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Research Article

Ethno-Botanical Survey of Taro (*Colocasia esculenta*) in Bench Ethnic Group, Bench Maji Zone, Ethiopia

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ABSTRACT

Taro is belongs to Araceae family, herbaceous plants grown in moist habitat as staple food in southern and southwest parts of Ethiopia that produce underground corm/tubers or aerial leaves. This research was developed with objective of identifying the growable habitat, diversity of varieties and potential production of taro (*Colocasia esculenta*) in Bench ethnic groups, Bench Maji Zone, Ethiopia. A total of 122 informants were selected from eight Kebeles using purposive and random sampling method. The reliable data were collected from households using semi-structured questionnaires, focus group discussions and field observations which were analyzed by using excel spreadsheet and descriptive statistics. A total of four different types of taro varieties (Backa/Keny godere, Boka, Dalus and Gorse) were recorded from the districts. Taros were identified having significant values for the people as human food accounts 100% followed by market value 62.29% and others too. The usable parts of taro for human consumption purposes was tuber account 100% and around 14.92% of young leaves used for food and other purposes. The corms are underground thickened edible part of taro. Farmers' indigenous experience on production of taro crops in the district was observed to be remarkable. Therefore, this knowledge of practice by farmers must be kept and supported by stakeholders to investigate the productive variety and further improved production and market linkage mechanisms with central.

Key words: Cultivation, Ethnobotany, Food security, Market Value, Production, Varieties of taro

INTRODUCTION

Taro (*Colocasia esculenta* (L.) Schott.) is herbaceous, perennial tuber crop that belongs to the family Araceae (aroid family) (Manner and Taylor, 2010, Amadi *et al.*, 2011; Prajapati *et al.*, 2011). Taro is planted widely in tropical and sub-tropical regions as traditional staple food (Gebre *et al.*, 2015; Norman *et al.*, 2015). As different studies of ethno-botanical suggested that taro originated in South Central Asia, probably in India or the Malay Peninsula (Onwueme, 1999; Manner and Taylor, 2010; Akwee *et al.*, 2015) and it distributed to other world parts but the largest area of the cultivation is in West Africa which therefore accounts for the greatest quantity of the production (Onwueme, 1999; Kuswara and Prana, 2003). Taros are soft stem plants which grow in shady damp places and the swamps of the wetter tropics and it require an average daily temperature above 21ºC for normal production but cannot or poor yields at high altitudes (Amadi *et al.*, 2011; Eze *et al.*, 2016). This means that reasonable yields can be obtained even in shade conditions where other crops might fail completely. This is a particularly important characteristic which enables taro to fit into unique intercropping systems with tree crops and other crops. In botanical language, the taro "tuber" is really a corm, a thickened, underground stem of certain plants, resembling bulbs. Taro is loaded with nutrients that it is an excellent source of fiber, vitamins C and E, thiamine, riboflavin and niacin, potassium, magnesium, phosphorus, iron and folate which are important constituents of human diet (Hunt *et al.*, 2013).

Different factors are hampered the activities of farmers to cultivate taro and to get remarkable products in various taro growing area in Africa (Akwee *et al.*, 2015; Yebo and Dagne, 2015). The most frequent challenge that affects the growth and development of taro are considered as constraints like froze temperature and light, diseases and pests, loss of wise management systems and so on (Ubalua *et al.*, 2016). In many parts of southern and southwestern Ethiopia, taro plant is widely distributed and cultivated that the farmers considered it as the main staple food for large rural communities. Hence, the main

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objective of this research was to study the ethnobotanical and cultivation of Taro by local farmers in Bench ethnic group, Bench Maji Zone, Southwest Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study area located in Bench Maji zone in both Debub and Semen Bench districts that are about 565Km far from administrative center of the zone in the southwest of Ethiopia from Addis Ababa (Figure 1). This area is evergreen vegetation and diverse plant which has high average temperature and receives high amounts of rainfall with an average of 1800-2200 mm annually for more than seven months. The topography of the area comprises different land features (Bench Maji zone Agriculture and Rural Development Office, 2012).

Method of data collection

The data collection of taro crop potential production and utilization in Debub and Semen Bench districts were employed by using purposive sampling method that used to select the representative study sites with respect to the potential of taro crops production. Thus, a total of eight Kebeles were selected. These site selection and data collection were made with the help and guidance of Districts and Zonal Agriculture and Rural Development Office. Using the simple random sampling method, the respondent and key informants were employed to select from the pre-selected kebeles. Therefore, a total of 120 sample size/ households/farmers were selected based on the proportion and applying the formula provided by Yamane (1967). The study was carried out to assess people's activities and their management practices on the taro crops and usage of the plants. The instrument used for data collection were includes questionnaires, structured and semi-structured interviews, field observations and focus group discussions and also identification of the local varieties of taro using morphological characteristics and farmers indigenous knowledge.

