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Ethnobotanical Survey, Consumption Pattern and Genetic Conservation of Leafy Vegetables in South-West Nigeria

Temitope O Onuminya*[1], Michael I Osundinakin[2] and Oluwatoyin T Ogundipe[1]
[1]*Department of Botany, University of Lagos, Akoka, Lagos, Nigeria.*
[2]*Department of Botany, Lagos State University, Ojo, Lagos, Nigeria.*
tadeyemi@unilag.edu.ng, michael2lead@yahoo.com, toyin60@yahoo.com
**Corresponding author, E-mail: tadeyemi@unilag.edu.ng*
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Abstract

Leafy vegetables are important in human nutrition; however, their diversity as seen in the dishes in South western Nigeria appears to be diminishing. Many popular delicacies are no longer available in the markets. Therefore, this research was conducted to identify and document leafy vegetables in South West Nigeria, assess their ethnobotanical uses from questionnaires administered to farmers/sellers, secure their genetic resource base, and improve their value chain in South-West Nigeria. Vegetable samples were collected from different local communities in five South-West states in Nigeria, identified using manual/flora, and authenticated at the University of Lagos Herbarium. One thousand respondents, 200 in each state, participated in the study. Of these, 76.7% were female, while 23.3% were male. A total of twenty-six (26) leafy vegetables were collected. Twenty-one (21) species are indigenous to the study area, while five (5) species are non-indigenous. Ethnobotanical survey on leafy vegetables from farms and markets revealed that *Launaea taraxacifolia*, *Solanum macrocarpon*, *Solanum nigrum*, *Solanum aethiopicum*, *Solanecio biafrae*, *Crassocephalum crepidioides* and *Basella alba* are of high medicinal value. They can be used solely or as a recipe with other leafy plants in the treatment of various ailments including malaria, typhoid, blood pressure, stomach disorder, heart diseases and gastrointestinal tract infections. These vegetable species have been neglected and underutilized by humans. Generally, a low degree of consumption, extent of consumption, and cash income capacity was recorded, with exception to the commonly cultivated vegetables. Extracted DNA from the leafy vegetables yielded good-quality DNA; this has been deposited in the DNA bank at the University of Lagos. This study has documented indigenous knowledge on leafy vegetables in southwest Nigeria and contributed towards ex-situ conservation of the species in the DNA bank.

Keywords: Leafy Vegetables, Ethnobotany, Genetic Conservation, Indigenous knowledge, Underutilized species.

Introduction

Globally, population expansion puts a burden on economic growth, decreases food security and environmental sustainability. The challenge for the future, therefore, lies in global food security that necessitates a doubling of food production in the nearest future to meet the needs of the growing population. In order to attain food security in Nigeria, there is a need to diversify food production and promote a wider range of healthy foods that would ensure sustainable feeding of the populace. Underutilized or indigenous leafy vegetables have high potentials in this regard, being able to contribute to food production diversification

and healthier diets (Ebert 2014). Leafy vegetables are plants whose leaves are consumed primarily for their nutritional values either raw or cooked (Dhellot et al. 2006). They are also known to be good repositories of bioactive compounds hence they are used in curing various ailments (Ayodele 2005). These leafy vegetables are adapted to local food and farm systems after enormous interactions with humans and the environment. Many leafy vegetables are highly nutritious (Odhav et al. 2007, Yang and Keding 2009) and easy to incorporate into farm systems because they require limited space and fit within short rotations (Schreinemachers et al. 2018). They are rich sources of vitamin A, calcium, iron, and folate, which promote good health, strengthen the immune system and protect against disease (Xin 2016). According to Leenders et al. (2013), people who consume more vegetables live longer than those who do not.

In South-Western Nigeria, many leafy vegetables have become underutilized/neglected, limiting mankind to unsafe, inadequate and innutritious food to meet their dietary needs (Adebooye and Opabode 2004). The nutritional and medicinal values of neglected and underutilized leafy vegetables are high in comparison with commonly cultivated ones; therefore they serve as potent reservoirs of nutrients for human consumption. However, the traditional knowledge about indigenous or underutilized vegetables in Nigeria is largely transmitted by oral tradition from generation to generation without any written records. Hence, a need to document the ethnobotanical uses of leafy vegetables.

