Research Article

Importance of fenugreek (Trigonella foenum-graecum L) to smallholder farmers in the case of Eastern and Southern Ethiopia

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Abstract

Information on the diversity of landraces, cultivation practices, and feeding habits is necessary to improve the crops through selection and/or hybridization. This study was conducted to generate information to document cropping practices, values, and socio-cultural aspects of fenugreek. A study was conducted in five districts of Oromia and one yem special districts at Southern Nations, Nationalities, and Peoples’ Regional States, and data were collected using structured and semi-structured interviews from 144 general and 24 key informants. Assessment of data was conducted through interviews with informants regarding cropping systems of the specific landraces, plant nomenclature of traditional landraces, distinctive criteria of each landrace, and use of fenugreek. R software version 4.1.2 and MS Excel 2010 were used to analyze qualitative data, quantify, sort, determine proportions and draw figures, percentages, means, and tables. The result indicated that Hulbata guracha and Hulbata Dima in Eastern Hararghe and Abesha abish and Orome abish in Yem Special district were reported as popular farmers’ cultivars. The farmers named the cultivars mainly based on seed color, seed source, and taste. Sole cropping of fenugreek was more common in Yem special district (65.3%), whereas intercropping with sorghum and Catha edulis (khat) was common in East Hararghe (27.3%) and crop rotation was practiced in both East Hararghe (97.2%) and Yem especial district (88.8%). The farmers in the study area use fenugreek mainly as food in East Hararghe (100%) while in Yem special district used mainly as a spice (100%). This is due to socio-cultural and knowledge differences on the importance of fenugreek in the study area that influence feeding habits, cultivation practice, and uses.

Introduction

Fenugreek (Trigonella foenum-graecum L.) is an annual, self-pollinating and diploid (2n=16) legume species [1]. It originated in countries bordering the eastern shores of the Mediterranean Sea and is now widely cultivated in China, Egypt, Ethiopia, Morocco, Ukraine, Greece, and Turkey [2]. Ethiopia is an original homeland of a fenugreek subspecies known as the Mediterranean ecotype, which has a distribution extending from Eritrea to Somalia [3]. Fenugreek is a multipurpose crop that is utilized as food, feed, spices, and medicinal plant, and the oil is used in perfumery in France [4]. It enriches soil through symbiosis with microorganisms, which fix atmospheric nitrogen [5,6]. In Ethiopia, the crop is produced either as a spice, food, or for other special purposes, such as for nursing mothers and infants as a breakfast beverage also, used in crop rotation for purpose of soil fertility, income generation, a flavoring for traditional bread, and maintains the soft texture of “tef-injera” [7]. Almost all farmers in Hararghe use fenugreek in the major food called ‘Lafiso’ which is made from either maize or sorghum “Injera” and served as baked in a mixture of fenugreek flour boiled either with meat or alone. In the Harari region, people also use fenugreek to prepare their favorite dish, known as ‘Hulbat Meraq’; they use fenugreek cooked with meat and mixed with Injera [8]. Ethiopia is one of the countries in the world where fenugreek is most widely cultivated [9,10]. The production and distribution of fenugreek are similar to those of other cool-season food legumes such as faba bean, field pea, lentil, chickpea, and grass pea [11]. During the 2014 cropping season, fenugreek covers 20,524.4 hectares in the country with an average yield of 1.2tha-1. Fenugreek ranks 9th among highland pulses production in Ethiopia but it ranks 7th and 4th in East Hararghe and Yem Special districts in Southern Nation Nationalities and Peoples, respectively. In East Hararghe, fenugreek occupied 10.3% of the cultivated land being used for pulse production which covers 144.0 hectares of land with an
average yield of 1.375 tons per hectare, In Yem Special district fenugreek is expected to cover 0.1% of the land as equal to the average land allocated for fenugreek in Southern Nation Nationalities and Peoples [12]. However, this important crop is neglected and underutilized which will unintentionally need the risk of losing some important landraces and documented information used by farmers in different that have been maintained and used by farmers over hundreds or thousands of years [13]. Limited information is available about fenugreek landraces and production systems in Ethiopia [14]. On-farm diversity information of fenugreek including the criteria of farmers used to classify their landraces, importance, use and the cropping systems differences or similarities in different regions of the country critical issue for crop improvement and share information about the importance of the crop. Therefore, it was necessary to generate information about the production system and importance of fenugreek in the Southern Nation, Nationalities, and Peoples Region (Yem special district) and the Eastern Hararghe Zone of Oromiya Regional State due to the high production of the crop in these areas. This is because, the cropping systems, the utilization of the crop by farming households, the economic importance, and other related information are not well documented in Ethiopia. Assessment of the production system and the importance of the crop is equally important as the evaluation of genetic variability to generate information that can be utilized by researchers to improve the productivity of the crop. Therefore, the current study was undertaken with the following objectives to describe and document cropping practices, uses, and socio-cultural aspects of fenugreek in the major growing areas of eastern and southern Ethiopia.

