
Production Status and Relevance of Anchote (*Coccinia Abyssinica* (Lam.) in Ethiopia: A Review

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ABSTRACT: A review was undertaken to obtain the related research results and facts on the production status and relevance of Anchote (*Coccinia abyssinica* (Lam.)) in Ethiopia with the aim of delivering the synthesized and summarized information to the beneficiaries. Anchote (*Coccinia abyssinica* (Lam.) Cogn.) belongs to the family cucurbitaceae is indigenous to Ethiopia. It is grown for its edible root tuber and leafy vegetables in western and south western parts of Ethiopia. The most economical part of Anchote is the tuberous root with diversified potentials of food, animal feed, medicinal and starch production, that will contribute towards food security, income generation, and resource base conservation. According to the existing tradition, the suitable production area of Anchote is believed to be the home garden which strategically reduces the burden for women who are actively engaged in the cultivation of Anchote. An improved understanding of the production, utilization, and estimated future economic importance of these crops has potentially far-reaching implication in research and development areas at both the international and, national levels.

KEYWORDS, Anchote, *Coccinia abyssinica*, benefits, production

INTRODUCTION

Ethiopia is the center of origin and diversity for *Anchote* (*Coccinia abyssinica*) (Lam.) (Cogn.) where it has been cultivated by farmers for centuries specifically in south and southwestern parts of Ethiopia (Abera, 1995; Amare, 1973). *Anchote* is found both as cultivated and in wild form with sporadic distribution (Endashaw, 2007; FAO, 2007; Girma & Hailu, 2007). The plant is adapted to grow in an altitudinal ranging from 1300 to 2800 meter above sea level with an estimated annual precipitation range of 762- 1016 mm (Amare, 1973). *Anchote* is however cultivated mainly in Western part of Ethiopia in Oromia Region for long time and has diversified uses as a traditional and medicinal plant (Habtamu & Kelbessa, 1997 as cited by Ayalew, 2016). In Western Oromia Zone, *Anchote* is one of the major root and tuber crops cultivated on nearly 300 ha of the land yielding on average 10-15 t ha⁻¹ and produced for food, cultural, social and economic purposes for the communities (Abdissa, 2000; Guma, *etal*, 2015).

According to Desta (2011), the most economical part of *Anchote* that is the tuberous root with diversified potentials for food, animal feed, medicinal and starch production, that will contribute

towards food security, income generation, and resource base conservation. Women also have a big role in preserving the seeds in good condition without deterioration of the quality of seeds. In Oromo society, women store the seed of *Anchote* in either clay or wooden pots. This will have an advantage for maintaining the shelf life of the seed as per desired level. Usually, women have an exclusive role in production and postharvest handling of the crop during harvesting, seed extraction, storage, and making it available for sowing in the next growing season (Abera, 1995). According to the existing tradition, the suitable production area of *Anchote* is believed to be the home garden which strategically reduces the burden for women who are actively engaged in the cultivation of *Anchote* (Girma & Hailu, 2007). Appreciating the importance of *Anchote* for women, (Abera,1995) brought forward that woman in rural community get monetary terms as well as entrepreneurial terms in decision making and management from *anchote* cultivation. An improved understanding of the production, utilization, and estimated future economic importance of these crops has potentially far-reaching implication in research and development areas at both the international and, national levels (Ayalew,2016). Two an-chote cultivars are known locally as red and white, based on the tuber color (Tileye 2020).

Anchote [*Coccinia abyssinica*(Lam.) Cogn.] is a tuber crop cultivated for human consumption in the South-western areas of Ethiopia. *Anchote* belongs to the *cucurbitaceae* family and *conccinia* genus having over 30 *species*, about eight of which are believed to occur in Ethiopia (Mengesha *et al.*, 2012; Bekele *et al.*,2013; Fekadu *et al.*, 2013; Yambo and Feyissa, 2013; Yassin *et al.*, 2013). Among the other root crops grown by Ethiopian farmers, *Anchote* is less popular, particularly in the central and south Eastern areas of the country.