Several authors have reviewed leafy vegetable in the past decades with a focus on understanding the diversity (Tanimonure et al. 2021), market potential (Ayanwale et al. 2011, Aju et al. 2013), farmers' perspectives (Tanimonure 2021) and medicinal potentials of the vegetables (Ayodele 2005). Similarly, suggestions have been made on various conservation strategies for the species with emphasis on the need to accumulate and conserve the genetic diversity of leafy vegetables in gene banks–a very useful tool for breeding program (Adebooye and Opabode 2004, Ayodele 2005, Tanimonure et al. 2021). Yet, there has not been many efforts towards achieving this in southwestern Nigeria. Hence, a steady decline is observed in the diversity of leafy vegetables sold in various markets within the region.

The introduction of genetically modified organisms has influenced the choice of leafy vegetables planted by farmers due to their newly introduced traits that can withstand the current climate changes (Raman 2017, Tanimonure et al. 2021). However, the diversity of the leafy vegetables gene pool is highly diminishing, thereby, decreasing their availability in the Nigerian South-West region. Hence, the need to conserve their genetic resources for food security and crop improvements.

In this study, the aim was to conduct an ethnobotanical survey, document indigenous knowledge on vegetable uses and conserve genetic materials of the leafy vegetables in a DNA bank. This would serve as the first strategic steps for proper conservation upon which other studies can be based.

Materials and Methods

Sampling and participants

The study was conducted between January and December 2021 in eleven locations across seven local government areas in five southwestern states in Nigeria. The sampling locations were as follows: Ajegunle farm settlement (N 7° 8.731 E 3° 25.782), Osiele market (N 7° 11.566 E 3° 27.029) and Federal University of Agriculture Abeokuta in Odeda Local Government (N 7° 14.147 E 3° 26.163) Ogun State; Ibarapa east farm in Ibarapa local government area (N 7° 31.839 E 3° 25.754) and Oje market (N 7° 23.324 E 3° 54.464) in Ibadan North West Local Government, Oyo State; Omu Panu farm (N 7° 46.147 E 4° 36.701) in Osogbo local government area, Otefun (N 7° 49.129 E 4° 35.238) and Igbona Adele market (N 7° 46.824 E 4° 33.456) in Olorunda Local Government, Osun State; Rufus Giwa polytechnic farm (N 7° 13.845 E 5° 32.991) and Oja Oba farm (N 7° 11.746 E 5° 35.124) in Owo Local Government, Ondo State and

Lagos Mainland Local Government, Lagos Metropolis (N 6° 28' 48.95" E 3° 23' 4.28"). The sampling locations are major towns with different farm communities. The major occupations of these communities include farming and trading of farm produce. Participants who participated in the questionnaire survey were men and women of age 18–60 years.

Data collection and plant validation

Qualitative techniques (focal-group discussions and individual interviews with farmers, vegetable traders, and community members) were used in the questionnaire survey and a total of 200 questionnaires were administered per state. One thousand respondents, 200 in each of the five states sampled, participated in the study. Of these, 76.7% were female, while 23.3% were male. The questionnaires contained local names, ethnobotanical uses, extent/degree of consumption, coordinate and cash income capacity of the vegetables. Ethnobotanical uses of commonly cultivated, neglected, and underutilized leafy vegetables were documented during the interview.

Leafy vegetable samples were collected with all floral parts, pressed, dried, and preserved as herbarium specimens at the University of Lagos herbarium following Radford et al. (1974). The herbarium specimens were identified and authenticated using manuals, floras, and monographs such as Keay et al. (1964), Akobundu and Agyakwa (1998), and Hutchinson and Dalziel (1954, 1958, 1963, 1968, and 1972). Further authentication of the plant samples was done at the Lagos University Herbarium by the curator.