Method of data analysis

The collected Ethnobotanical data were entered in to Excel spreadsheet and summarized using descriptive statistics. The spreadsheet data filter facility was employed to determine frequencies and percentage of citations so as to identify the most common use and habitat preferred for cultivation.

RESULTS AND DISCUSSION

General characteristics of respondents

Analyses of information collated from respondents of the district with respect to their age, sex, educational status, household size and marital status were considered. Hence, out of the 122 respondents taken for the interviewed, 94 were men whereas the rest 28 were contributed by women. In the present study males were more in number than females in total sampled population as well as in key informants because most females were not agreed to be participated in the interview. The age category above 51 (43.44%) followed by 41-50 (25.41%) and 31-40 (21.31%) had been the highest number of respondents that participated in the study. Conversely, the age group 20-30 was represented by the lowest number of respondents. Likewise, the educational backgrounds of respondents, majority (33.61%) were illiterate while primary cycle primary (26.23%) and secondary cycle (23.77%). Although most of the participants were illiterate which coincided mainly with age group above 51, they were generally considered as important information of traditional knowledge of cultivating, variety selection and managing taro tuber crops for good product. The family size of most households was 6-8 (43.44%) followed by 3-5 (34.43%) of the respondents and least size was recorded in 1-2 (9.02%). Regarding the duration that the farmers (cultivators) have been lived in the districts mostly more than 31 years (63.93%) which implies this mode of cultivation were common by their parents and grandparents in that specific Kebele (Table 1).

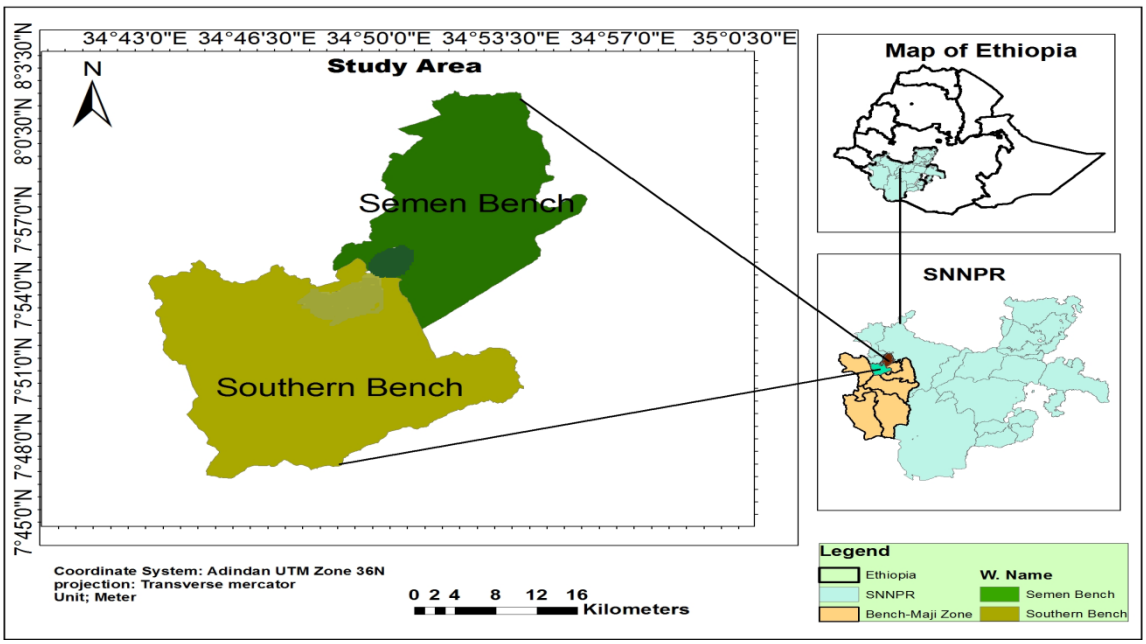

Fig. 1: Map of Study Area.

