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Diversity, Use and Conservation of Spices and Condiments in the Home Gardens (Derkuwa) of Konta Special District (Woreda), Southern Ethiopia

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Abstract

This ethnobotanical study documented the diversity and use of spices and condiments growing in Konta special District (woreda), Southern Ethiopia. A total of 61 informants, among them 20 key informants and 4 spice vendors were selected for this study. A total of 120 home gardens were visited. In the home gardens a 2 x 2m quadrat was made and the number of spices and condiments in each quadrat were counted and recorded. A total of 26 species of spices in 24 genera and 15 families were studied. There are predominant herbs (92%) with only two shrubs (8%). Informant consensus on the cultural value of the spices and condiment plants showed that all the informants considered *Zingiber officinale*, *Aframomum corrorima*, *Coriandrum sativum*, *Lipidium sativum*, *Ocimum americanum*, *Piper capense* and *Ruta chalepensis* as the well-known spices in the area. Of the spices and condiments species documented, 16 (60%) of them have also been used in traditional medicine. Informants also identified major threats of spices and condiments in the area. Both cultivated and non-cultivated species of spices and condiments of the district need enhanced development and conservation, as it has been indicated that some of these species are threatened by deforestation.

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Introduction

Biodiversity, the totality of living things, is the product of hundreds of millions of years of evolutionary process (UNEP, 1995). Biodiversity represents diversity at all levels of biological organization – the ecosystem, the species, the organism and the gene (Stuart and Adams, 1990; Pearce and Moran, 1994; Frankel *et al.*, 1995). It is the source of food, fuel, and medicine and contributes to the maintenance of ecological systems (UNEP, 1995). It also includes cultural diversity (UNEP, 1992; Quiroz,

1994; Jain, 2000; Mathewos Agize *et al.*, 2013 a&b). Ethnobotanical information enables us to know the indigenous knowledge on the diverse plant use and traditional management system. Therefore, the effective conservation of indigenous plants also serves to conserve indigenous knowledge (Engels, 2002; Mathewos Agize *et al.*, 2015). Home gardens are clear examples of diversity rich production systems that serve both development and conservation functions (Mathewos Agize *et al.*, 2013b; Mathewos Agize and Lieke 2016; Mathewos Agize *et al.*, 2016). Their contribution to

biodiversity is observed at the levels of ecosystem (natural ecosystems, which contain wild species, are the sources for plant species found in home garden and cultivated fields), species and genes (Eyzaguirre and Watson, 2002). Home gardens can often maintain many more varieties of useful plants and specific types that are not grown on larger scales (Hodgkin, 2002; Zemed Asfaw, 2001).

Ethiopia has a long tradition of using spices, condiments, additives and herbs in its traditional food culture. The peoples of Ethiopia have been very keen in incorporating and integrating new crops into the existing farming complex and into traditional food preparation. In this process the home garden has played important and key roles. Spices and condiments make a significant proportion of home garden plants. there are species of spices including some that occur such as *Aframomum corrorima* and *Piper capense* in the natural ecosystems Keffa (Siegenthaler, 1963; Mathewos Agize and Lieke, 2016), Dawuro (Alemayehu Asfaw *et al.*, 2015; Mathewos Agize, 2015) Dawuro, konta Special District and Gamo Gofa (Mathewos Agize, 2015; Mathewos Agize and Lieke, 2016).

Home gardens are sites for the domestication of wild varieties, for example germplasm for medicinal plants and fuel wood in the home garden largely comes from the natural ecosystem (Bennett-Lartey, *et al.*, 2002; Tesfaye Haylemariam *et al.*, 2009). Therefore, the natural ecosystems, which contain wild species, are the sources for plant species found in home garden and cultivated fields. As a result, home gardens are important centers of experimental cultivation, plant introduction and crop improvement as well as refuges for unique genetic diversity (Engels, 2002). The crops include cereals, fruits, vegetables, oils, pulses, roots/tubers, medicines, spices, condiments, fragrances, fumigants, crafts/implements, dyes, utility, ornamentals and others (Farrington, 1999).

The term spice is used to mean a plant of indigenous or exotic origin, which is aromatic, or has hot, pleasant taste, used to enhance the flavor of foods or to add to them the stimulant ingredients contained in them (cited in EEPA, 2003). Condiment is a substance which is added to the already prepared food to enhance its flavor (Mathewos Agize, 2015). Example, pepper is a spice, mustard, which is made up of ground mustard seeds, vinegar and salt is condiment. The words 'spice' and 'condiment' are used to denote plants or plant products that are used to flavor foods or beverages before, during

or after their preparation (Jansen, 1981; Mathewos Agize and Lieke, 2016). These plant species grow both as wild and cultivated spices and are important in many ways. Their importance could fall into five broad categories: - As a flavoring material, as a source of essential oils, as a source of coloring material, sources of cash income and employment, and diversification of agriculture for export; Of these categories, the first three shows the importance of spices in diets of human beings and the last two show their roles in the country's economy (EEPA, 2003).

Spices are used to season insipid food, such as those mainly of carbohydrate origin in many parts of the tropics, and to add zest to the monotonous diet. They were also used as preservatives and fumigants (Purseglove *et al.*, 1981). Spices were most used in the ancient world as preservatives, perfumes and medicines (Farrington, 1999). Generally spices are native to hot countries (Farrington, 1999) and majority of them are originated in Asiatic tropics (Purseglove *et al.*, 1981).