Methodology

Description of study area

The study was conducted in two major fenugreek growing areas of Eastern Hararghe Zone and Southern Nation, Nationalities, and Peoples Region (Yem special district). East Hararghe Zone is located between 7° 32" N and 9° 44" N latitude, and 41° 12" E and 42° 53" E longitude, and has an altitude ranging from 500 to 3,400 m.a.s.l [15]. The study area in East Hararghe included four districts, namely Girawa, Kersa, Meta, and Kurfa Chele. Yem Special district is both its administrative zone and a district. In total, five districts were selected for the survey (Figure 1).

Materials used

Materials used for survey research included a Smartphone (Motorola 2nd generation) installed with ODK (Open Data Kit) software and a camera to take pictures of plants and seeds, a GPS to record longitude and latitude, and a power bank for charging the phone during fieldwork.

Figure 1: Map of the survey study area.
Source: Prepared by the author
Sampling design

Study site selection: The two study areas were selected purposively to include areas likely to have enough information because they have high production of fenugreek. The Yem Special district in Southern Nations Nationalities Peoples and East Hararghe Zone in Oromiya Regional State were selected based on agroecological and socio-cultural differences and high production of fenugreek during the 2014/15 cropping season [12]. Each area was stratified by agroecological zone [16], so each stratum has a unique combination of the agroecological zone with an ethnicity (cultural differences). Two different agro-ecologies (Warm sub-humid lowlands classified as (SH2) and Tepid sub-humid mid-highlands classified as (SH3) and two ethnic groups (Oromo and Yem), so there were a total of four strata included in the study. Within each of the four strata, three kebeles (a total of 12) were randomly selected, to obtain an unbiased estimate of information for distinguishing criteria of one landrace from others together with the associated use values and the traditional cropping systems of fenugreek.

Informant selection

After the selection of the study kebeles, a total of 168 informants (144 general informants and 24 key informants) were selected. The selection was purposive for key informants and random for general informants. To get detailed and valuable information about fenugreek, two key informants from each of the 12 kebeles, a total of 24 key informants, were interviewed using a semi-structured interview guide.

First, all households within the kebele were stratified into two relative wealth categories; namely high-income and low-income groups from groups six low-income and six high-income households were randomly selected in Kebele similarly within each income category, 3 women and 3 men were selected for the survey. Lastly from each kebele, 12 households were selected for a structured survey of general informants. The detail of the sampling procedure is indicated in Table 1.

Data collection

Assessment of variations and cropping systems of fenugreek: Data on crop uses, local name, and cropping system were collected from October 2016 to February 2017 from primary sources using a structured interview by ODK (Open Data Kit installed on a smartphone), semi-structured interviews, and field observation.

Farmers’ field observation and key and general informant interviews were done according to standard procedures [17,18]. Farmer’s field observation was done to get the necessary information on the cropping system and morphological structures of the landraces of fenugreek.

The interviews with informants provided detailed information regarding cropping systems of the specific landraces, plant nomenclature of traditional landraces, distinctive criteria of each landrace, and use of fenugreek. Care was taken to determine the consistency in farmers’ naming and describing fenugreek landraces by comparing information from farmer households and different social groups. The names of landraces were recorded at the same time as the collection of seed, in collaboration with the informant farmer for identification of the landrace in the field of farmers.

Data analysis

Descriptive: The researcher observed data at harvest on the botanical description of landraces by farmers was analyzed using qualitative approaches as recommended by Martin [13] and Cotton [19] also R Software and MS Excel 2010 were used to analyze quantify, sort, draw figures, percentage, means, and tables.

Result and desiccation

Fenugreek was used for various purposes in East Hararghe and Yem special district as indicated in Figure 2. The result reflects fenugreek used as food, spice, medicine, bee forage, and fodder in all study areas of Yem special district and Eastern Hararghe but there was use difference in the area to area as food more commonly used in East Hararghe 100% and as spice more common in Yem 100% than East Hararghe this may be due to socio-cultural difference in the study area.