Genetic conservation

Total genomic DNA was extracted from the vegetable samples following the modified CTAB protocol of Doyle and Doyle (1987). About 10 mL buffer solution (a solution of 100 mM Tris-HCL, 1.4 M NaCl, 20 mM ethylene-di-tetra acetic acid, and 2 % hexadecyltrimethylammonium bromide) were poured in labelled Eppendorf tubes and 80 µL of beta-mercaptoethanol was added to the buffer solution under a fume cupboard. The mixture was returned to the water bath for heating. The ground samples were poured into the tubes containing the preheated buffer solution and the mixtures were swirled in order to suspend the slurry. The slurry was poured into the tubes and incubated at 65 °C. Five (5) mL of Sevag solution (960 mL of chloroform and 40 mL of amyl alcohol) was added to the mixtures, mixed gently, rocked on an orbital shaker, centrifuge at 4000 rpm and aqueous (top) phase was transferred into newly labelled Eppendorf tubes. Ice-cold isopropanol was added to each aqueous phase and mixed gently. The solution was kept inside the freezer to precipitate the DNA, spun in the centrifuge, and 3 ml of 70% ethanol was added to dislodge the pellets and facilitate the washing of the DNA samples. The sample was eluted in 30–50 µL of distilled water and kept at -80 ^{o} C for further studies. The quality of extracted DNA was checked by means of electrophoresis in 1% agarose gel and visualized by staining with ethidium bromide under ultraviolet light. It was photographed with the gel documentation system (UVidoc). The quantity of extracted DNA was estimated by determining the absorbance ratio using an Eppendorf biophotometer and measured in ng/µL.

Data analysis

Data collected were grouped and expressed as the frequency and percentage of the vegetable samples using a Graph Pad prism and the geo-referenced points were plotted on a Nigerian map using the ArcMapGIS software.

Results

Distribution of leafy vegetables

Figure 1 shows the distribution and diversity of collected leafy vegetables in Lagos, Ogun, Oyo, Osun, and Ondo States in South-West Nigeria.

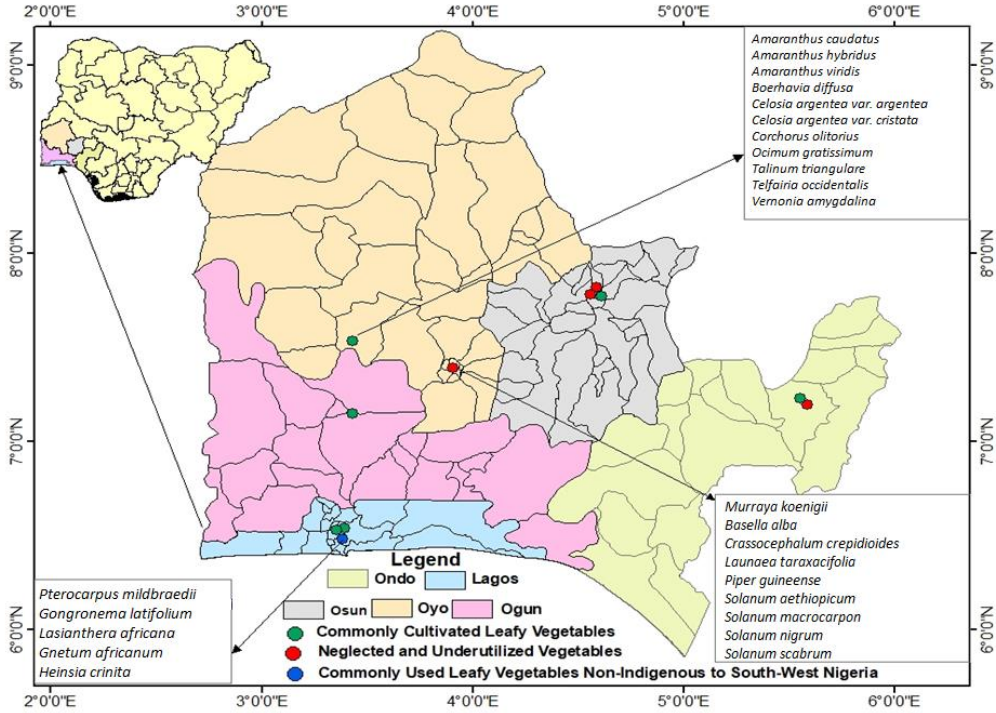

Figure 1: Regions of distribution and diversity of leafy vegetables in South-West Nigeria.

The family Solanaceae (40%) was the most neglected and underutilized vegetables followed by Asteraceae (30%), Basellaceae (10%), Rutaceae (10%), and Piperaceae (10%), while the family Amaranthaceae topped the list of the most commonly cultivated leafy vegetables in South-West Nigeria (Figure 2).

