentration related to a higher score in all attribute. The highest score was observed in a sample made using 20% potato+80% red teff and the lowest in the control (100% red teff) for overall acceptability. There was no significant difference observed between the samples made using 100% red teff, 10% potato+90% red teff and 15% potato+85% red teff and between 15% potato+85% red teff and 20% potato+80% red teff (P<0.05) in overall acceptability. According to the study, the sample made using 20% potato+80% red teff was found the highest consumer acceptability.

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