Fenugreek was one of the important crops that add value for low-income farmers in all study areas but the different market

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Table 1: Summary of sampling procedure of Informants.

| Zone            | Major agroecology | District (Woreda) | Kebeles          | Ethnicity | No. informant | General informant | Key informant |
|-----------------|-------------------|-------------------|------------------|-----------|---------------|-------------------|---------------|
| East-Hararghe   | SH2               | Girawa            | Laffosomolo      | Oromo     | 12            | 2                 | 2             |
|                 |                   | Girawa            | Laffolatessa     | Oromo     | 12            | 2                 | 2             |
|                 |                   | Girawa            | Dregemechu       | Oromo     | 12            | 36                | 2             |
|                 |                   | Kurfa chele       | Dhekebe          | Oromo     | 12            | 2                 | 2             |
|                 |                   | Kersa             | Weter -Town      | Oromo     | 12            | 2                 | 2             |
|                 | SH3               | Meta              | Haro kutir hulet | Oromo     | 12            | 36                | 2             |
|                 |                   |                   | Sumo-Awasho      | Yem       | 12            | 2                 | 2             |
|                 |                   |                   | Fofa -Town       | Yem       | 12            | 2                 | 2             |
|                 |                   |                   | Aya - Etero      | Yem       | 12            | 36                | 2             |
|                 |                   | Girwa             | Tigrir           | Yem       | 12            | 2                 | 2             |
|                 |                   | Kerew             | Yem              | 12            | 36            | 2                 |
|                 |                   |                   | Konef            | Yem       | 24            |                   |               |
| Total           |                   |                   |                  |           | 5             | 144               |               |

SH2 = Warm sub_humid lowland, SH3 = Tepid sub _ humid mid highland

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prices from place to place Figure 3 reviled that the market price of *Hulbata Guracha* was more expensive than *Hulbata Dimma* in both East Harare and Yem special district this maybe *Hulbata Guracha* was more important than *Hulbata Dimma* in nutritional content Tables 2,3.

A cropping system refers to the combination of crops grown in a given area within a year similarly in the present study area combinations of cropping systems are practiced. Intercropping is one of the intensive cropping systems which ensure sustainable utilization of limited land resources [20,21]. Figure 4 reveals that fenugreek is grown as a sole crop and as an intercrop with cereals however cropping systems differ from place to place in the study area intercropping was more common in East Hararghe 65% but sole cropping was common in Yem special district 72%.

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![Figure 2: Use of fenugreek as reported by the informants.](image)

![Figure 3: Market Price of fenugreek as reported by Informants.](image)

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Table 3: Fenugreek landraces cultivated in the study area varied by seed color.

| Seed sample | Local name          | Language | Translation                     | Explanation                                      | Agro ecology | Place of collection          |
|-------------|---------------------|----------|--------------------------------|------------------------------------------------|--------------|------------------------------|
| Abesha-Abish| Yemigna             | Yem      | ‘fenugreek from Abesha people’ | seed obtained from family                        | SH2          | Yem, Sumo Awasho             |
| Hulbata-guracha | Oromia             | ‘black fenugreek’ | darker seed color | SH3 | East Hararghe, Water Town |
| Orome-abish | Yemagna             | Oromo    | ‘fenugreek from Oromo people’ | seed obtained from Oromo in past                   | SH3          | Yem, Tigir, and Kone          |
| Hulbata-Dima | Oromia             | ‘red fenugreek’ | Reddish seed color | SH2 | East Hararghe, laftosomolo  |

SH2 = Warm sub_humid lowland, SH3 = Tepid sub_humid mid highland

Figure 4: Cropping system of fenugreek as reported by informants in the study area.

Figure 5: Rotation of fenugreek with other crops.
purposes. In Yem, farmers use fenugreek seed in the form of powder and mix it with different types of food and milk. Fenugreek seed powder is used as a spice to make food more flavorful rather than as a food by itself. This difference in the use of fenugreek might be due to differences in feeding habits of the different ethnic groups or socio-cultural contexts. The result of this study agrees with that of Singh [27] and Yadugiri (2010) who reported that farmers at either individual or community levels use crop landraces to meet their various medicinal, nutritional, and cultural needs. Beleiuma and Singh [28] also reported the use of landraces of fenugreek for different purposes like medicine, food, and spice in the Oromia Region.

According to Seran and Brintha [29], cropping systems tend to vary from location to location. Farmers in different parts of the world intercrop different crops according to their preferences based on socio and biological needs [30]. The present study indicates that cropping systems for fenugreek are different in East Hararghe and Yem. Intercropping of fenugreek with other crops was more often practiced in East Hararghe (65%) than in Yem (27%). Sole cropping is predominantly practiced (72%) in the Yem district rather than intercropping. This may be due to a shortage of arable land in East Hararghe. In East Hararghe Zone, fenugreek is usually intercropped with "khat" (38%), sorghum (36%), and maize (6%). In Yem Special district, fenugreek is intercropped with maize (20%), sorghum (8%), and cassava (6%). The result revealed that the crops grown as a major food or source of income differ from location to location [29], and fenugreek is usually intercropped with major crops (Jemal, 1998). In East Hararghe Zone, sorghum and Khat are the major crops, but in Yem Special district maize is the major crop, and fenugreek is mostly intercropped with maize.