Ethnobotanical uses

Ethnobotanical uses of underutilized and neglected leafy vegetables as documented from farmers, and market women include: treatment of fever, dysentery, cataract, diarrhoea, laxative, constipation, urticarial, wound dressing, cough, indigestion, tonic, ear problem, abdominal pains, bone breakage, ritual rites, stomach disorder, herbal recipe, rheumatism, antimicrobials, sedatives, ringworms, skin diseases, malaria, boils, and diuretic. The major vegetable plant parts that have been used in the treatment of these ailments are the leaves and fruits (Table 1).

Commonly cultivated leafy vegetables in the South-West region of Nigeria have similar ethnobotanical uses as the underutilized ones (Table 2). For instance, *A. caudatus*, *A. hybridus*, *A. viridis*, and *C. argentea var. cristata* are used as a diuretic. Other commonly cultivated leafy vegetable species are used in the treatment of pulmonary infections, eye problems, ringworm, dysentery, cough, skin diseases, smallpox, scabies, stomach disorder, worms, fever, diabetes, piles, high blood pressure, teeth problems, etc.

Some of the leafy vegetables recorded were found to be non-indigenous to the South-West region of Nigeria rather they were introduced to the region by other cultures and they vary in their use (Table 3). Examples include *G. africanum* and *P. mildbraedii* which are majorly consumed and used in the treatment of sore throat, nausea, diarrhoea, and dysentery. Other ethnobotanical uses of vegetables in this group include management of stomach pain, ringworm, malaria, diabetes, ulcer, laxative, headache, and head lice.

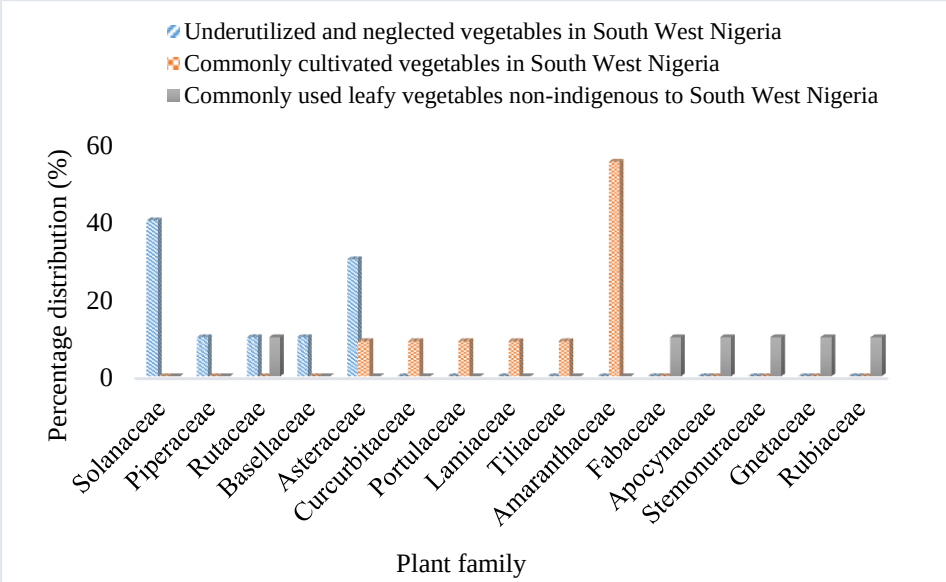

Figure 2: Distribution of commonly cultivated, underutilized and neglected vegetables in south west Nigeria, and commonly used leafy vegetables non-indigenous to South-West Nigeria.

