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ETHNOTAXONOMY AND ETHNOMEDICINE OF *ENSETE VENTRICOSUM* IN GEDEBANO-GUTAZER-WELENE DISTRICT, GURAGE ZONE, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' (SNNP) REGIONAL STATE, ETHIOPIA

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ABSTRACT: The aim of this study was to document local knowledge on classification and medicinal uses of *Ensete ventricosum* (enset) in Gedebano-Gutazer-Welene district. Seven study sites (kebeles) were selected on the basis of well managed enset gardens. A total of 150 informants were involved, among which 30 were key informants. Ethnobotanical data collection was conducted by using Participatory Rural Appraisal (PRA) techniques. Degree of dissimilarities among the enset varieties was done by using Principal Coordinate Analyses (PCoA). A total of 33 farmers' varieties were reported, which were clustered in two defined groups within which six subgroups were included. This indicates the high intra-specific variation of the species, which might be the result of rapid adaptive radiation. The result may have taxonomic implication adding to the existing knowledge on farmers' variety as well as posing query to molecular systematics. In addition to its importance as staple food, different parts of enset are very crucial in the local health care system. Broken bone, wound, compromised immunity and other maternity related problems are treated with enset. Different varieties of this plant are utilized to induce milk production during breast feeding and as inhibitor when it is needed. The wide range of medicinal uses might indicate a high intra-specific diversification mainly in the biochemical characters of the species. Having tremendous uses and being an indigenous plant species, the plant should be given conservation attention. The usefulness of the plant also calls for better processing and production technologies for its sustainable and widespread use.

Key words/phrases: Enset, Farmers' variety, Principal Coordinate Analyses.

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INTRODUCTION

Enset (*Ensete ventricosum* (Welw.) Cheesman) is a diploid (2n=18) herbaceous perennial plant which belongs to the family Musaceae, along with bananas and plantains in the genus *Musa*. It is a known staple food in the southern regions of Ethiopia commonly known as false banana, the Ethiopian banana or the Abyssinian banana (Westphal, 1975). This drought-resistant plant (Shigeta, 1990), has a size of medium tree growing up to 12 m in height (Lye and Edwards, 1997). Further description of enset reported that the plant is well recognized by its stout and fleshy pseudostem, bearing tightly overlapping leaves from the base. Mature leaf blades can measure 5 m long and 1 m wide. Flowers are born at the late age of the plant once in its life cycle. They appear in massive pendant thyrses covered by large pink bracts. Fruits bear hard, black and rounded seeds.

Although the plant is widely distributed in tropical regions of Africa and Asia, the knowledge to use its pseudostem and corm as food and medicine is well developed in Ethiopia. The Southern Nations, Nationalities and Peoples' Region is believed to be the region of enset domestication where it became a crucial crop establishing the farming system in the area. The people in this region were known to grow and use enset during the Neolithic period, 10–12,000 ago (Vavilov, 1951; Brandt and Fattovich, 1990; Brandt, 1996; Stanley, 1996). Enset is cultivated as perennial plantation in homestead rings in association with other companion crop species that are growing in main agricultural land. The pseudostem is the most commonly used part as food followed by the corm.

Different scholars have shown interest in this hunger striking plant and most of them have focused on the importance of the plant for its food yield. Earlier studies (Brandt and Fattovich, 1990; Brandt *et al*., 1997; Hildebrand, 2001; Admassu Tsegaye, 2002; Belachew Garedew *et al*., 2017) have focused more on the description of processing the plant for food products and for the cultural management system. Few studies have dealt with diversities of enset landraces along with the driving forces to such variability (Shigeta, 1991; Amare Seifu and Daniel Fitamo, 2016). Other studies have also paid attention to its value for food security, which geared the studies towards assessing the diversity, distribution patterns, ecology, growth physiology, cultural production and processing of the products for food (Bizuayehu Tesfaye, 2002; Bizuayehu Tesfaye and Lüdders, 2003; Yemane Tsehaye and Fassil Kebebew, 2006; Karlsson *et al*., 2013; Temessgen Magule *et al*., 2014; Melesse Maryo *et al*., 2015). Currently

PhD studies are being conducted emphasizing on the phytochemistry and antimicrobial activities of selected medicinally useful enset varieties (ongoing research; pers. comm.). Despite its importance for food security, enset plant is highly affected by diseases (Tewodros Mulualem and Tesfaye Walle, 2014). Hence, application of farmers' traditional knowledge to characterize different varieties is highly crucial in selecting the best disease-resistant varieties. A molecular data analysis using RAPD markers suggested wild enset as the potential source of useful and rare genes (Genet Birmeta *et al*., 2004).

Enset has great therapeutic potential for several human ailments known and practiced by farmers in enset growing areas. Local communities in these areas give high regard to enset for its efficacy as broken bone setter (Yemane Tsehaye and Fassil Kebebew, 2006) and for boosting immunity, especially during child birth (ongoing research; pers. comm.). On the other hand, enset growing communities are specialists in identifying diverse varieties of enset together with their use specificity (ongoing research; pers. comm.). Such ethnomedicinal and ethnotaxonomical knowledge must be given due attention to further promote the sustainability of this iconic crop. The present study aims at documenting the local communities' knowledge of the diversity and medicinal uses of *Ensete ventricosum* in Gedebano-Gutazer-Welene district of the southern region of Ethiopia.

