

# Traditional knowledge associated with yeast preservation and Teff Injera making process in east and west Gojam zones of Ethiopia

## Abstract

Teff is a major food grain in Ethiopia but is a minor cereal crop and traditionally grown as a cereal crop. The grain is ground to flour mainly used for making popular pancake-like local bread called injera. A major source of inoculum for teff fermentation is the teff flour itself. Ersho is supposed to be a starter for teff fermentation. This study aimed to document the traditional knowledge associated with traditional injera making and Ersho/yeast preservation processes in the two well-known Teff producing areas in the region. Systematic random sampling method followed by questionnaire survey was employed. A total of 90 household injera makers (90) were participated to get the actual information considering the culture of the study area. Three Zones were selected from Amhara region and 46 (51.1%), 29(32.2%) and 15(16.7%) study participants were recruited from East Gojam, West Gojam, and Awi Zones, respectively. Results were revealed that it is common to use traditionally fermented foods like injera, bread, Tella, Tej, Buqir in the community. The type of teff flour they use to bake injera is (48%, 53.3%) for nech teff, (12%, 13.3%) for key teff, (30%, 33.3%) for sergegna teff. The role microorganisms in teff dough fermentation are not well known in the community. Most of the respondents (79, 87.8%) have no information about the role of microorganisms in fermentation in the process. This might be related to the educational background of the respondents. The duration of fermenting teff flour is vary according to teff type and the consumption of the family, in average 4.01 days are needed. The average days for the injera to be spoiled are 4.96 days. To get quality injera some respondents use "afsit" while others use warm water, this has to be studied in the future.

**Keywords:** teff, yeast, traditional knowledge, fermented foods

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## Introduction

Teff (*Eragrostis tef*), a cereal grain that is included grass family of Poaceae, and endemic and diversified to Ethiopia and it has been widely produced for many centuries.<sup>1,2</sup> Teff is a self-pollinated, annual, warm season grass that is used throughout the world as grain for human consumption and as forage for livestock. Teff grain is found widely in most part of the country mainly grown under diverse agro-ecological conditions in the altitude ranging from 1800 to 2100 meters above sea level. Teff belongs to the family Poaceae, sub-family Eragrostidae and genus Eragrostis. This genus has 350 species and it is the only cultivated cereal species. The teff center of origin and diversity is Ethiopia.<sup>3</sup> The major Teff producing areas are Amhara, Oromia, Tigray and South nation and nationality regional people of Ethiopia. In Ethiopia there are several varieties of teff, each unique to specific growing condition,<sup>4,5</sup> describes three main types of teff grain, white, brown and mixed (brown and white).

East and West Gojam of Amhara and East and West Shoa of Oromiya region are particularly known teff producing areas in the country.<sup>6</sup> East Gojjam is the leading zone in Teff production constituting more than 10 percent of the national annual Teff production.<sup>7</sup> Teff supports more than 60-75% of Ethiopia's population as staple food and believed as a traditional medicine especially for diabetic people in many areas of the country. Teff is also quite high in energy, fat content 2.6%, Protein content 8% to 15% (with an average of 11%). While the vitamin content is about average compared to other cereals, the fermentation process of making injera

generates additional vitamins, further enhancing the value of the grain. In addition, the mineral content shows especially good values for iron and calcium. Teff does not contain gluten and is therefore a promising alternative for those suffering from coeliac disease or other forms of low gluten tolerance. Teff is highly nutritious and is an important part of Ethiopia's cultural heritage and national identity. Being labeled as one of the latest super foods of the 21<sup>st</sup> century, like the ancient Andean grain quinoa, teff's international popularity is rapidly growing.<sup>8-10</sup>

Teff is a major food grain in Ethiopia but is a minor cereal crop worldwide. In Ethiopia, teff is traditionally grown as a cereal crop. The grain is ground to flour mainly used for making popular pancake-like local bread called injera, which has a honeycomb-like appearance. Injera is made from dough fermented for 2-3 days and sometimes flour.<sup>11</sup> Teff is used for many applications including products such as injera and tella. The production of injera and tella involve fermentation stages, and are dependent on temperature and other environmental factors.<sup>12</sup> Although injera is parts of the main staple foods for Ethiopian community, its preparation techniques are still too traditional, labor intensive and time consuming. It is also a burden for women as it is considered as females work. Attention should be given mainly to its processing technology at small and/or large scale production. Teff-injera has high keeping quality than injera prepared from other cereals.<sup>13</sup>