Suitable Ecology for *Anchote* Production

In Ethiopia, *anchote* is naturally grown in all regions (Amhara, Oromia, Southern Nations, Nationalities and People's Region, and Tigray). It grows at elevation 1300– 2800 m and on different kinds of soil types (on limestone, sandstone, black soil, chromic nitisol, loam, on deep to shallow soil) (Daba *et al.* 2012). Apart from cereals and pulses, Ethiopian agroecosystems are highly suitable for the production of high-quality roots and tubers. Getahun (1973) listed about 30 edible starchy root and tuber crops from Ethiopia. According to Mekbib and Deresa,2016, production of *anchote* still depends on local varieties maintained by farmers. The authors did not consider the newly released anchote varieties by Research center like DebreZeit Agricultural Research Center. The crop is believed to have enormous genetic diversity, since it is indigenous and have been cultivated by native farmers for a long time (Abera and Gudeta,2007). Studies confirmed the existence of wide phenotypic variation in the species of *anchote* that provides good opportunity for genetic improvement of the crop through breeding (Fekadu, 2014). Tolera (2017) identified both common and rare morphological traits in different *anchote* accessions that indicate its broad genetic diversity and undergoes both sexual and asexual reproduction by seed and vegetative root, respectively. The same study also noted that flowers of separate sexes on the same plant with male flowers blooming earlier and this simplify cross-pollination. These double functions (sexual vs. asexual reproduction and separate male/female flowers) provide opportunities for breeding to improve the agronomic performance of the crop. *Anchote* grows principally for its tuberous root named 'Ancootee' in Afan oromo. Its leaf is edible as a cooked

green vegetable, which makes it a multipurpose crop. Oromo people, mainly women produce *Anchote* in their backyard. Despite this, adequate attention has not been given to the plant as food crop for a long period of time (Daba et al., 2012; Girma & Hailu, 2007; Yambo & Feyissa, 2013). Hence, *Anchote* still remains as one of the most underutilized root and tuber crops in Ethiopia. *Anchote* yield strongly responds to soil fertility, especially to wood ash (Wayessa 2018). Although slash and burn is commonly practiced, farmers also use cattle manure. Gradual reduction in the availability of cattle manure forces using chemical fertilizers (Ta'a 2002; Wayessa 2018).

Nutritional contribution of *Anchote*

Nutritionally, *Anchote* has appreciable nutritional composition mainly of protein and calcium (Desta, 2011; Habtamu et al., 2013; Habtamu & Kelbessa, 1997). *Anchote* is a good source of carbohydrates, proteins, minerals and fibers. Its protein content is by far greater than other root crops (Ayalew,2016). It is also rich source of calcium, which is an important constituent of human bones and teeth (Abera and Haile,2015, Shebabaw,2013). It was reported that the nutrient concentrations in *anchote* tuber are by far higher than that found in equal weight of potato (*Solaniumtuberosum* L.), yam (*Dioscoreaabyssinica*) cassava (*Manihotesculenta* Crantz) tubers (Parmar *etal*,2017, Abera and Haile,2015).

Importance of *Anchote* for food security

Leafy vegetables are the cheapest and most abundant source of proteins because of their ability to synthesize amino acids from a wide range of virtually available primary materials such as water, carbon dioxide, and atmospheric nitrogen as in legumes (Aye, 2012). Leaf proteins can be considered as the world most abundant protein source which is synthesized with a direct and efficient utilization of solar energy (Fasuyi & Aletor, 2005; Kung *et al.*, 1980). Leaf protein concentrates (LPCs) also have a favorable amino acid composition which could be used effectively to supplement traditional cereal-based diets used in most developing countries (Dewanji *et al.* 1997). According to Ayalew *et al.* (2017), *anchote* contains good quality protein composition and it can be used as a source of essential amino acids (Leu, Ile, Thr, SAAs, and AAAs) which are found in adequate amount to enhance protein quality especially when preparing plant-based complimentary food products. So, it is possible to conclude that *anchote* has reasonable quality of nutrients especially in composition. Therefore, it is a potential and promising source of nutrients that can be used in food formulations.

Anchote has appreciable amount of protein in its leaf, and can be good source for production of leaf protein concentrate for human food as well as animal feeds. In addition, the tuber and leaf of *Anchote* also can be used as a food ingredient and for new food product development since the nutrient composition of *Anchote* showed us its potential for different food formulation, specifically with its high protein content (Ayalew,2016). Recognizing the nutritional importance of *Anchote* (Bekele *etal*,2014, Wayessa,2018, Tileye,2020,) indicate that its young leaves cooked used as vegetable. The study conducted by (Hora,1995) and (Bekele,2007) revealed that *anchote* is used by the local inhabitants to prepare a variety of food items for traditional ceremonies, special food for guests, and for animal fattening. For tuber and root crops, Walingo (2009) recommended the importance of proper processing before consumption in order to reduce the effect of anti-