MATERIALS AND METHODS

Study area

Gedebano-Gutazer-Welene district is located 119 km Southwest of Addis Ababa. The administrative centre of the district is the town named Mehal-Amba, which is located 39 km away after detouring from the town called 'Mezoria'. Gedebano-Gutazer-Welene district shares borders with Meskan, Kebena, Muhur-aklil districts, of the Gurage Zone in its southern, northern and western sides, respectively, and with Chulule district of Oromia Regional State in its eastern side (Fig. 1). The total land area is 54,500 hectares (CSA, 1999). According to CSA (2007), the total population of the district is 93,408 and the majority of the population (96.7%) are followers of Muslim religion. The CSA (1994) report indicated that the largest ethnic group reported in Gedebano-Gutazer-Welene were the Welene and Gedebano people (97.26%).

The altitudinal range of the district lies between 1,800 and 2,600 m and the annual average rain fall received ranges from 900 mm to 1,400 mm. The daily average temperature ranges between 15°C and 24°C. The district is

generally represented by three traditionally known agroecological zones: *Dega* (highland), *woinadega* (midhighland) and *qola* (lowland). This classification was mainly based on topography and climatic conditions of the area. As described by Hurni (1998), in mountainous countries such as Ethiopia, the topography, in particular altitude, and steepness and slope characteristics, plays an important role in agroecological zonation.

Sampling study sites

Study sites were selected during the reconnaissance survey with the help of local administrative officers. Of the total 32 administrative kebeles (villages) in the district, seven kebeles were selected purposively based on their size, productivity of enset, agroecology and distance from the nearest town (Mehal-amba). The sampled kebeles are among those kebeles known for their well-managed enset farms. Kebeles with bigger land mass and larger number of households were preferred to avoid limitations of garden sampling. Selection of the kebeles considered those kebeles located at a walking distance and otherwise with a better transport access. With regard to the agroecology, two of the kebeles (Desa and Sefatonakersa) represent *dega*, three (Ochena-ankede, Beder and Tilamo) represent *woinadega*, and the remaining two (Jimawelene and Kecha) represent *qola*.

Selection of informants

The study area included about 28.03% of the total population size of the district. A total of 150 informants who were above 20 years old were involved in this study. Females comprised 35% (53) of the total informants (Table 1). The general informants were 120 and the remaining 30 (20 male and 10 female) participated as key informants. The composition of key informants included elders (22; age range between 45 and 60), traditional healers (seven; age range between 50 and 60), and knowledgeable persons from the district's health centre (one; 36 years old). These groups of informants were selected by using purposive sampling method based on prior information. Nineteen of the key informants were nominated as knowledgeable or local experts prior to the actual data collection period. Eleven of the key informants were identified among the randomly selected informants based on the level of knowledge obtained from the questionnaire and interview. This group of informants were part of the data collection throughout the research period since they were identified as knowledgeable. The selection of purposive sampling, tied with the objective of the research, enables the researcher to strategize one's choice based on what is appropriate for the study (Palys, 2008).

Fig. 1. Map of the study area.

Selection of the general informants was through simple random sampling. This sampling method is useful when the population is small, homogenous and readily available (Moore, 2007). The population in the selected study sites can be considered as homogenous since they mainly engage in enset farming. On the other hand, this sampling method is useful to find out

people who might be knowledgeable but less popular due to several factors. The selection was done by employing a lottery method to give equal chance for each household in the kebele. The list of registered households was obtained from the district's administrative office and was used to draw the lottery. General informants were involved in the research by filling the questionnaires.

Table 1. Information about respondents.

No	Respondent category	Sex	Number	Key informants	Total
1	Farmers	M	40	-	70
		F	30	-	
2	Farmers but also nominated as knowledgeable in traditional medicine	M	41	15	57
		F	16	7	
3	Traditional healers	M	10	5	13
		F	3	2	
4	Health professionals	M	6	1	10
		F	4	-	
5	Total	M	97	21	150
		F	53	9	

Ethnobotanical data collection

The methods employed in collecting the ethnobotanical data followed techniques suggested in standard manuals, guidelines and protocols (Martin, 1995; Alexiades, 1996; Höft *et al*., 1999; Vogl and Vogl-Lukasser, 2004; Cámara-Leret *et al*., 2012). The focus of data collection was particularly on ethnotaxonomy and medicinal uses of enset plant for the purpose of this study. Participatory Rural Appraisal (PRA) was the technique of data collection. The researcher spent time with the community as a participant observant. This method is useful to get a first-hand perspective of activities by the community (Kawulich, 2005). Two rounds of study visits were conducted between March and April 2016 and in November 2016. Participant observation, guided field walk, questionnaires and interview methods were used as tools to obtain information from the 150 informants in two rounds of field work.

The questionnaires included closed and open ended questions, and were distributed to informants who could read and write or could get assistance from their family members, neighbours and by the researcher, in the absence of assistance from family members and neighbours. The questionnaires were collected during subsequent field visits and when semi-structured interviews were conducted. Interviews, led by the researcher, were conducted with key

informants individually and as well as a group. It was also handled at the convenience of the interviewee, during market day, walking through gardens, in the house and in special meeting places of the villages. Conducting group interview allows the interviewer to see interaction among the interviewee. This method is also useful in letting individuals to memorize things better than being interviewed individually. On the other hand, the individual interview method helps the interviewer to ask additional questions to better understand the responses and to gauge the accuracy of answers by different respondents. It also avoids other people's influence.