Table 1: Household information of Respondents

Variable	Frequency	Percentage (%)
Age (years)		
20-30	12	9.84
31-40	26	21.31
41-50	31	25.41
>51	53	43.44
Sex		
Male	94	77.05
Female	28	22.95
Educational status		
Illiterate	41	33.61
First cycle (1-4 grade)	32	26.23
Second cycle (5-8 grade)	29	23.77
Secondary high school (9-10 grade)	19	15.57
Preparatory (11-12 grade)	1	0.82
Degree and above	-	-
Household size		
1-2	11	9.02
3-5	42	34.43
6-8	53	43.44
9 and above	16	13.11
Live in Kebele		
less than ten years	7	5.74
11-20 years	14	11.48
21-30 years	23	18.85
More than 31 years	78	63.93

Morphological characteristic of Taro

The local name of Taro (*Colocasia esculenta*) is also called Zhong or Godere in Bench people. It is herbaceous plant consisting of a central corm from which cormels, root and shoots arise. The shoot consists mainly of the leaves which arise from the apex of the corm. The leaves are therefore the most prominent aerial organ of the plant. Each leaf consists of a long erect petiole and a large lamina. The attachment of the petiole is not at the edge of the lamina but at some point in the middle of the lamina. This form of attachment is a diagnostic feature which generally distinguish taro from other edible aroids (Manner and Taylor, 2010, Amadi *et al*., 2011; Prajapati *et al*., 2011; Matthews *et al*., 2012; Hunt *et al*., 2013; Sundar *et al*, 2016). The petiole is attached to the lamina at the indentation. Taro was recorded four varieties from Bench district that cultivated by farmers. The features that the farmers set criteria were mostly morphological and tastes: for instance leaves, shape and color of corms, color and attachment of petioles and also the taste of the corms. Based on these traditional criteria, the farmers selected the *Boka* is dark green petiole and most edible; *Dalus* (white godere) that had white petiole and tuber and also it is sweety which is preferred by the community for consumption purposes; Gorse which is deep dark lower parts of leaves and sweet taste (Figure 2); whereas *Keny godere* is broad and highly fissured leave and has big tuber/ corm which is less sweet as compare from taro (godere).

Based on the information gained from the informants and field observations, almost all of the people frequently used for the consumption and other purposes was corm/tuber of the taro parts that account 100% and around 14.92% of young leaves of taro used for food and other purposes (Figure 3). The corms are remaining underground thickened edible part of taro.

Habitat of taro cultivation

Taro crop is grown as traditional foods or is adapted to unique ecosystems and is little importance to world food production. These crops are grown widely throughout tropical and subtropical regions around the world and are a staple food for over millions of people globally (Bourke and Vlassak, 2004; Ben, 2010; Bradshaw, 2010; Matthews *et al*., 2012; Sundar *et al*, 2016). These crops can be grown at most any time of the year so long as temperature does not freeze. And be very

Fig. 2: Main varieties of Taro from Sheko woreda.

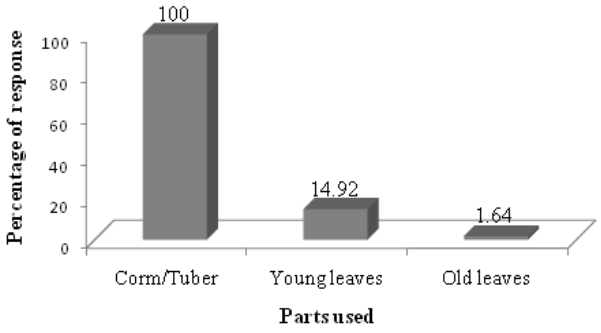

Fig. 3: Part of the taro frequently usable by the local people

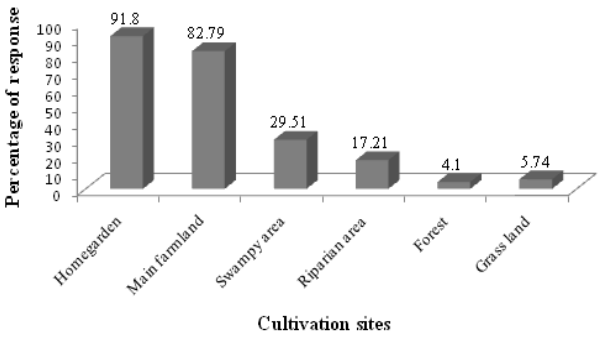

Fig. 4: Main site preferred by farmers for Taro cultivation

careful about spearing them or breaking them when digging the longer roots. Store root crops in low light and cool temperatures where they can last up to several months (Yebo and Dagne, 2015). Despite a growing reliance of taro on distribution and adaptability in the southwest Ethiopia particularly Bench Maji zone, Bench ethnic group, these are important components of the whole kebeles diets for the large rural populations that still prevail food security.