Traditionally it is believed that injera quality is determined by different environmental factors and cultural practices. The traditional processes in injera making in East and West Gojam is not well

documented. The retention/preservation of ‘Ersho’ or starter culture for the next batch injera is different among the two communities. Therefore, this study is designed to document the traditional knowledge associated with teff dough fermentation process and to document the traditional yeast retention /preservation/ process in the community.

## Methodology

### Study sites

The study was conducted in Amhara Regional State which covers some 157,647 km<sup>2</sup> across north western and eastern Ethiopia. The long term mean annual rainfall of the region is 1165.2 mm.<sup>14</sup> Within the region four major cereal systems have been recognized: sorghum-maize system in the lowland agro-ecological zone, wheat-teff system in the single rain season area of the mid-land agro-ecological zone, wheat-teff system in the double rain seasons of the mid-land agro-ecological zone and barley system in the high land agro-ecological zone.<sup>15</sup> East and west Gojam zones were the major sampling sites for this study and are found in North West direction of the county having 300, 385 & 400 km distance from Addis Ababa, respectively.

### Study design

Systematic random sampling method followed by questionnaire survey was employed considering the budget and time for this study. The study was conducted from October-December 2018/19 from the six Woredas selected from the three zonal administrations. A survey of traditional processing methods and raw materials used for the preparation of injera and traditional method Ersho/yeast/ preservation was employed using in-depth interviews. A total of 90 household injera baking females were selected and participated in this study for sharing of their knowledge on the processes and yeast “Ersho” preservation.

**Table 1** Proportion of study respondents from each district

	District	Frequency	percent	Valid percent	C percent
Valid	Aneded	15	16.7	16.7	16.7
	Awabel	15	16.7	16.7	33.3
	Dejen	15	16.7	16.7	50
	South Achefer	15	16.7	16.7	66.7
	Yilmana Densa	15	16.7	16.7	83.3
	Semen Achefer	15	16.7	16.7	100
	Total	90	100	100	

The duration of an individual in certain area is essential for detailed knowledge of traditional practices in the community. Based on study results the respondents reside in the study area with the maximum of 65 years and minimum of 1 year with the mean of 25.93 years. As to the profession of study respondents of the study, close to half of the respondents of this study, (44.4%) are farmers in the studied areas where as (42.2% and 13.3%) of them are employees in the Governmental offices and merchants, respectively. The means of subsistence of these study respondents can be described as 43.3% as farming as their major means of subsistence. Other respondents are

### Data collection

This study was conducted in two Zones of Amhara Regional State, East Gojam and West Gojam. The zones were recommended for this study purposely by Regional Bureau of Agriculture based on the production of Teff from other zones in the region. Accordingly, Dejen district, Awabel district and Dejen districts were selected for this study from East Gojam. Similarly Yilmana Densa (Adet) district, Semen Achefer District and Debub Achefer were selected for the same purpose. Proportionally 15 well known injera maker females were selected and interviewed. The data was collected through in depth Semi-structured interview of all the processes in injera making and Ersho retention processes.

### Data analysis

The data gathered from the interview was analyzed using descriptive statistics, Microsoft Excel spreadsheet software and SPSS version 21.

## Results and discussion

### Demographic information

The study involved 90 female respondents to get the actual information considering the culture of the study area. Accordingly all participants were females. The marital status of the respondents is as follows, majority of the respondents 80 (88%) were married females. Similarly, (8, 8.9%) of female respondents are single and the remaining 2 (2.2%) were divorced. Religion wise the respondents of the study groups were 85.6% orthodox Christians and 14.4% Muslims. The educational background of the respondents were fall into 31.1% above 12 grades, 26.7% illiterate, 20% grade 10-12, 8.9% attended informal education, and 6.7% grade 1-4 and 5-8 respectively (Table 1).

