Characterization of Major Anchote[*Coccinia abyssinica* (Lam.) Cogn.] Producing Areas of Ethiopia

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Abstract

Characterizing anchote producing areas with agro-ecologies, topography and soil types using updated and latest GIS data infrastructure and Geo-processing and overlay analysis, to determine the suitable areas of production and to use in extension and popularization of anchote to other parts of Ethiopia. The major agro-ecological zones in which anchote is widely grown are identified as tepid sub-humid mid-highlands (32.43%), warm sub-humid lowlands (29.04%), tepid humid mid highlands (9.73%), warm moist lowlands (9.38%), warm humid lowlands (7.49%), and warm per-humid lowlands (6.06%). The area major anchote producing areas cover 124,634 square kilometers. The lowest topography was 396 m a.s.l while the average and highest altitudes were 1590 and 3300 m. a.s.l, respectively. The major soil types were Nitisols (59.80%) and Leptosols. The identification of climatic factors of the major anchote growing areas helps to extended it into Ethiopian agricultural system to advance the the crop to play its role in food and nutritional security.

Key words: Anchote, Under-utilized, Agroecology, topography, soils

Introduction

Anchote, Coccinia abysinica (Lam.) Cogn., is an annual trailing vine belonging to the Cucurbitaceae family best known and grown principally for its tuberous root even though its tender leaves are also widely used as food. The need to promote this neglected and under-utilized crop and safeguard its diversity by characterizing the producing areas is paramount because of its nutritional, agronomic, medicinal, socio-cultural and socio-economic importance for the growers and to promote to the broader similar areas to produce and utilize to attain food and nutritional security and socio-economic advantages to the growers.

Objectives

- To characterize the major anchote producing areas with their climatic conditions for ease of extension and popularization
- To determine the suitable areas of production in Ethiopia.

Materials and methods

The zonal statistics of the climate of the study area was accomplished by using Quantum GIS (Version QGIS 3.24.0 'Tisler') of the QGIS Development Team, (2022) were used from the 2020 version of the Geospatial and Farming Systems Consortium of the Sustainable Intensification Innovation Laboratory. The data taken was at its highest resolution; 30 seconds (~1 km2) – in GeoTiff (.tif) tile for each month of the years averaged from 1970-2018 climate data. The climate data considered were total precipitation(mm), annual temperature($^{o}_{C}$), topography, and soil chemical properties (types and reaction) and analyzed using updated and latest GIS data infrastructure and Geo-processing and GIS overlay analysis. Soil acidity was measured by electrometric method, which involves a glass, H ion sensing (indicator) electrode paired with a reference electrode attached to a suitable meter proportional to pH.

Discussion

The areas receiving similar precipitation; up to 415 mm, with temperature ranges; 5-35 $^{o}_{C}$, in Ethiopia could be potential producers of anchote, though the elasticity of is natural preference remains to be a gap to be filled by research and development. Research results on anchote show it is highly adaptive to alkaline soils with higher yield than on acidic soils (Desta *et al*., 2021).

This result shows the possibility to extend anchote to the irrigated areas of the country as a valuable and food and nutritional security and cash crop.

Results

The lower and higher precipitation across the major anchote producing areas is zero to 415 mm. Across the major anchote producing areas, rain starts in March and April at southwestern and in May at central areas. Higher precipitation (mm) occurs in months of June (75-344), July (64-415), August (75-404), and September (88-315) (Figure 1). The annual minimum, average and maximum temperature ($^{o}_{C}$) of the major anchote producing areas were 5, 15 and 35 respectively (Figure 2). The major anchote producing areas are moderately to strongly acidic and anchote thrived to perform under this difficult soil condition (Figure 3). According to Schlede (1989), about 40.9 % of the Ethiopian total land is affected by soil acidity.

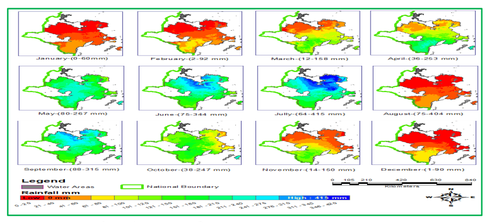

Figure 1. Annual precipitation across major anchote producing areas

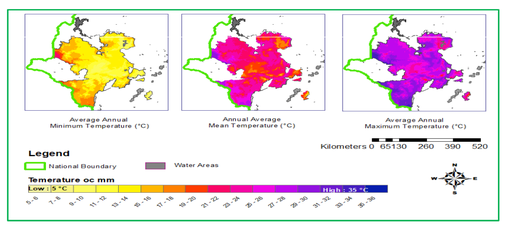

Figure 2. Dominant temperature of the major anchote producing areas

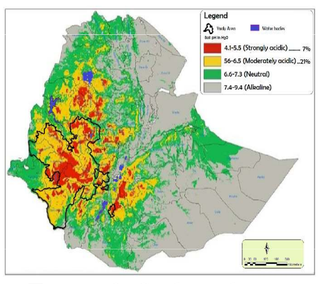

Figure 3. Soil acidity map of major anchote producing areas

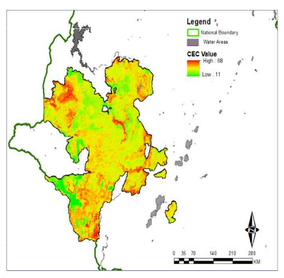

Figure 4. Soil salinity map of major anchote producing areas

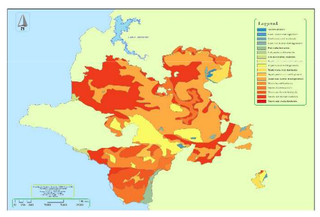

Figure 5 a. Agroecological zones map of major anchote producing areas

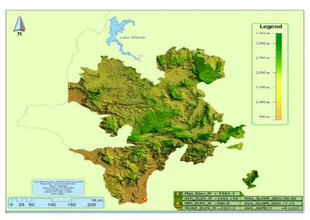

Figure 5 b. Topography map of major anchote producing areas

The major agro-ecological zones of anchote were tepid sub-humid mid-highlands (32.43%), warm sub-humid lowlands (29.04%), tepid humid mid highlands (9.73%), warm moist lowlands (9.38%), warm humid lowlands (7.49%), warm per-humid lowlands (6.06%), tepid moist mid highlands (2.41%), hot moist lowlands (1.29%), and tepid per-humid mid highland (1.23%)(Figure 5 a). Anchote grows well from 396 m a.s.l to 3300 m a.s.l with the average altitude of 1590 m a.s.l though most producing areas lie to 2200 m a.s.l. (Figure 5 b).

Conclusion

The identification of climatic factors of the major anchote growing areas confirms the possibility of production and utilization at broader similar areas of Ethiopia and shows the scope of the crop to be extended in Ethiopian agricultural system to advance the development of the crop to play its role in food and nutritional security as its young tender leaves, young immature fruits and roots are consumable (Figure 6).

Figure 6. Tender leaves, immature fruits and roots of anchote

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