Ethiopia hosts a number of indigenous and introduced spices. Among the widely grown species; Ethiopian cardamom or 'korerima' (*Aframomum corrorima*), Long pepper (*Piper capense*), buck thorn (*Rhamnus prinoides*) and garden cress (*Lipidium sativum*) are believed to be native spices; with the first three growing along arabica coffee in the southern and south western afro-montane areas of Ethiopia. Ginger (*Zingiber officinale*), black cumin (*Nigella sativa*), bird's eye chilly (*Capsicum frutescens*), coriander (*Coriandrum sativum*), fenugreek (*Trigonella foenum-graecum*), basil (*Ocimum americanum*), dill (*Anethum graveolens*) and fennel (*Foeniculum vulgare*) are introduced spices and currently cultivated in wide areas of Ethiopia. These spices have been introduced in the country since 1500 A.D. Other than the above introduced spices; cinnamon (*Cinnamomum zeylanicum*), black pepper (*Piper nigrum*) and cardamoms (*Elettaria cardamomum*) are recent introduction in the country since 1960s (EEPA, 2003; Mathewos Agize, 2015; Mathewos Agize and Lieke, 2016).

Spices have a deep-rooted history in Ethiopia. Traditional spices such as korarrima (*Aframomum corrorima*), Ethiopian long pepper (*Piper capense*), black cumin (*Nigella sativa*), bishop's weed or Ethiopian caraway (*Trachyspermum ammi*), cumin (*Cuminum cyminum*), sacred basil (*Ocimum basilicum*), coriander (*Coriandrum sativum*), fenugreek (*Trigonella foenum-graecum*), hot pepper (*Capsicum annuum*) and thyme

(*Thymus schimperi*) perhaps have had a profound influence on the course of its history and ancient civilization. As recorded in the old testament of the Bible, their history in Ethiopia goes back to times earlier than the Queen of Sheba (Zenebe Woldu, 2002). In Ethiopia, both the fresh and dried leaves and inflorescences of basil, *O. basilicum* L., are used almost daily as highly appreciated flavoring agents (Jansen, 1981). For Ethiopians significance of spices and condiments can hardly be over estimated. These plant species are needed everyday in the preparation of traditional foods (Injera and wot). In addition, some are used in the preparation of Ethiopian traditional alcoholic beverages, such as, Tella, Tedj, Areki or katikala (Janson, 1981). Furthermore, some others are also used to flavor coffee, tea, and home made bread difo dabo and ambasha, butter, raw dried meat quanta, milk (Zenebe Woldu, 2002). In addition spices are also used to flavor different vegetables and as medicine and perfume (Sebsebe Demissew, 1993). The study was aimed at investigating and documenting the ethnobotanical knowledge of the 'Konta' people focusing on diversity, use and conservation of spices and condiments.

Materials and Methods

Description of the Study Area

The study was carried out in 'Ameya' (the main town of the woreda), 'Cheta (five kilometers far to the south of the main town), 'Chebera' (twenty kilometers far to the south of the main town) and 'Chida' (eighteen kilometers far to the north of the main town) kebeles of Konta special District (Woreda) in southwestern Ethiopia. It is situated at a distance of 447 km from Addis Ababa through Jimma; 544 km from Addis Ababa through Wolaita-Dawuro. The woreda is bounded by Jimma and Keffa zones from the north (Dedo and Menjo woredas respectively); Dawuro zone in the east (Tocha and Esera Districts); Keffa zone in the west (Telo, Cheta and Decha Districts) and Gamugofa in the southeast (Melekoza and Basketo Districts). The study area is located between 36°35' to 36°50'E longitude and 7°03' to 7°15' N latitude (EMA, 1988). The elevation of the study sites is in the range of 1400-2400 meters above sea level (KSWAD, 2002).

The District (Woreda) consists of agroecological zones such as; the H₂ tepid to cool humid mid high lands, H₁-hot to warm humid low lands and M₁-hot to warm moist low lands (MoA, 2000). The growing period conditions are particularly favourable in this zone for rain fed

farming: long and very reliable growing periods allow a high biomass productivity that can still be achieved by available cultivars, yet the presence of sufficiently long dry period allows ripening and harvesting and can keep weeds, pests and crop diseases in check (De pauw and Bruggeman, 1988).

The study area situated partly in the part of south western moist afro-montane evergreen forest. This ecosystem is in most cases characterized by one or more closed strata of evergreen trees. The vegetation in this ecosystem can be further divided into two (Friis, 1992; Sebsebe Demissew *et al.*, 2004). One type includes what is traditionally referred to as the afro-montane rain forest. The forest characteristically contains a mixture of zigba (*Podocarpus falcatus*) broad-leaved species as emergent trees in the canopy including kerero (*Pouteria (Aningeria) adolfi-friederici*). Kerkeha (the mountain bamboo- *Arundinaria alpina*) is also one of the characteristic species. There are also a number of medium-sized trees, and large shrubs. The second type includes the transitional rain forest. The characteristic species in the canopy includes *Pouteria (Aningeria) altissima*, *Anthocleista schweinfurthii*, *Ficus mucosa* and species of *Garcinia*, *Manilkara* and *Trilepisium*. According to the broad vegetations types of Ethiopia (TGE, as cited in Zerihun Woldu, 1999), the vegetation of the District is partly included in dry ever green montane forest and grass land and evergreen scrub. And the vegetation of the study area is observed to be heterogenous which includes short grassland, bush land, wood land and forest. Agriculture is largely confined in the upland areas with forest increasingly restricted to the steepest and most inaccessible slopes. Shifting cultivation is common in the south and southwestern lowlands on the undulating and rolling plains by the residents of the area.