Governmental works that they rely on salary for their income. The remaining 4.4% of the respondents rely on trading as their means of income.

### Tradition of consuming fermented foods

In response to the consumption of types of fermented foods by the respondents, all respondents agreed that they consume fermented food in their everyday life. 72.2% of them use Injera, bread, and Tella, 21.2% use injera, bread, Tella, and Areqae and Tej; 5.6% rely up on Injera, bread, and Buqir (non-alcoholic drink) (Table 2).

**Table 2** Type of fermented foods and drinks used in the community

		Frequency	Percent	Valid percent
	Injera, Bread, Tela	65	72.2	72.2
	Injera, Bread, Tela, Areqe, Tej	20	21.2	21.2
Valid	Injera, Bread, Buqir	5	5.6	5.6
	Total	90	100	100

### Variety of teff used

The community uses different types of teff varieties for injera baking. These varieties can be released by agricultural research centers or simply found in the hands of farmers. Generally the most common names in the community are three. The type of teff flour they use to bake injera is 48%, (53.3%) for nech teff (white teff), 12%, (13.3%) for key teff (Red teff), 30%, (33.3%) for sergegeña teff (mixed white and red teff).

### Understanding the role of microbes in fermentation

Understanding of the role of microorganisms/yeasts/ in the study area for baking injera is very minimal. Results showed that only 11, (12.2%) study respondents are aware of the role of microbes in the process of injera making. This might be related to the educational background of the respondents. The rest of the respondents 79, (87.8%) have no any information of as microorganisms have role in fermentation process. Similarly, the presence of microorganisms/ yeast/ in the starter culture is not well known in the study area. Results showed that only 12, (13.3%) study respondents know very well the presence of microorganisms/yeasts/ in the ersho to ferment the teff flour. The remaining respondents (78, 86.7) never know the existence of microorganisms in the ersho. This also might be related to the educational background of the respondents. The role of

microorganisms in teff fermentation in the study is almost not known as they are fermenting the flour. (84.4%) of the respondents do not know even as microbes are there in the dough for fermenting. The rest of the respondents 15.6% are aware of the existence of microbes especially yeasts in the fermentation (Table 3).

### Yeast preservation process

Respondents were asked the way they retain/preserve ersho for the next injera baking in the routine process. Based on this 29, (32.2%) simply use the remaining of the previous dough as a starter culture for the next batch. Others 56, (62.2%) add few grams of teff flour and water for the next batch of injera making. The rest of the respondents 5, (5.6%) use simply add only water on the remaining and kept for some days (Table 4).

### Starter culture preparation

Starter culture preparation or ‘Erscho’ preparation is the process of maintaining or preservation for the next batch of injera baking. Based on this 84, (93.3%) of the respondents were used the yeast starter culture for their current injera baking from previously retrained dough and only 5, (5.6%) obtained their ‘Erscho’ from longer days fermentation of the teff flour by itself. Only 1.1% retain from the bucket itself (Table 5).

**Table 3** Understanding of respondents about the role of microbes in fermentation

Do you know about the role of microbes in fermentation?					
		Frequency	percent	Valid percent	C percent
Valid	Yes	14	15.6	15.6	15.6
	No	76	84.4	84.4	100
	Total	90	100	100	

**Table 4** List of raw materials for starter culture retention

What are the raw materials for the preparation of ‘Erscho’ in Teff dough					
		Frequency	percent	Valid percent	C percent
Valid	Previous ersho	29	32.2	32.2	32.2
	Previous ersho+flour+water	56	62.2	62.2	62.2
	Flour+water	5	5.6	5.6	100
	Total	90	100	100	

**Table 5** Steps for starter culture Retention/preparation

How do you prepare the 'Ersho' for your current "Enjera" baking		Frequency	percent	Valid percent	C percent
Valid	Retained from the previous dough	84	93.3	93.3	93.3
	From longer days of fermentation of the flour	5	5.6	5.6	98.9
	Plastic	1	1.1	1.1	100
	Total	90	100	100	

### Type of starter culture preparation

In a traditional fermentation of teff the community uses homemade fermenter for the preparation of Injera. Results from questionnaire survey revealed that all respondents 90, (100%) use homemade fermenter from back sloping of the previous batch of injera making. None of the respondents use commercial fermenters for injera making.