The questions for both the questionnaires and semi-structured interview were prepared in Amharic language to use during the study. Although the majority of the people in the district speak Welenigna as their first language, they also communicate in Amharic language. These questions were translated to English to provide supplementary information. Semi-structured interview was conducted with individual informants and with two or more members of informants after field observation as well as during guided field walk. Efficacy of the plants at different age of the plant, dosage prescribed by traditional healers, way of preparation and administration were recorded.

Analysis of data

The data were organized and analyzed using simple descriptive statistical tools in Excel sheet. In addition to this, Principal Coordinate Analysis (PCoA) was computed using NTSYSpc ver. 2.1. to determine the degree of dissimilarities among the farmers' varieties. Preference ranking was used to identify the best preferred enset variety for its medicinal use in broken bone setting. Fifteen key informants were given the list of four enset varieties and allowed to give scores for the enset varieties based on their knowledge about the efficacy of the plant. Informants were requested to give the highest score (4) for the best efficient variety, medium scores (2 and 3) for the varieties which are considered having medicinal use and are used in the absence of the best variety, the lowest score (1) was given for the varieties with least priority in terms of their efficacy. The scores were summed up and ranked to identify the most preferred variety by the society.

The best enset variety for its multipurpose use was also identified using direct matrix ranking method. Enset varieties with more than three uses were identified according to responses of the informants and provided to the fifteen key informants for scoring, and were told to give 1–4 scores (highest value for most preferred use and lowest value for least preferred use). The

sum total of average scores, provided by the 15 informants, were used to rank the enset varieties for their multipurpose use in the study area.

RESULTS AND DISCUSSION

Ethnotaxonomy of enset in Gedebano-Gutazer-Welene district

Cognition of the local communities about the diversity of enset

A total of 33 farmers' varieties were reported as being grown in Gedebano-Gutazer-Welene district. Informants used qualitative characters related to morphology and productivity of the plant to identify the varieties. Morphological traits such as colour of pseudostem, midribs, petiole and leaves, height and width/girth of the pseudostem together with maturity time were used as parameters to identify the varieties. Such characterization of the infra-specific varieties was also used by local communities in Angacha district, Southern Nations, Nationalities and Peoples' Region of Ethiopia (Ashenafi Ayenew *et al*., 2016).

About 16 of the varieties (48.5%) were identified by their dark coloured pseudostems, midribs and petioles, which the informants describe them as 'reddish' or 'brownish'. This is followed by the light coloured varieties, described as 'white', 'yellow' or light green (10: 31%). Whitish pseudostem and midrib colour with black tints or dots were also characters used to subdivide the second group of varieties. One variety was easily identified by the informants due to its dark green pseudostem (Table 2). The latter character was also remarkably identified by informants elsewhere, which was reported as a typical character of wild enset (Adanech Jarso, 2017; Asaminew Weldegebriel, 2019). The fact that informants reported gradient colouration (colour with intermediate state) supports their knowledge on nature and the character on enset in a holistic way. In taxonomical point of view, colour is among the characters that show continuous or intermediate states. It is a characteristic of human visual perception of light wavelengths, which can be affected by external factors. Colour may be a useful taxonomic character if the pattern of variation correlates with other important characters (Lespinats and Fertil, 2011). Some studies evidenced that colouration in plant parts can be influenced by external factors such as micronutrients (e.g. Lobo, 2008; Telias and Hoover, 2008; Hansen *et al*., 2009).

Height and width of the stem, along with the maturity period of the plant were important features used by the local communities to identify the enset varieties growing in their area. The maturity period ranges between two to

seven years as perceived by the local community. Informants agree that enset plants in colder climatic conditions mature late when compared to enset plants growing in warm climatic conditions. This can be an evidence for the cognition of local communities about the impact of climate change on the growth physiology of plants.

Table 2. Taxonomic characters and character states used by the enset growing farmers in the study area (Gedebano-Gutazer-Welene district).

No	Local name of enset varieties	Taxonomic characters as perceived by the informants			
		Sheath colour	**Stem height**	**Stem diameter**	**Maturity age in years**
1	*Astara*	Reddish	Short	Thick	3 to 6
2	*Qibnar*	Roan	Tall	Thick	4 to 7
3	*Guarye*	Whitish	Tall	Thin	4 to 6
4	*Dere*	Yellow	Short.	Thick	4 to 6
5	*Mymote*	Brownish	Medium	Thin	3 to 6
6	*Lemmat*	Whitish	Medium	Thick	2 to 6
7	*Bush-wayse*	Reddish	Tall	Thick	4 to 7
8	*Badedet*	Reddish	Tall	Thick	3 to 6
9	*Biras*	Reddish	Tall	Thick	2 to 6
10	*Aychore*	Reddish	Medium	Thick	3 to 6
11	*Bicham*	Reddish	Tall	Thin	2 to 6
12	*Teteret*	Roan	Medium	Thick	4 to 7
13	*We'a*	Whitish	Tall	Thick	3 to 7
14	*Anzone*	Yellow	Tall	Thick	4 to 7
15	*Zigbot*	Yellow	Tall	Thick	4 to 7
16	*Fegiyet*	Brownish	Tall	Medium	4 to 7
17	*Hyrete*	Roan	Tall	Medium	3 to 7
18	*Kanchaybane*	Roan	Tall	Thick	3 to 6
19	*Anduate*	Reddish	Tall	Thick	4 to 7
20	*Ferezea*	Reddish	Tall	Thick	3 to 7
21	*Nechwe*	Whitish	Short	Thin	2 to 3
22	*Agade*	Whitish	Tall	Thick	3 to 4
23	*Wennade*	Reddish	Tall	Thin	2 to 4
24	*Enneba*	Greenish	Medium	Thin	2 to 3
25	*Derbuate*	Whitish	Tall	Thick	5 to 6
26	*Sebbare*	Brownish	Short	Thick	3 to 6
27	*Temoysie*	Brownish	Short	Thick	2 to 6
28	*Charkimma*	Whitish	Short	Thin	4 to 7
29	*Gimbuate*	Reddish	Tall	Thick	3 to 5
30	*Zobirr*	Brownish	Tall	Thick	2 to 6
31	*Emmine*	Whitish	Short	Thick	4 to 6
32	*Gaznnar*	Reddish	Short	Thick	3 to 6
33	*Yewerete*	Whitish	Medium	Thin	2 to 3