Selection of the study sites, sampling technique and informants

The study was carried out in four kebeles of the woreda (Ameya, Cheta, Chebera and Chida). The kebeles selected randomly among the spice producing kebeles and they are differed in terms of distance to urban market, altitude and socio-cultural back ground. Ameya & Chida are towns in the Woreda; the study was carried around these towns and the other two rural areas. A total of 120 home gardens (30 from each Kebele) were visited. Among these home gardens 50 home gardens (12-13 home gardens in each kebele) were selected for botanical data collection and to record species

abundance. A 2 x 2m quadrat was made in 42 of the home gardens and in the remaining 8 home gardens (because they have relatively large size) two quadrats (each with 2 x 2m) were used, and the number of spices and condiments in each quadrat were counted and recorded.

Households were picked from the Kebeles register book through random picking of the household following the procedure described in Deaton (1998). The informants were farmers who had lived within the study area for ten years and above. Households in each of the kebeles were classed as poor, medium and rich on the basis of the size of the land they have, and involvement in other income generating activities. A total of 50 owners of home gardens, 20 key informants (13 of them are among the owners of home gardens) and four spice vendors were selected randomly. The age range of the informants is from 30 to 73. The selection of the knowledgeable people (Key Informants) was based on unstructured interview with randomly encountered members of the society. Thus, one whose name was mentioned by at least three to five encountered people was selected as a key informant. The study involved 56 men and 5 women informants because of cultural reasons, the men are identified as owners. Home garden owners were informed about the purpose of the study and asked permission to visit their house & home garden as recommended by Vogl and Lukassen (2004).

Data collection method

Botanical data collection

Depending upon information provided by informants all the spices and condiments found in and around home gardens were listed by their vernacular names. Following Begossi (1996), as cited in Vogel and Lukassen (2004), home gardens were surveyed, for every house granting permission, Voucher specimens were collected from the home gardens and seeds were collected from the market. And the spice found exclusively outside the home garden, in this case *Piper capense* was collected from the surrounding area. Following Kent & Coker (1992) a 2x2m quadrat was made in each home garden and within this quadrat the type of spices found, number of individuals of each type and species abundance was documented. For each plant collected-notes were made on the species name and authority, vernacular name, family, habit, diversity, uses and parts used. The collected specimens were pressed, dried and their identification reconfirmed at the National Herbarium

(Ethiopia), Addis Ababa University. Identification of some common and well known species (e.g. *Ruta chalepensis*, *Allium sativum*, *Allium cepa*) was made in the field and the rest were identified at the National Herbarium using taxonomic keys in floras and by comparison with already identified specimens and using Flora of Ethiopia & Eritrea: (Edwards *et al.*, 1997 and 2000), (Hedberg *et al.*, 1989, 2003, 2004 and 2006), and (Hedberg & Edwards, 1995). Doubtful identifications were later on checked with experts at the National Herbarium.

Ethnobotanical data collection

Ethnobotanical data were obtained from four main sources: through guided field walk, home garden survey, crop field survey and market survey. The local people were involved as informants, guides and assistants. The following methods were used to elicit ethnobotanical information: Semi-structured interviews and Market survey.

Data Analysis

Information that was obtained through interviews, observation, preference ranking, paired comparison and informant consensus was summarized, described and tabulated. The ranks given for preferences and paired comparison were summed to find total scores following Martin (1995) and the ranks arranged (to determine the main preferred useful spices in home gardens).

Species abundance values were analyzed using the method described in Martin (1995), calculating for each species relative density which is the number of individuals of one species divided by the total number of individuals of all species in a quadrat and multiplied by 100. Species diversity among the four kebeles was analyzed using Shannon's diversity index (Magurran, 1987). To determine the similarity in species composition spices and condiments among different study areas (studied by other researchers) Jaccard's Coefficient of Similarity (JCS) was used (Rice and Belland, 1982).

Results and Discussions

The Konta people are settled farmers who depend on natural resources derived through direct use from natural habitat and agricultural production. This dependence on plant resources had contributed to their being sources of an extensive knowledge on the use and conservation of

useful flora of the area; mainly of edible plants. Among the many categories of plants used by the people for various purposes are found the spices and condiments.

Most of the people in the study area acquire the indigenous knowledge from their parents. The unwritten, but living oral literature of the people often provides a sensitive reflection of their culture and social value. This can reflect what has been said earlier by Balick and Cox (1996) that traditional societies of the world accumulated a wealth of knowledge as a result of prolonged interaction with the natural world in their surroundings. It is often used as a vehicle for transmitting the history and culture of people from generation to generation, which is in agreement with earlier reports (Aregbeyene, 1996).

The type and position of *Derkuwa* (home garden)

In the study area and home gardens are found universally. The home gardens (*Derkuwa*) of Konta Woreda are mostly irregular structures in shape except for some which are circular or rectangular in shape. The size of the home gardens is also varying and in general in the range of 50m² to 200m².