### Duration of Teff fermentation for injera baking

The activities in traditional injera baking for the consecutive days are vary from one respondent to the other respondent.

#### Day one

82 respondents the retained yeast/ersho from the backed one and immediately mix with the flour to make thick dough locally named as "Dibit" in local language. The other group of respondents 5 of them simply mix few grams of teff powder to the back slope of the Ersho and cover it for some days until the yeast consume the flour for some days. The remaining 3 respondents simply put the remained Ersho in the container and preserve it as it is for some 2-3 days before mixing it with teff flour.

#### Day two

According to the our interview result only 2 respondents mix the teff flour with Ersho on day to after the back sloped ersho stayed in the container for a day. Mixing with ersho is done by 3 respondents of this study. Most of the study respondents use "Afsit" or warm water to get high quality injera. They can use interchangeably for injera baking. Accordingly, thickening with warm water is also done by 4 respondents and afsit preparation is done by 3 respondents of this study. For the remaining 64 individuals of the study day two is the dough is gelatinous in the form of local name "Dibit".

#### Day three

According to the our interview result only 2 respondents mix the teff flour with Ersho on day two after the back sloped ersho stayed in the container for a day. Mixing with ersho is done by 3 respondents of this study. Most of this study respondents the third day is the day of addition of "Afsit" or warm water to get high quality injera. They can use interchangeably for injera baking. Accordingly, thickening with warm water is also done by 4 respondents and afsit preparation is done by 3 respondents of this study. For the remaining 64 individuals of the study day two is the dough is gelatinous in the form of local name "Dibit".

#### Day four

Majority of this study respondents bake injera on the fourth day, this is done by almost by 60 respondents of the study. They bake routinely every four days difference. Addition of hot water and afsit making was also done by 7 respondents for each. Day 4 is also ersho preservation stage for only 2 respondents.

#### Day five

Baking is done by 16 respondents of this study. Addition of afsit and warm water to the dibit is done by 1 and 1 respondents of this study, respectively. Based on the finding of this study the hot water is used by respondents of East Gojam and Afsit is used by respondents of west Gojam. The purpose of warm water or afsit is to get high quality injera.

#### Day six

The sixth day is the day baking for 4 respondents of the study. During the six day only addition of warm water is done by one respondent of the study.

#### Day seven

The seventh is the only baking day for only one respondent of this study. For most of the respondents it is the day of preparing for the next injera baking (Table 6).

**Table 6** Summary of steps for Injera making

Day-1	Frequency
Mixing with ersho	82
Mixing water with flour	5
Yeast/'Ersho' starter preparation	3
Ersho preservation	0
Day-2	Frequency
0	64
Diluting with warm water	4
Mixing with ersho	3
teff dough	16
afsit	3

Table continue

Day-3	Frequency
Diluting with warm water	0
0	22
Baking	8
Hot water	39
Afsit	21
Day-4	Frequency
Baking	60
0	14
Diluting with warm water	7
Afsit preparation& Dilution	7
ersho	2
Day-5	Frequency
0	69
Afsit preparation& Dilution	3
Baking	16
Ershe retention	1
Diluting with warm water	1
Day-6	Frequency
0	85
Baking	4
Diluting with warm water	1
Day-7	Frequency
0	89
baking	1

## Conclusion and recommendations

From results of this study we can generalize that the teff injera processing is almost the same for all respondents except for the duration of baking time. There is a big difference in the use of hot water and 'Afsit' in respondents of the two zones which are added to the dough to get soft injera. In East Gojam hot water is used and West Gojam use Afsit. This difference is based on the need of the family to make the injera. We can also conclude that warm water is used by respondents of East Gojam and Afsit is used by respondents of west Gojam. Majority of this study respondents bake injera on the fourth day, this is done by almost by two third (60) respondents of this study. They bake routinely every four days difference. This might be the appropriate time to get soft and quality Injera. The difference in quality in using hot water or 'Afsit' should be studied scientifically and proved.

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## Conflicts of interest

The author declares there are no conflicts of interest.

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