The output from the PCoA resulted in two defined groups within which six subgroups revealed. More than 50% (21) of the varieties clustered together showing minimal distance among them while few of them scattered in the PCoA plot exhibiting little dissimilarity (Table 3 and Fig. 2). This shows

that the varieties recognized by the local people are very close genetically. On the other hand, this emic classification of the local communities produces a high number of infra-specific taxa using very few characters. Thus, in this study the local classification system matches the approaches of artificial classification system. This implies that an improved resolution of clusters may be obtained if more parameters are considered and quantified.

Table 3. Varieties of enset clustered under each subgroup produced in the Principal Coordinates Analyses (PCoA).

Groups	Subgroups	Varieties
Group 1 (G1)	Subgroup 1.1 (SG 1.1)	*Kanchaybane, Yewerete, Nechiwe*
	Subgroup 1.2 (SG 1.2)	*Guarye, Charkma, Agade,*
	Subgroup 1.3 (SG 1.3)	*Astara, Qibinar, Lemmat, Bush-Wayse, Badedet, Biras, Aychore, Fegyet, Annduate, Derbuate, Dere, Gazner, Temosye, Sebare, Ennabena*
Group 2 (G 2)	Subgroup 2.1 (SG 2.1)	*Wenade*
	Subgroup 2.2 (SG 2.2	*Mymote, Bicham, Gimbuate*
	Subgroup 2.3 (SG 2.3)	*Emmine, Ferezyea, Wea, Teteret, Anzone, Zigbot, Hyrete, Zobbira*

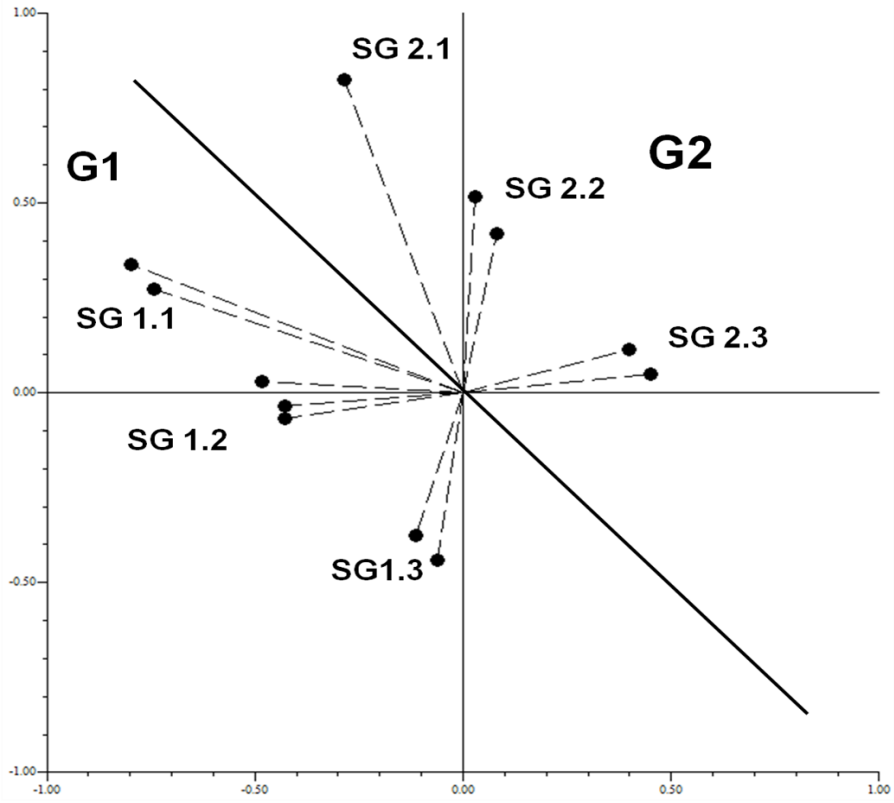

Fig. 2. Clusters resulted in the Principal Coordinate Analyses (PCoA) based on coefficient of similarity among the four characters observed in the 33 enset farmers' varieties.

The enset growing farmers also recognize the plant as 'male' and 'female'. Informants used dichotomous keys to denote the plant as either male or female. Length of maturity years, size, hardiness/stiffness, productivity, taste and quality of products, potential to resist disease, etc. were the main traits used by the informants to categorize enset gender wise (Table 4).

Table 2. Characters used to categorize the enset plant as male and female by the local community.