It is very difficult to determine the size of some home gardens in the study area because they are either connected with the crop fields or are bounded with forests. Those that are fenced are fenced with plants such as *Euphorbia abyssinica*, *Bougainvillea spp.* & the split stems of mountain bamboo (*Arundinaria alpina.*). In the study area the types of home gardens (*Derkuwa*) in relation to the living house include back yard (50%), enclosed yard (1.7%), side yard (40%) and front yard type (10%).

According to Zemedu Asfaw and Ayele Nigatu (1995) reported, extended gardens are common in the south and south west of the country. Though, the average land holding in the Woreda ranges from 1-2 ha, average size of the home garden is in the range of 50m²-200m² (0.5%-20% of the total land holding). According to Brownringg (1985), the size of home gardens can fall anywhere within the range of a few square meters to several thousands. However, this source points out that the sizes of rural gardens are smaller than the areas devoted to other agricultural production. The size of home gardens varies with altitude (the size of home gardens increases with decreased altitude), but the diversity index does not necessarily increase with altitude. In the study area the types of home gardens (*Derkuwa*) in relation to the living

house include back yard, enclosed yard, side yard and front yard type.

The Konta home gardens are characterized as being a dynamic agricultural ecosystem where a high level of diversity in useful plant species (including spices and condiments), domesticated or wild forms are present. This great plant diversity existing in home gardens was acquired through traditional farming system of local people. Hence, the home gardens similar to other traditional home gardens in the country are also elaborated in Zemedu Asfaw (1997), house diverse species of plants.

The study also revealed that although some gardens are not fenced this did not apply to all as there were some that were properly fenced. Those that are fenced are fenced with plants such as *Euphorbia abyssinica*, *Bougainvillea spp.* & the split stems of mountain bamboo (*Arundinaria alpina.*). Farmers in Cheta & Chebera do not properly fence their home gardens because of the fear that they have from looters occasionally visiting the area from far places.

Home gardens in the study area provide a number of services to the local people. The primary function of these home gardens is for quick and easy access to food stuffs as justified by the prevalence of high number and dominance of food plants. Together with these food plants spices and condiments that are used to flavor foods are also produced.

Production of some of the culturally important spices and condiments is mainly on a subsistence basis. These spices & condiments are often intercropped and rarely occupy a significant proportion of the home garden.

Spice & Condiment Diversity in and around the *Derkuwa* of Konta special Woreda

The people in the study area identified 27 species of spices and condiments that are used as food in various ways. Out of these, twenty five species are cultivated while one, *Piper capense*, is non-cultivated and *Elettaria cardamomum* is recently introduced spice. List of spices and condiments found in the home gardens, growth form, and their vernacular name is given (Table 1).

There are a total of 26 species of spices and condiments belonging to 24 genera and 14 families (Table 5). In all the four kebeles, the greatest numbers of species were in

the families of Apiaceae (4 species), Zingiberaceae (4 species) and Lamiaceae (3 species).

Local people in the study area are very knowledgeable on the vernacular names, characteristics and uses of different spices and condiments. All the spices and condiments were reported with their local names.

Among the food crops growing in the Konta home gardens (*Derkuwa*), a total of 27 spice & condiment species in 25 genera and 15 families were recorded. In a similar study carried out in *Daaddegoyo* (Keffa home garden) around Bonga by Feleke Woldyes (2000), 21 species of spices and condiments have been recorded under food plants of the people of Keffa. Zemedu Asfaw and Zerihun Woldu (1997) also conducted a similar study on crop association of Gurage and Welayita home gardens in Southern Ethiopia and their survey showed 20 and 16 species of spices and condiments in Welayita and Gurage respectively. In addition to that, Belachew Wassihun *et al.*, (2003) recorded 6 species of spices and condiments under useful plants in *Danio-Gade* (Home gardens of Gamo) and Mathewos Agize (2015), Mathewos Agize *et al.*, 2013 a&b) reported 43 species of spices and condiments in Dadda/Emeriya (Loma and gena Bosa Districts of Dawuro), in Southern Ethiopia.

As it is observed from the species diversity of these five places, the spice species composition of Konta home gardens is higher than Gamo and Gurage home gardens and in the same range with Keffa and Wolayita home gardens. But the study conducted by the four researchers did not focus specifically on spices and condiments as the result the data does not represent the spice and condiment species diversity of those areas.

In general it was observed that the species diversity (number of species) differs in different sites. For example in Ameya (2100 m.a.s.l) the number of spices and condiment species ranges from 1 to 4 species, in Chida (1800 m.a.s.l) from 3 to 6 species, in Cheta (1600m.a.s.l) from 3 to 5 species and in Chebera (1400 m.a.s.l) from 4 to 7 species, in each home garden.

Konta has highly diversified and favorable environment conducive for the production of exotic and indigenous spices. The present study shows that the Konta people use taxonomically diverse group of spice and condiment in and around home gardens. These spices and condiments play great role in the diet of the local people. As a result the people use large quantities of herbs and

spices in their daily food preparations and thus it has high local demand.