On this regard, taro was the commonest and most easily growable tuber crops that can be grown every moist and warm environment of Bench district. These tubers were highly adapted in swampy area but the tuber which grown in the swampy area were not preferable for food by the communities. Because the taste is less as compare the tuber that grown in the non swampy area. As compare from the other type of tuber, it is loosen management that do not require expenditure of energy of labors and money.

Taro (godere) can be found in their main fields and other microenvironments such as rain fed field, irrigated paddy field, home garden, swamp and other natural habitats or in the wild. In home garden and main field cultivation of Taro is often intercropped with corn (maize); beans, fruit trees and vegetables in the rain fed and irrigated upland, or rotated with winter crops. Based on the season and agro-ecology of the environment, the productivity, maturity and type of cultivation of root and tuber crops strictly varies from the other crops accordingly (Elfick, 2010; Hunt *et al.,* 2013; Mekbib and Deressa, 2016). Taro can be grown intercropping cultivation mode in the area typically with enset, yams, maize, sugar cane, cabbage and the like. Taro plants are easily cultivated by tubers, thick potato-like roots vegetative.

As respondents pointed out, taro grown in swampy area is not preferred for food comparing to taro grown from other habitats. Because it possessed less in taste and not marketable for sailing. But the most preferable taro was cultivated from home garden (91.8%) followed by farmland (82.79%) (Figure 4). Therefore, the most preferable habitat used for cultivation of taro cultivation by farmers was home garden and farmland. But the rest habitats like swampy, riparian, forest, near to fence, and along road sides were not preferred by people for cultivation; rather taro simply grown in these habitat without the intervention of the community. And hence, such taros are not sweet in taste which is harvested from naturally growing areas.

Harvesting and extending shelf life of Taro corms

When the plant is matured the leaf and stem become dry and fall down to the ground and the corm also pushes the soil up. This is the main sign for maturity of taro. It can give products within seven months or above (Gunua and Kokoa, 1995; Manner and Taylor, 2010; Mekbib and Deressa, 2016). The maturity, harvesting time and storage place were different from place to place. There were obvious indicators associated with some of the taro crops maturity for harvesting in the study area used by the indigenous farmers in between 8-12 months. The local farmers of the study area were experienced to harvest and store the taro tuber crops using their indigenous knowledge in different storage materials to extend the shelf life. After identifying the maturity of these tuber crops clearly and then harvested in the appropriate time and store in the appropriate place to extend the shelf life of the crops. Most of the types of tuber crops can be "field stored", meaning left in the ground to grow, for varying lengths of time until they are needed for eating or/and propagation purposes as planting material for the next propagation seasons. The time varies from a few months to many years depending upon the type of root and tuber crops. In fact, taro can perish quite quickly following harvesting; field storage is often the best solution for keeping root crops fresh.

When field storage is not practicable, there are some traditional methods of preservation that can be used to extend the shelf life of taro crops. As stated by respondents, the farmers practice using the traditional knowledge to preserve the post harvest products of tuber crop due different methods. The quality and quantity of taro products were various among kebeles and types of local varieties. Such as white tuber taro is more productive than the black taro which was habitually preferred by the producers for consumption and market purposes.

Major value and opportunities of Taro

Taro (Zhong or Godere) is a staple food in all Kebeles of the Bench district which was source of most of the daily food intake for large rural populations. Development of taro crop is important in the study area because they met local food preferences, providing an important part of the diet as they produce more edible energy per hectare per day than any other crop groups which play an important role in food security, nutrition and climate change adaptation (Elfick, 2010; Matthews *et al*., 2012). Despite their importance, investment of taro crops has been much lower than the cereal crops in the districts even in the country too.

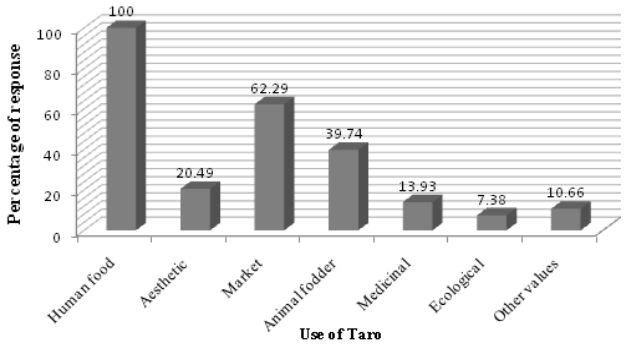

Fig. 5: Main use of Taro/Godere for Bench People.