Characters	**Perceived sex and associated character states**	
	Male	**Female**
Maturity time	Late	Early
Duration of product fermentation	Slow	Fast
Overall size of the plant	Big	Smaller
Hardiness/Stiffness	Hard and stiff	Soft and fragile
Quality of products	Fibrous, sour and less palatable	Low fiber, tasty
Average yield	High	Lower
Quality and quantity of fiber product	Strong, high in quality and quantity	Low strength, low in quality and in quantity
Susceptibility to disease and pests	Highly resistant	Susceptible

Such emic categorization of enset plant was recorded in Angacha district of the Southern Nations, Nationalities and Peoples' region of Ethiopia, who recognized the plant as 'male' and 'female' based on length of maturity years, ease of processing, yield, quality of products and resistance to disease and drought (Ashenafi Ayenew *et al*., 2016).

Use oriented system of classification was also a common practice in grouping different varieties of enset. Some of the varieties were listed as varieties used mainly as food while others were listed as important medicinally (Table 5). Folk taxonomy usually depends on morphology and uses (Hunn, 1982; Maurä*o et al*., 2006; Firew Mekbib, 2007). Integration of such use oriented classifications is recommended to conserve and cognize the knowledge system as well as the biological taxa at infra-specific level (Hunn, 1982; Balakrishnan *et al*., 2014; Franco *et al*., 2015).

Enset growing practice of the farmers to maintain such diverse varieties in each garden indicates the age-old close association of the people with the plant. People from the southern region of the country commonly say that the people and the plant cannot live without each other as mentioned in Gebre Yintiso (1995). Co-survival of the plant and the people for a remarkable period of time contributed to its domestication witnessing the earlier hypothesis by Brandt and Fattovich (1990). This vital ethnotaxonomic knowledge is highly important for the integration of the knowledge system in the existing method of classification. Traditional knowledge encompasses a wide range of information which has been and is a significant potential to

the development of the contemporary science (Berkes, 1999; Kimmerer, 2002). Rediscovering and integrating traditional knowledge is fundamental to achieve the goals of conservation and sustainable development. The detailed knowledge of the local communities in characterizing each variety is fundamental for further investigation on the plant's performance against drought. Besides, farmers' knowledge and perception of the disease-resistant versus susceptible varieties is vital to the effort of integrated crop management system (Shigeta, 1990; Endale Tebeje, 1997). Resilient environments are best achieved through mitigation and adaptation of survivors (Fadda *et al*., 2011; Miniyahil Tilahun *et al*., 2017) such as the enset plant.

Table 3. Different groups of varieties based on characters as perceived by the enset growing farmers.

Characters and varieties under each character states			
Uses		**Potency of disease resistance**	
Mainly as food	**Mainly as medicine**	**High**	**Low**
Badedet	*Astara*	*Badedet*	*Astara*
Biras	*Guare*	*Lemmat*	*Guare*
Aychore	*Qibnar*	*Biras*	*Qibnar*
Bicham	*Mymote*		
Teteret	*Lemmat*		
We'a	*charkima*		
Anzone	*Dere*		
Zigbot	*Bush-wayse*		
Fegiyet			
Hyrete			
Kanchaybane			
Anduate			
Ferezea			
Necho			
Agade			
Wennade			
Enneba			
Derbuate			
Sebbare			
Temoysie			
Charkimma			
Gimbuate			
Zobirr			
Emmine			
Gaznnar			
Yewerete			

Ethnomedicine of enset in Gedebano-Gutazer-Welene district

Medicinal values of enset to heal fractured or broken bones

This study offers evidence on the diverse health benefits of enset very well known by the local communities in Gedebano-Gutazer-Welene district. Seven of the thirty-three farmers' varieties were reported to have medicinal

and religious (ritual) values. All informants agreed that enset plant has a very important medicinal use particularly in setting broken bones. *Astara*, *Qibnar*, *Dere* and *Lemmat* were the varieties mentioned by 147 (98%) informants as important varieties used to set broken bones. However, the first two varieties got a total of 133 (87%) mentions while the remaining two were mentioned by fewer informants (47: 31% and 32: 21%, respectively).

Informants agreed that *Astara* and *Qibnar* are the best varieties with regard to efficacy. *Astara* was perceived as the best of all by 71 (47%) informants while 18 (27%) informants reported *Qibnar* is highly efficient. However, 26 (87%) of the key informants agreed that both varieties have to be used for the best result and best when equal amounts of the two are taken (Fig. 3). According to the key informants, the two varieties are applied and used at different stage of the treatment. *Astara* is used at the beginning while *Qibnar* is prescribed at a later stage. The first treatment is meant to keep the affected part (the broken bone and cartilages) soft so that the broken pieces can be fixed in the right position. Once the bones are fixed in the right position and settled, *Qibnar* is prescribed so that the fixed bone becomes stiff and strong. *Qibnar* was also mentioned as important variety to protect the family against evil spirits and is usually grown in front of many houses. This was reported by 76 (51%) of the total informants. The corm, locally known as *Amicho*, is the most frequently mentioned part of enset for its food and medicinal uses. The boiled corm and the starchy powder from the pseudostem of *Astara* (locally called bulla) are eaten with milk to treat ailments related with broken or fractured bones, joint displacements and swellings. Similar functions of two farmers' varieties (with different local names) were also reported from Angacha district, southern Ethiopia (Ashenafi Ayenew *et al*., 2016).