Spices and condiments are not only cultivated for their flavor, in the area, but also for their medicinal values. For example, spices like *Ruta chalepensis*, *Artemisia absinthium*, *Artemisia afra*, *Lepidium sativum*, *Coriandrum sativum*, *Ocimum americanum* are exclusively planted in the home garden for this purpose. They have dual function as a spice and herbal medicine. Food plants that also offer medicine are known as nutraceutical plants. The term nutraceutical implies 'food or parts of food that provide medical or health benefits' (Felice, 1999; Tigist Wondimu *et al.*, 2006). In this study about 60 % of the spice and condiment species produced in the home garden are nutraceutical plants. Gardens that produce coffee, enset and spices usually produce in excess, some of which products are sold for cash. Such gardens are usually larger (found in Cheta & Cheber) and most of the times primarily produce spices for sale. Therefore, locally growing spices and condiments are means of income to the local farmers. It has contributed a lot in the livelihood of Cheta and Chebera farmers and it is also the most important supporter of the economy of the Woreda in many respects. But there are also farmers known as gatherer of forest products, they are among the poorer members of the community. In the Konta markets, especially in the market days (mostly once in a week) it is possible to see wholesale exchanges of bulk produce (such as ginger, false cardamom, long piper and hot pepper) for distribution outside the Woreda. It is also possible to find many retailers who sell small quantities of both imported and local spices and condiments. The general area is found at the center of the spice zone or the spice belt of the country.

Most frequently occurring plants of the home gardens of Ameya, Cheta, Chebera and Chida

During the home garden survey numerous food and non-food plants (shade trees and shrubs, & other utility plants) were observed in the study area. Among these plants those that are dominant & frequently occurring in most of the home gardens, selected for this study, were recorded includes *Ipomoea batatas*, *Enset ventricosum*, *Coffea arabica*, and *Saccharum officinarum*.

Plants such as *Gossypium barbadense*, *Cucurbita pepo*, *Croton macrostachyus*, *Brassica carinata*, *Nicotiana tabacum*, *Annona squamosa*, *Cordia africana* and *Manihot esculenta* are found in a very few home gardens and others (listed in appendix VI) are found only in a

single home garden that are selected for this study. *Enset ventricosum*, *Coffea arabica*, *Colocasia esculenta*, *Carica papaya*, *Ipomoea batatas*, *Moringa stenopetala*, *Saccharum officinarum* and *Musa paradisiaca* were present in >50% of the home gardens sampled for this study in all the four kebeles of the Woreda.

The local people cultivate these spices and condiments in their home gardens and crop fields to satisfy their subsistence and commercial needs. They also harvest some of the spices and condiments from the wild (the natural forest). Assessment of the habits of the spices was made, which revealed that 25 spices and condiments (92% of them) are herbs whereas two of them are shrubs. Most of the spices and condiments plant species were found to be multi-purpose and were reported as they are used as a traditional medicine. People in Konta commonly use traditional medicines because they do not have free and easy access to modern medicine and they retain rich knowledge of the uses of medicinal plants. Species composition and abundance in each garden also vary according to personal preference and size of home garden. Total number of spice and condiment species encountered and over all species diversity of each Kebele calculated using Shannon diversity index.

In the study area, it shows that relatively high diversity is found in Chebera (2.816) & Chida (2.717). In Chebera and Chida Kebeles farmers tend to plant spices to generate income and this increases the diversity of spices and condiments in the home garden. Expansion of other cash crops (such as *Saccharum officinarum*, and *Coffea arabica*) in and around home gardens decreases the diversity of spice plants in home gardens. As a result diversity indices show that spices and condiments species diversity is relatively low in Ameya kebele. Those that are culturally important and have no significant value in the market (Such as *Artemisia afra*, *Artemisia absinthium*, *Cyperus esculentus* and *Anethum graveolens*) are very few or absent in Cheta and Ameya.

Uses of the spices and condiments and their preparation

Spices and condiments growing in Konta and their use

Plant parts used and mode of preparation

Assessment on plant parts utilized reveals that the arial parts are the most commonly used, accounting to 30% of the total recorded spice and condiment plants followed

by seed (22%), fruit (15%), leaves (15%), root (11%) and bulb (7%).

The seeds and roots of the spices and condiments are used in dried and ground form. Often the fresh leaves of *Ruta chalepensis*, *Mentha spicata*, *Anethum graveolens*, *Artemisia afra*, *Foeniculum vulgare* are used as condiments in the form of pot herbs. The bulbs of *Allium cepa* and *Allium sativum* are used in both the fresh and dry form. The fresh bulb of *Cyperus esculentus* is added (after mild crushing) as a condiment in coffee. *Capsicum annum* and *Capsicum frutescens* are used green as fresh vegetables or red in dried and ground form (usually mixed with other spices and condiments). *Z. officinale* is cultivated for the spicy rhizome and used in the dried and powdered form.

Quantitative results of Ethnobotanical Data

Preference ranking for eight useful spices in the home garden

In this study, eight useful spices of home gardens were selected with the assistance of key informants. Each key informant was asked to arrange the useful spices according to personal preference. Then, the most important or preferred useful spice was assigned the highest number (8) and the least preferred was assigned the least number (1). These numbers were summed up for all respondents. The Preference ranking for eight useful spices in the home garden showed that *Zingiber officinale* (Jenjelo) is the most preferred followed by *Allium sativum* (Tumo), *Capsicum annum* and *Aframomum corrorima* in that order. *Allium cepa* and *Coriandrum sativum* are preferred in the 5th & 6th while *Brassica nigra* is the least preferred by respondents.