Although taro had numerous uses worldwide, the data collated from the respondents (Figure 5), the local farmers used taro crops traditionally most of the time for human food accounts (100%) followed by market value (62.29%), animal fodder (39.74%) and aesthetic value (20.49%). Here, the use of taro crops for other purposes means for example mat, shade, and spiritual and holyday festivity. As the aforementioned data implies, the Bench people cultivated taro primarily for the sake of consumption of food. Likewise, taro used comparably as ornamental value in the home garden by inspiring the over viewing of surroundings and also ecologically important to protect soil erosion and the remains of it increases soil fertility in the home garden and main fields. In similar manner stated, taro crops are plants yielding starchy corms / tubers of a stems that used mainly for human food (as such or in processed form), for animal feed and for manufacturing starch, alcohol and fermented beverages including beer (Gunua and Kokoa,1995; Onwueme, 1999; Akwee *et al*, 2015; Sundar *et al*, 2016).

After observing the entire morphological indicators for maturation of taro tuber, they pulled out from the soil carefully using different digger tools. When the people use the taro tuber, firstly, the tubers are pilled and washed after it the matured one and boil it till it is easily to chew. The boiled tuber was eaten with common spices in the districts or without spice too. The food is also used with other food to celebrate during festivity days to invite any guests or neighbors that could be eaten in group. To use for the consumption purposes, first the tip part of the matured tuber is removed. Because the tip part is not tasty, this has bitter taste (Figure 6). On the other hand, spices were prepared from different plants for eating it with boiled taro tuber. The most common representative spices in the community were Pepper, Tenadam, Besobila, Ginger, Rosmarus, etc.

Fig. 6: Process of taro tuber preparation for food.

Fig. 7: Survey of Taro /Zhong tubers in the local Market.

The market survey of taro tubers was analyzed on the affordable activities of farmers from different nearby Kebeles. The researchers made a market survey in Mizan and Aman towns of the study area and observed different type of local variety products of taro where selling and buying took place (Figure 7). Market value of the taro is very inexpensive as compare to other root and tuber crops which are common in the locality. This low in price of taro tuber made the taro producers discourages to produce for the sake of money generating by providing for regional and central market. But they had produced mostly for sake of domestic consumption purposes. The availability of this corm/tuber in the market indicated as it is produced highly in the surrounding area of the districts. The main challenge of the producers was discouragement in market and value chain from nearby districts and central markets. Because its importance is not clearly known in the other non- taro growing area. Those people are not interested and well informed for buying from the producers to use its corms as a food sources.

Constraints and traditional control system of Taro cultivation

In the survey of this data from study area, same circumstances were happened in all representative kebeles. Common constraints like pest and diseases, worms; lack of proper management, absence of any investor on the production of taro, lack of any linkage with central market and industry taken as raw material was the leading problems that reduce productivity of taro. Compare to any root and tuber crops, taro is more or less resistant to environmental constraints. But the most visible constraints of taro are pest and diseases worldwide (Onwueme, 1999; Sundar *et al.*, 2016). For the enhancement of production and control mechanisms of certain constraints, most farmers did not (little) get any training on taro production by different organization. The Woreda agricultural and development offices attempted to distribute a few selected taro varieties in terms of productivities and quality. Instead farmers were practicing still using their indigenous knowledge and taro naturally grown easily without governing by experts properly to give marvelous products. Because the environment is exclusively moisture which makes suit for production of taro. Regarding the control measure of constraints that reduce the productivity of taro crops in the study area, since there was no significant damage observed in the study area and hence low attention is given by office of agriculture on the control measures of diseases and pests and other factors. But still the farmers are aiding by extension advice of developmental agents on tuber crop production. There is no doubt that collaboration and regional networking for taro crop improvement research has been made and continues to be beneficial, as per needs of the countries/ in the various regions and realizing the difficulties they face in operating or maintaining effective research programme commensurate with their infrastructure and facilities (Iyagba, 2010).

Conclusion

This study focused on the survey of ethno-botany and utilization of taro crops by rural farmers of bench ethnic groups in Bench Maji Zones, Ethiopia. Accordingly, the taro was cultivated highly by the people for the sake of primary staple food and also for the value of market, ornamental and ecological. This was because the environment is moist which is suited for the cultivation of taro. Taro could be grown easily everywhere mainly in habitat of home garden, farmland and swampy area preferred by farmers to cultivate taro. This needs to be given emphasis for cultivation and encouragement of taro growers and investors for solving the food problems as regional and national level.

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