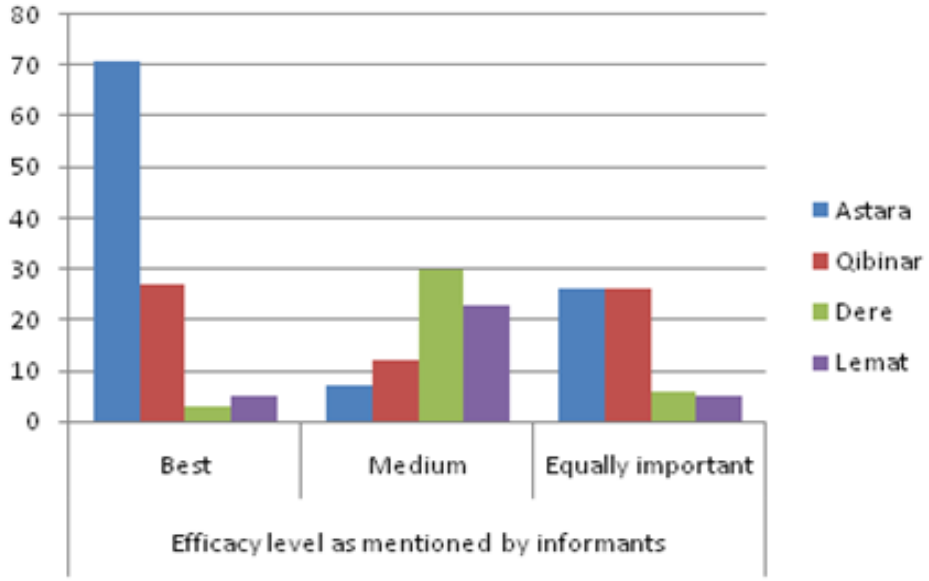

Fig. 3. Number of mentions for the level of importance of enset varieties in broken bone setting.

The fact that enset is famous in broken bone setting in the growing area is due to the high content of iron and calcium as mentioned by Kefale Alemu and Sandford (1991). The knowledge of the local community of the specific variety used in setting broken bone also indicates the different application of the varieties. *Astara* is prescribed at the earlier stage indicating the food product from this variety softens tissue. This particular variety may have a property of decalcification. On the other hand, *Qibnar* is prescribed once the bone is set properly at the right position. The informants explained the purpose of the latter prescription is to strengthen/harden the already set bone. The implication of this knowledge is that the variety named *Qibnar* is rich in its calcium content.

Medicinal use of enset in periods of child birth and child care

The corm and the pseudostem of enset have a sound use in boosting immunities of women during the period of child birth and child care. These parts are prescribed as special dietary requirements to take care of the mother and the child's health. Boiled corm of *Astara* is also known for its use in stimulating the mammary glands. Women who gave birth are recommended to eat food products of this variety in early stage of delivery for the best breast feeding. The corm of *Qibnar* is also prescribed for the same purpose. It is recommended to be eaten with cheese specially prepared

with butter and milk. Surprisingly, another variety of enset, named as *Mymote*, is used to inhibit milk production indicating that this variety has inhibiting effect on the mammary gland. Women are recommended to eat this variety when they decide to stop breast feeding (Table 6 and 7).

Milk production is related to the presence of lactose sugar, which is important to stimulate lactation hormone that is used to initiate milk production. The fact that *Astara* stimulates the mammary gland for milk production explains that the variety is rich in milk sugar (lactose). Lactose enhances lactogenesis II or the production of lactation which stimulates milk production (Cox *et al*., 1999). *Astara* may also have impact in repressing the production of progesterone.

After lactogenesis II, there is a switch to the autocrine (local) control system. This maintenance stage is called lactogenesis III, which is also a stage at which milk synthesis is controlled. In this stage a production of whey protein called feedback inhibitor of lactation (FIL) takes place (Hartmann and Prosser, 1984). *Mymote* perhaps contains the bioactive ingredient, which inhibit the activity of lactation hormone by increasing production of progesterone. Thus, further research is needed to understand inhibitory process of this variety.

Other medicinal uses of enset

Reports from the key informants indicated that the leaves and fruits are not used as food but have important medicinal use (Table 6). Nine (67%) of the thirteen traditional healers reported that leaves of enset are used to enhance labour during childbirth. This use was also reported elsewhere in Ethiopia (Ashenafi Ayenew *et al*., 2016) and Tanzania (Lovetti *et al*., 2014) suggesting that it may also cause abortion if taken in earlier periods of pregnancy. Infusion from burnt fruits and leaves are prescribed to hepatitis patients and treatment of diseases with liver complications. *Ensete superbum* is a typical sister species of *Ensete ventricosum* distributed in India. This species of the genus *Ensete* is reported to have a paramount therapeutic potential for several human ailments including diabetes, kidney stone, appendicitis, leucoderma, leucorrhoea, cancer, measles, psychosomatic disorder, venereal diseases, stomach ache, dog bites and dysuria (Vasundharan *et al*., 2015). Thus, enset might have detoxification effect. These comparable findings also indicate the importance of the plant at genus level. Although at different localities, the local communities' knowledge is comparable indicating that the knowledge system shows similarity given that the environment is similar.

Table 4. Uses of different enset farmers' varieties, parts used, mode of preparation and administration.