Lists of five locally useful spices identified with the assistance of the key informants were arranged in ten possible combinations from the relation $n(n-1)/2$; where n are five in this case. The order with in each pair was randomized before every pair was presented to the selected informants. Then, 20 key informants were asked to identify the one that they prefer from each pair presented to them and the results were recorded.

Based on the responses of the respondents *Zingiber officinale* with a total score came in the first rank followed by, *Allium sativum*, *Capsicum annum*, *Coriandrum sativum* and *Aframomum corrorima*. This is similar partly, with what is obtained in preference ranking.

Fig.1 Map of the study area

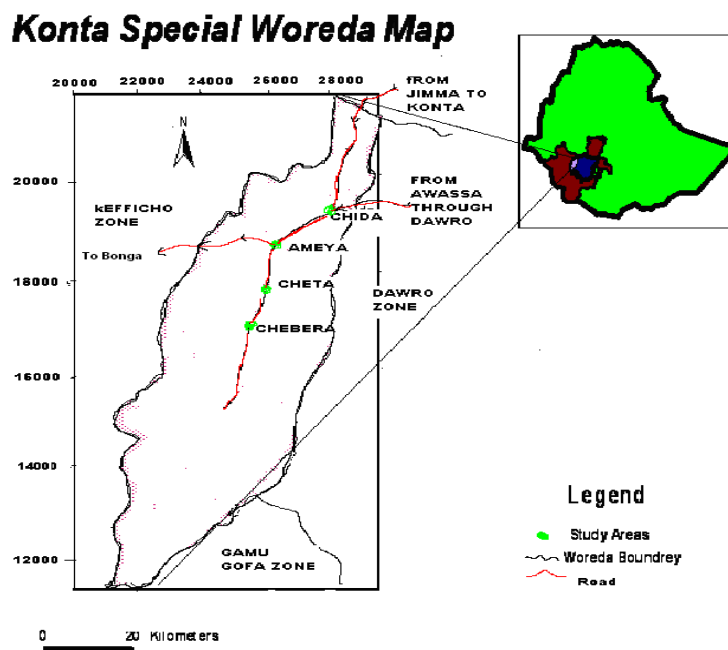


Table.1 Spices and condiments found in and around the home gardens of Konta special Woreda

Scientific name	Family	Vernacular name	Growth form
<i>Aframomum corrorima</i> (Braun)Jansen	Zingiberaceae	Okashe	Herb
<i>Allium cepa</i> L.	Alliaceae	Sunquruto	Herb
<i>Allium sativum</i> L.	Alliaceae	Tumo	Herb
<i>Anethum graveolens</i> L.	Apiaceae	Shilara	Herb
<i>Artemisia absinthium</i> L.	Asteraceae	Natero	Herb
<i>Artemisia afra</i> Jacq. Ex. Wild.	Asteraceae	Agupa	Herb
<i>Brassica nigra</i> L. var abyssinica	Brassicaceae	Senafeayefa	Herb
<i>Capsicum annuum</i> L.	Solanaceae	Benbere	Herb
<i>Capsicum frutescens</i> L.	Solanaceae	Mitsmita	Herb
<i>Coriandrum sativum</i> L.	Apiaceae	Debo	Herb
<i>Curcuma domestica</i> Val.	Zingiberaceae	Irdii	Herb
<i>Cymbopogon citratus</i> (DC) Stapf.	Poaceae	Bunchecha	Herb
<i>Cyperus esculentus</i> L	Cyperaceae	Bidare	Grass
<i>Foeniculum vulgare</i> L.	Apiaceae	Shilara	Herb
<i>Lepidium sativum</i> L.	Brassicaceae	Selpa	Herb
<i>Mentha spicata</i> L.	Lamiaceae	Masho	Herb
<i>Nigella sativa</i> L.	Ranunculaceae	Kresa sewa	Herb
<i>Ocimum americanum</i> L.	Lamiaceae	Dunkiya	Herb
<i>Piper capense</i> L	Piperaceae	Tunja	Herb
<i>Rhamnus prinoides</i> L' Herit	Rhamnaceae	Gasha	Shrub
<i>Ruta chalepensis</i> L.	Rutaceae	Tselotiya	Herb
<i>Thymus schimperi</i> Ronninger	Lamiaceae	Zenbano	Herb
<i>Trachyspermum ammi</i> (L.) Sprague ex Turrill	Apiaceae	Bosa sewa	Herb
<i>Trigonella foenum-graecum</i> L.	Fabaceae	Shuqua	Herb
<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Jenjelo	Herb