nutritional factors and to improve nutrient availability. Fekadu *et al.* (2013) reported that peeling before cooking is more effective for availability of some nutrient and mineral contents. Currently, *anchote* meals are often found in hotels in the cities and towns of Oromia, which spreads the knowledge about this plant (Wayessa 2018). Moreover, *Anchote* could serve as a potential plant food to alleviate protein-energy malnutrition by providing useful nutrients to the diet. Based on the existing evidence, both tubers and leaves are nutritious which makes *Anchote* a double purpose crop and hence can serve as a potential plant food for the indigenous inhabitants of *Anchote* growing areas to ensure food and nutrition security. *Anchote* is also rich in quality protein and can provide essential amino acids as source of protein supplement for all age groups in order to meet the recommendations of WHO/FAO/UNU (Ayalew,2016). The unique characteristics of the plant is the edibility of its different parts such as its tuber, leaf, and fruit which makes the plant ideal as potential food security crop (Amare 1973; Endashaw 2007; Desta 2011).

***Anchote* as Medicinal Plant**

From medicinal point of view, *Anchote* plays important roles in the customs and tradition of the western part of Ethiopia as it is used for healing of broken and/or fractured bones as well as dislocated joints (Abera, 1995; Amare, 1973; Endashaw, 2007). Traditionally the tuber is also used by lactating mothers and sick people to recover their health and strength (Habtamu & Kelbessa, 1997). There are so many anecdotal and observation evidences that *Anchote* has high medicinal values in addition to its nutritional, cultural values and socio- economic importance. Amare (1976) reported Coccinia. Abyssinica tuberous root is used as medicine by traditional practitioners and dietary food in south and south western parts of Ethiopia. In addition, Engels and Hawkes (1991) reported the lists of medicinal plants of Ethiopia and among which *Anchote* is one. The authors reported that the juice produced from *anchote* tuber contains saponin and this compound is used to treat disease such as gonorrhoea, tuberculosis and cancer. *Anchote* plants' tuber extract was used in the green synthesis of zinc oxide nanoparticles (ZnO Nps), which is being tested for its antibacterial and antioxidant activity (Safawo *et al.* 2018). The antimicrobial activities of the synthesized ZnO Nps were evaluated against several pathogenic bacteria, including Staphylococcus aureus and Salmonella typhimurium. Moreover, ZnO Nps showed free radical scavenging activity.

CONCLUSIONS AND RECOMMENDATION

Anchote (*Coccinia abyssinica*) is an endemic root tuber crop of Ethiopia and grown for edible vegetable roots and leaves in western Ethiopia. The crop is rich in nutrients (starch, proteins, ca and p among the others). It is widely consumed by the rural and urban communities in western Ethiopia. There are about ten species found in Ethiopia and among which coccinia abyssinica is cultivated for consumption. The crop has nutritional, cultural and medicinal values. The male and female flowers of *Coccinia abysinaica* is found on separate parts of the same plant which is dependent on insects for cross pollination. *anchote* is naturally grown in all regions (Amhara, Oromia, Southern Nations, Nationalities and People's Region, and Tigray). *Anchote* is a food security crop, used for economic, socio-cultural and medicinal purposes. In the future, like other *Coccinia* sp. fruits of the cultivated *anchote* may be eaten and contains beneficial nutrients

compounds for human health like carotenoids, other macro and micro nutrients and phytochemicals; hence it needs attention with regard to research priorities. Breeding shall consider fruit production parallel to improvement of the tuber yield and quality. One aspects of the tuber quality in breeding should consider its processing quality like time for cooking and taste. On top of that as leafy vegetables, further leaf processing and consumption and its nutrient compositions should be investigated. In the future, *anchote* processing and blending with other food sources for complete diet preparation for infant and adults when mixed with other ingredients and substantiated or corroborated with research findings for technological aspects.

The research extension should make more effort to demonstrate and popularize the crop to all corner of Ethiopia recognizing the importance of the crop. Hence, the following points need due attention in the future to improve *anchote* production, productivity and consumption:

Develop food processing technology packages containing *anchote* food sources for domestic consumption and for export as different snacks like biscuits.

Demonstration and popularization of newly released *anchote* variety by Debreit Agricultural Research Center, which is called D-01 should be carried out to create demand on production and utilization of the crop.

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