No	Variety name	Disease treated	Function	Other uses	Parts used	Mode of preparation
1	*Astara*	Broken bone	Bone setting: Repair & soften broken bone	Used as stimulator of mammary gland for breast feeding Food	Corm and Pseudostem	For medicinal purpose: boiled corm is eaten; fermented sheath extracts from the pseudostem is prepared as bread and eaten As mammary gland stimulator: eating boiled corm with cheese and butter For food: fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
2	*Qibnar*	Broken bone Pneumonia and cough	Bone setting and healing the wound: Join and stiffen broken bone	Used as stimulator of mammary gland for breast feeding Ritual importance: planting this variety in front of the main gate is assumed as safe guard against devils' and all evil spirit attacks Food	Corm and Pseudostem	For medicinal purpose: boiled corm is eaten; fermented sheath extracts from the pseudostem is prepared as bread and eaten As mammary gland stimulator: eating boiled corm with cheese and butter For food: fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
3	*Guarye*	Wound Cough	Prevents infection Soothes coughing	Food	Leaves, Corm and Pseudostem	For medicinal purpose: eaten as porridge with butter to boost immunity; boiled corm is also eaten as soup to ease cough. The leaf sheath is used to cover the wound and also fluid from the sheath is used to wash the wound For food: fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
4	*Dere*	Wound	Bone setting and	Food: preferred for its quality	Leaves, Corm	For medicinal purpose: The leaf sheath is

No	Variety name	Disease treated	Function	Other uses	Parts used	Mode of preparation
		Broken bone	healing the wound	as food	and Pseudostem	used to cover the wound and also fluid from the sheath is used to wash the wound; boiled corm is eaten; fermented sheath extracts from the pseudostem is prepared as bread and eaten. For food: fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
5	*Mymote*	Wound Hemorrhage	Prevents infections	Used as inhibitor of mammary gland when women decide to stop breast feeding Food	Leaves, Corm and Pseudostem	For medicinal purpose: the leaf sheath is used to cover the wound and also fluid from the sheath is used to wash the wound. As mammary gland inhibitor: eating boiled corm For food: fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
6	*Lemmat*	Broken bone	Bone setting: used to strengthen bone, and muscle joint	Food: preferred variety as enset disease resistant	Corm and Pseudostem	For medicinal purpose: boiled corm is eaten; fermented sheath extracts from the pseudostem is prepared as bread and eaten. For food: fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
7	*Bush-wayse*	Induce labor and help the expulsion of delayed placental discharge	Relax muscles	Ritual importance: planting this variety in front of the main gate is assumed as safe guard against devils’ and all evil spirit attacks Food	Corm Leaves	For medicinal purpose: corm is boiled and eaten with butter or milk; leaf is fed with salt (especially for cattle) For food: fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well

No	Variety name	Disease treated	Function	Other uses	Parts used	Mode of preparation
						cooked corm
8	*Badedet*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
9	*Biras*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
10	*Aychore*	Not known		Food: preferred for its productivity and high quality of ‘Bula’ and ‘Kocho’	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
11	*Bicham*	Not known		Food: preferred for its productivity and high quality of ‘Bula’ and ‘Kocho’	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
12	*Teteret*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
13	*We’a*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
14	*Anzone*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
15	*Zigbot*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge (‘Bula’) and bread (‘Kocho’); very well cooked corm
16	*Fegiyet*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge

No	Variety name	Disease treated	Function	Other uses	Parts used	Mode of preparation
						('Bula') and bread ('Kocho'); very well cooked corm
17	*Hyrete*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
18	*Kanchaybane*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
19	*Anduate*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
20	*Ferezea*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
21	*Necho*	Not known		Food: preferred for its productivity and high quality of 'Bula' and 'Kocho'	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
22	*Agade*	Not known		Food: preferred for its productivity and high quality of 'Bula' and 'Kocho'	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
23	*Wennade*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
24	*Enneba*	Not known		Food: preferred for its productivity and high quality of 'Bula' and 'Kocho'	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
25	*Derbuate*	Not known		Food: preferred for its	Corm and	Fermented sheath extracts from the

No	Variety name	Disease treated	Function	Other uses	Parts used	Mode of preparation
				productivity and high quality of 'Bula' and 'Kocho'	Pseudostem	pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
26	*Sebbare*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
27	*Temoysie*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
28	*Charkimma*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
29	*Gimbuate*	Not known		Food: preferred for its productivity and high quality of 'Bula' and 'Kocho'	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
30	*Zobirr*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
31	*Emmine*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
32	*Gaznnar*	Not known		Food	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm
33	*Yewerete*	Not known		Food: preferred for its productivity and high quality of 'Bula' and 'Kocho'	Corm and Pseudostem	Fermented sheath extracts from the pseudostem are prepared as porridge ('Bula') and bread ('Kocho'); very well cooked corm

Efficacy of enset as per the age of the plant

About 90% (135) of the informants agreed that the efficacy of enset increases with age. Accordingly, a six year old enset plant was reported by a considerable number of informants (102; 68%) as the most efficient variety (Table 7). Few (11: 7%) informants also mentioned enset up to eight years old can be more medicinally efficient than the younger plants. The dosage increases as the age of the plant increases. The most probable explanation for this may be as dosage of the prescription increases the chemical concentration in the plant might increase (e.g. lactic acid as it is observed in Agave plant (Pinos-Rodriguez *et al*., 2008), Copper, Zinc, Calcium, Magnesium, iron, etc. as it is observed in *Euphorbia pulcherima* leaves (Dole and Wilkins, 1991). The more the dosage of the prescription, the more the biochemical content would be, which may alter the expected result.

Table 5. Age of the plant in accordance to its efficacy.