In agreement with this result, other studies have found that intercropping is a profitable approach, especially for the small landholders. Intercropping of cereals with legumes proved to be more productive than that of sole cropping [31] who reported that sorghum and maize are major food crops often grown in association with pulse crops in the East Hararghe Zone.

The high percentage of farmers using crop rotation indicates that farmers are aware of the benefits of fenugreek as a rotation crop. Crop rotation has been used to increase yield and to prevent harmful changes to the soil environment that limit productivity in the long term [32]. Different types of crops are sown after fenugreek within the crop rotation as indicated in Figure 5. The majority of farmers in East Hararghe and Yem rotate fenugreek with cereals such as maize (56% and 88%, respectively), sorghum (55%, and 79% respectively), and finger millet (23% in Yem only). Few farmers rotate fenugreek with root crops, such as potatoes (13% and 11%, respectively). The reason that fewer farmers rotate fenugreek with root crops than cereals may be due to the greater benefits of high soil fertility of legumes for cereal production. According to key informants, after the harvest of fenugreek, sorghum and maize are planted.

| Activity          | East Hararghe male | East Hararghe female | Yem special wereda male | Yem special wereda female |
|-------------------|--------------------|----------------------|-------------------------|--------------------------|
| Plowing           |                    |                      |                         |                          |
| Hoeing            |                    |                      |                         |                          |
| Sowing/planting   |                    |                      |                         |                          |
| Weeding           |                    |                      |                         |                          |
| Fertilizer        |                    |                      |                         |                          |
| Harvesting        |                    |                      |                         |                          |
| Threshing         |                    |                      |                         |                          |
| Storage           |                    |                      |                         |                          |
| Marketing         |                    |                      |                         |                          |
| Seed selection    |                    |                      |                         |                          |
| Fodder collect    |                    |                      |                         |                          |
| Food preparation  |                    |                      |                         |                          |

Figure 6: Gender roles in the production of fenugreek reported by informants.
to take advantage of higher soil fertility and to reduce diseases and weeds. This result agrees with Sadeghzadeh, et al. (2009), who reported that fenugreek can be a very useful legume crop for incorporation into the short-term rotation and for fixation of nitrogen to improve soil fertility.

As shown in Figure 6, fenugreek production is done by females and males however; some agronomic activities that are mostly done by men include plowing and hoeing because these need more energy than other activities. A small number of females participate in plowing and hoeing in East Hararghe but not in Yem special district, which may be due to socio-cultural variation. Sowing, weeding, fertilizer application, harvesting, threshing, storage, and fodder collection are done by both males and females across the study area. Women are exclusively involved in food preparation for home consumption; where marketing and seed selection are also done mainly by females in both study areas. The current study agrees with that of Sintayehu [33] who reported that harvesting and storing are the tasks for women and men. Ogato, et al. [34], reported that females and males equally participate in weeding, storing, fertilizer application, harvesting, and threshing in three districts of Ambo in Ethiopia [35,36].

Conclusion

The results from the study indicated that farmers in the study area classify their landraces based on morphological traits such as seed color, seed source, and taste. The landraces identified based on farmer’s classification criteria are *Hulbata gurach* and *Hulbata Dima* from Eastern Hararghe Zone and *Abesha abish* and *Orome abish* from Yem Special district. Farmers in both agro-ecologies of Eastern Hararghe Zone and Yem Special district grow fenugreek for various purposes, including food, spice, medicine, fodder, and bee forage. Almost all farmers in East Hararghe use fenugreek as food and medicine, but not as many in Yem apparently due to socio-cultural differences.

Cropping for fenugreek varies from location to location. Sole cropping was more common in Yem, whereas intercropping with sorghum and Khat was common in East Hararghe. In addition, crop rotation is practiced by the majority of farmers in both East Hararghe and Yem, which indicates that farmers are aware of the benefits of fenugreek to improve soil fertility. The current study indicates there is variation in landraces that exist on hand of farmers’ morphology, color, uses, conclusion and name that was a base for improvement of fenugreek crop.

Recommendation

The study was conducted by field observation and interview of informants it is recommended that the landraces information obtained during the study should be tested in experimental fields for improvement of fenugreek productivity.

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