Table.2 Uses of the spices and condiments growing in Konta

<i>Species</i>	<i>Parts used</i>	<i>Use</i>
<i>Aframomum corrorima</i>	<i>Capsule</i>	<i>As a spice in butter & WOT (local sauce) making and Preparation of other spices</i>
<i>Allium cepa</i>	<i>Bulb</i>	<i>Spice in the preparation of local food & other spices</i>
<i>Allium sativum</i>	<i>Bulb</i>	<i>Spice & medicinal</i>
<i>Anethum graveolens</i>	<i>Arial part</i>	<i>Condiment in local alcoholic drink (KATIKALA) making & medicinal</i>
<i>Artemisia absinthium</i>	<i>Arial part</i>	<i>Condiment in coffee & medicinal</i>
<i>Artemisia afra</i>	<i>Leaves</i>	<i>Mainly medicinal & condiment in coffee</i>
<i>Brassica nigra</i>	<i>Seed</i>	<i>A spice in which young shoots & leaves are used as cooked vegetable</i>
<i>Capsicum annuum</i>	<i>Fruit</i>	<i>Spice</i>
<i>Capsicum frutescens</i>	<i>Fruit</i>	<i>Spice</i>
<i>Coriandrum sativum</i>	<i>Arial part</i>	<i>Spice & medicinal</i>
<i>Curcuma domestica</i>	<i>Rhizome</i>	<i>Spice in mild sauce (ALICHA WOT)</i>
<i>Cymbopogon citratus</i>	<i>Leaves</i>	<i>Condiment in tea & medicinal</i>
<i>Cyperus esculentus</i>	<i>Tubers</i>	<i>Condiment in coffee & medicinal</i>
<i>Elettaria cardamomum</i>	<i>Fruit</i>	<i>Spice</i>
<i>Foeniculum vulgare</i>	<i>Arial part</i>	<i>Condiment in local alcoholic drink (KATIKALA) Making and medicinal</i>
<i>Lipidium sativum</i>	<i>Seed</i>	<i>Spice & medicinal</i>
<i>Mentha spicata</i>	<i>Leaves</i>	<i>Condiment in tea</i>
<i>Nigella sativa</i>	<i>Seed</i>	<i>Spice & medicinal</i>
<i>Ocimum americanum</i>	<i>Leaves</i>	<i>Used as condiment in mild sauce</i>
<i>Piper capense</i>	<i>Spike</i>	<i>Spice</i>
<i>Rhamnus prinoides</i>	<i>Stem & leaves</i>	<i>Condiment in the local mild alcoholic drink</i>
<i>Ruta chalepensis</i>	<i>Arial part</i>	<i>Condiment in coffee & tea, medicinal & used in the preparation of other spices</i>
<i>Thymus schimperi</i>	<i>Arial part</i>	<i>Condiment in tea & medicinal</i>
<i>Trachyspermum ammi</i>	<i>Seed</i>	<i>Spice</i>
<i>Trigonella foenum-graecum</i>	<i>Seed</i>	<i>Spice & medicinal</i>
<i>Zingiber officinale</i>	<i>Rhizome</i>	<i>Used as a spice in food, tea & it is also used in combination with other spices; it is also medicinal.</i>

The clustering of respondents in the same groups could be due to similar age and life style. The results from paired comparison and preference ranking gave partly similar sequence of the species. The top three spices are the same and are ranked from 1-3 in the same order.

Informant consensus

Informant consensus on the cultural value of spices and condiment species was recorded and the following results were obtained *Aframomum corrorima*, *Allium cepa*, *Allium sativum*, *Artemisia absinthium*.

Seed production has virtually remained in the hands of the farmers, although seed sale in markets is common.

Most seeds of traditional spices and condiments are obtained locally from other members of the community or the local market.

Traditional seed exchange is commonly practiced in Konta woreda. The seeds and planting materials brought from out side or the forest are obtained largely through exchange within the community. The owners of home gardens have traditional knowledge and experience on selection of seeds/ seed pieces for their garden.

Recently, an introduction of improved varieties of exotic spices such as *Elettaria cardamomum* and *Curcuma domestica*, and local spices such as *Capsicum annuum* and *Zingiber officinale* has been attempted by the

Woreda agricultural desk. As most respondents agree, unless the local seed (provided by the Woreda) represents an improved selection of local spices and condiments farmers will continue to prefer using their own seed, which is available free.

Farmers harvest seeds of local spices and condiments and propagate by using their own traditional knowledge (based on their own preference). Management practices are basically traditional, seeds or seed pieces (portion of rhizomes) are broadcast, no precise spacing being applied. Some of them require extra water (in addition to the rain fall). For these, local farmers have special strategies and this includes production along river (in some cases home gardens stretch up to the river banks) and using supplementary watering (via irrigation).

Traditional home garden management also includes the strategy of cultivating different spices and condiments in different plots of their home garden. For example, spices & condiments such as *Ruta chalepensis*, *Ocimum americanum*, *Artemisia absinthium*, *Cymbopogon citratus*, and *Thymus schimperii*; known for their fragrant smell are usually planted near the cattle pen to buffer the bad smell produced from the cattle dung.

Farmers' perception of threats to the spices & condiments and their wild relatives

A number of threats of spices and condiments were mentioned by the key informants.

Deforestation, displacement of spices by fruits and other crops, pests, unwise methods of harvesting and grazing by domestic animals respectively are some of the major threats of spices and condiment plants in the study area.

Cultivated spices and condiments and those in the wild are faced with many threats. It is possible to see that deforestation and displacement of spices with fruits and other cash crops are the major threats to the spice and condiment diversity in the area. The preference rankings of the threats accorded the highest rank to deforestation similar conclusions were reached by Ensermu Kelbessa *et al.*, (1992) regarding the threats on endemic species of Ethiopia and Okafor (1997) regarding endemic food plants of Nigeria.