Age of the plant in years	Efficacy
1 year plant	Not efficient
2 year plant	Least efficient
3 year plant	Least efficient
4 year plant	Up to 10–20% efficient
5 year plant	Up to 40–80% efficient
6 year plant	Up to 90–100% efficient

Dosage administered as per age difference of patients

Traditional healers of the Gedebano-Gutazer-Welene district community consider age of patients when prescribing enset food as part of treatment in broken bone settings. The administered dosage can be between 0.06 kg for infants and 1 kg for adults per day (see Fig. 4). It is natural to consider dosage of drugs on the basis of patients' condition. Individual variability of age, weight or size determines drug responses in various ways. Elder people and infants are highly susceptible to dosage of drugs. This age-dosage relationship is practiced in modern pharmacopeia as well as in the traditional medication system (Carasco *et al*., 2016).

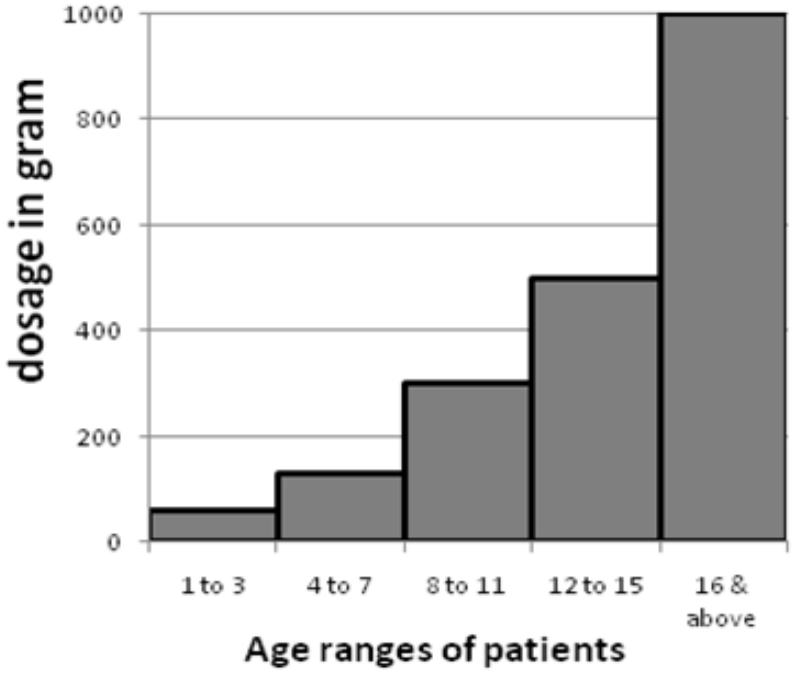

Fig. 4. Dosage prescription per age gradients of patients.

Preference and direct matrix ranking

The preference ranking analysis indicates that *Astara* and *Qibnar* ranked first indicating that they are the most preferred varieties used in broken bone setting (Table 8). This confirms the equally important varieties as weighted by the knowledgeable informants. The analysis of direct matrix ranking was used to infer the multipurpose variety of enset. In this analysis *Qibnar* stood first followed by *Guarye* for their importance providing diverse uses recognized by the community (Table 9). Although it was not variety specific, the multipurpose function of enset was reported by Seada Yassin *et al*. (2015) being applied for nine purposes. Banchiamlak Nigussie and Kim (2019) also reported the highest rank of enset as a multipurpose plant.

Table 6. Preference ranking analyses performed by the key informants.

Enset varieties	**Points given to each variety and number of informants**															**Scores**	**Ranks**
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**	**R12**	**R13**	**R14**	**R15**		
Astara	4	4	3	4	4	4	3	3	3	3	4	4	4	4	4	55	1
Qibnar	4	3	4	3	4	4	4	4	4	4	4	4	3	3	3	55	1
Dere	2	1	1	2	1	1	1	1	1	1	1	1	2	2	1	19	4
Lemat	1	2	2	1	2	2	2	2	2	2	2	2	1	1	2	26	3

Table 7. Direct matrix analyses for four varieties reported for more than three uses.

Enset varieties	**Points given to each variety for the uses indicated in the row below**					**Scores**	**Ranks**
	Food	**Medicinal**	**Ritual**	**Environmental**	**Other uses**		
Qibnar	4	4	4	4	4	20	1
Guarye	4	3	4	4	4	19	2
Dere	4	1	1	4	2	12	3
Maymote	4	2	2	4	1	13	4

CONCLUSION

This study reports the potential of local traditional knowledge in identifying the different varieties of enset plant existing in Gedebano-Gutazer-Welene district. It evidenced the knowledge system, socio-cultural familiarity and community practices that derive the maintenance of intra-specific enset diversity. Enset plant is highly popular in the study areas as traditional medicine in addition to its use as staple food, particularly in treating health problems related with broken bones, wounds, blood clotting, healthy pregnancy and child care. Usage of specific variety of the plant was highly pronounced in the district which reflects the age-old association of the people with enset. Prescription of the enset derived medicine also depends on age ranges in which, the older the patient is, the more the dose is prescribed. On the other hand, the enset associated traditional medicinal knowledge shows that efficacy of the plant increases with the age of the plant. The best medicinal age of the plant is six years old. But mostly the people use 5–8 years old plants. This indigenous and multipurpose plant should be given high attention with respect to conservation. Technology assisted processing and production method is highly recommended for efficient and sustainable utilization of this useful and iconic plant.

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