In addition to that the recent policy that has given priority to growing crops and fruits that suits urban tastes, or that offer a potential for income generation this has resulted in the decline of some culturally important

spices and condiments. The structure and feature of home gardens in the study area are influenced by commercial plants and home garden owner's needs. Farmers tend to cultivate crops that generate cash for their immediate needs, in their home gardens. For example, farmers around Ameya & Chida towns cultivate fruits (such as *Musa paradisiaca*, *Carica papaya*, and *Mangifera indica*) and crops, other than spices (such as *Coffea arabica*), in a large proportion of their home garden, as cash crop. This approach affects not only the structure but also species diversity of home gardens. Several people caution that there is a potential danger of diversity loss. The main threat of plant species diversity loss stems from commercialization of home gardening (Abdoellah, 1990; Christanty, 1990). Otherwise the impact of threat resulting from deforestation is mitigated by cultivating these plants in the home gardens and crop fields. Variation in the number of spices and condiments in the study area is also the result of difference in an individual interest.

Some of these threats are responsible in affecting spice and condiments production in the area from the forest (deforestation, grazing and unwise method of harvesting), and some others are responsible in affecting maintenance of these plants in the home garden (pests and displacement of spices with fruits and other crops).

Traditional conservation system (on farm conservation) by Konta people has been a common practice for long time. The local people have indigenous knowledge to manage useful spice and condiment species in their home gardens. This can agree with what has been said by Maheshwari (1988), that traditional management system not only helps to know more about the use of the plants concerned but also gives clue to their future development, *insitu* and *exsitu* conservation and sustainable use.

The presence of some spices and their wild relatives such as, *Piper capense*, *Aframomum corrorima*, and *Rhamnus prinoides* were recorded by Meseret Ademasu (2006), in the forest (Chebera churcuhra National Park) found in the study area. This also agrees with the statement in (M.Lock) that *Aframomum zambesiaceum* (wild relative of *Aframomum corrorima*) grows in forests usually in river valleys; 1460-2000m of Keffa and Illubabor; not known else where and *A. alboviolaceum* also grows in open, well-drained wood land and grass land; 1200m of Keffa. With increasing pressure on the wild habitat / the forest / due to demographic and socioeconomic changes, the shade trees that favor the growth of shade loving

spices are fast disappearing with the forest. Efforts to conserve indigenous spices of local area (that are mainly growing under forest shades) have been made by the local farmers, by planting, for example *Aframomum corrorima* in their home garden and crop field and *Piper capense* at the margin of their farm yard. Therefore, traditional management provides a favorable condition for increasing the species diversity in home gardens. The farmers enrich the diversity of their garden by protecting and introducing, useful spices and condiments from the surrounding forests. This conservation of genetic diversity in its natural environment-the farmer's field is termed insitu/ onfarm conservation.

Market Survey

The list of spices and condiments seen in the large local markets of the Woreda (Ameya and Chida). The data were collected from four local spice vendors (two from each market) using semi- structured interview. According to the responses of these informants, spices and condiments do not have fixed price in the local market *al.*, the time. In general locally growing spices & condiments have low price from November to January (It is the time next to the harvest of the spices & condiments in the area). If there is high production of a particular spice in the area then its value drops down. In some other time when there is high demand of that spice in the local market the farmers fail to bring what they have produced to the local market. Instead the local farmers take their products to neighboring woreda (known for their high spice production) or sell it to the vendors coming from other zones or regions. Long-distance traders go to the local farmers and buy spice and condiments produced by the local farmers and take to the far distance places such as Jimma, Addis Ababa and Welayita Sodo. Part time vendors (they themselves are local farmers) buy spices from poor farmers and take to the neighboring spice producing Woredas and sell it there. As observed in the local market the local spice & condiment vendors do not have standard measuring instruments to determine what they sell.

As the local spice vendors agree, not all spices that are growing in the home garden are sold in the local market. Spices and condiments such as *Anethum graveolens*, *Artemisia afra*, *Cyperus esculentus*, *Foeniculum vulgare* and *Mentha spicata*, though they have socio-cultural significance, do not have market value.

In addition to the locally domesticated spices and condiments imported spices (brought from other area)

and those that are harvested from the wild are also displayed in the market to be sold.

Only imported products are found in the market as this spice species is not produced in Konta or any where in Ethiopia.

All families in the four study sites practice home gardening. Home gardens in the broad sense are a basic agroecosystem in the area studied. The structure of home gardens and the farming practice allowed the maintenance of a considerable number of varieties of useful spice and condiment species actively by cultivation.

Some gardens in the study area produce spices in excess and usually sell them for cash. Such gardens are usually larger (found in Cheta & Chebera) and most of the times primarily produce spices for sale. These spices and condiments in addition to their use as food flavoring agent they are also used, locally as herbal medicines.

There are a number of problems related with spice production in this area:-

Deforestation and hence indiscriminate devastation of wild relatives of spices & condiments and non-cultivated spices with the natural forests. For example, the wild relatives of *Aframomum corrorima* (Gelesho okashe, Monkey's korerrima) and of *Piper capense* (Gelesho Tunja, Monkey's long pepper) are fast disappearing with the forest.

No comprehensive information regarding distribution of these plant species in different

Kebeles of the Woreda are available

Replacement of culturally important spices with fruits and cash crops

Both cultivated and non-cultivated species of spices and condiments of the Woreda need enhanced development and conservation, as it has been indicated that some of these species are threatened by deforestation.

Traditional conservation systems could be enhanced and developed in a scientific context and activated to safeguard these resources. For these, it is advisable to:-

Identify wild relatives of spices and condiments under threat.

To encourage more home and village level conservation.

To increase their potential through breeding / selection.

To encourage farmers plant large trees in the vicinity of living quarters (It is very important to the shade loving spices).

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