Table 1: Ethnobotanical uses of neglected and underutilized leafy vegetables

Vegetables species	Family name	Local name	Ethnobotanical uses
Murraya koenigii	Rutaceae	Efirin oso	Fever, dysentery, cataract and diarrhoea
Basella alba	Basellaceae	Amunututu	Laxative, constipation and urticarial
Solanecio biafrae	Asteraceae	Worowo	Wound dressing, cough, indigestion and tonic
Crassocephalum crepidioides	Asteraceae	Ebolo	Ear problem, indigestion and abdominal pains
Launaea taraxacifolia	Asteraceae	Yanrin	Bone breakage and to perform some ritual rites
Piper guineense	Piperaceae	Iyere	Stomach disorder, herbal recipe, rheumatism and antimicrobials
Solanum macrocarpon	Solanaceae	Gbagba	Indigestion, sedatives,
Solanum aethiopicum	Solanaceae	Igba	Indigestion
Solanum nigrum	Solanaceae	Odu	Ringworms, skin diseases, malaria and boils
Solanum scabrum	Solanaceae	Ogunmo	Diuretic and treatment of wounds

Table 2: Ethnobotanical uses of commonly cultivated leafy vegetables

Vegetables species	Family name	Local name	Ethnobotanical uses
Amaranthus caudatus	Amaranthaceae	Tete oyinbo (white)	Diuretic and laxative
Amaranthus hybridus	Amaranthaceae	Tete ayekanju	Diuretic and pulmonary infections
Amaranthus viridis	Amaranthaceae	Tete abalaye	Eye problem, ringworm, dysentery and diuretic
Boerhavia diffusa	Amaranthaceae	Tete olowojeja	Cough, skin diseases, smallpox and scabies
Celosia argentea var. argentea	Amaranthaceae	Soko olobe	Stomach disorder and cure scurvy
Celosia argentea var. cristata	Amaranthaceae	Soko shade	Diuretic and cough
Corchorus olitorius	Tiliaceae	Ewedu yaya	Worms, fever, and diarrhea
Ocimum gratissimum	Lamiaceae	Efinrin nla	Stomach disorder, high blood pressure, fever, diabetes, piles and insect repellant
Talinum triangulare	Portulacaceae	Gbure	High blood pressure, scabies and anaemia
Telfairia occidentalis	Cucurbitaceae	Ugu	Blood tonic and stomach disorder
Vernonia amygdalina	Asteraceae	Ewuro	Stomachache, teeth problem, ringworm, diabetes and malaria

Table 3: List of commonly used leafy vegetables introduced to South-West Nigeria

Vegetables	Family name	Local name	Ethnobotanical uses
Pterocarpus mildbraedii	Fabaceae	Oha	Diarrhoea and dysentery
Gongronema latifolium	Apocynaceae	Utazi	Stomach pain and ringworm
Lasianthera africana	Stemonuraceae	Editan	Malaria, diabetes, ulcer and laxative
Gnetum africanum	Gnetaceae	Ukazi	Sore throat and nausea
Heinsia crinita	Rubiaceae	Atama	Headache, craw-craw and head lice

Consumption patterns and cash income capacity of leafy vegetables

Solanum macrocarpon recorded a high (20%) degree of consumption (DOC) and was the most consumed neglected/underutilized leafy vegetable by participants across the sampled south western states. *Solanum aethiopicum* gave the second highest DOC (16%), while *L. taraxacifolia* had the lowest DOC of 1% (Table 4). However, all the neglected/underutilized species recorded a 100% restricted extent of consumption (EOC) and low cash income capacity (CIC).

In the commonly cultivated leafy vegetables documented, *T. triangulare* recorded 100% DOC, while *A. caudatus, C. olitorius, O. gratissimum* and *T. occidentalis* had 98% DOC, respectively. The EOC for *T. triangulare* was country-wide (CW) with a 100% score, followed by *A. caudatus* with CW 96%, *T. occidentalis* with CW 92%, and *C. argentea var. cristata* had the lowest CW of 10%. *A. caudatus, B. diffusa* and *C. argentea var. cristata* recorded a high CIC, while the remaining species had a low CIC (Table 5).

Some of the commonly used leafy vegetables recorded are not indigenous to the region (Table 6). Of these, *H. crinita* had a high DOC (54%), while *G. latifolium* had the lowest DOC (16%) record. The proportion of participants who reported the EOC of *H. crinita* and *L. africana* to be restricted was 96% and this was the highest when compared to other non-indigenous species recorded. All the identified species in this group had a low CIC value.

Table 4: Cash income capacity, degree and extent of consumption of neglected and underutilized leafy vegetables

Vegetables	DOC (%)	EOC (%)	CIC
M. koenigii	Low (94), High (6)	Restricted (100)	Low
B. alba	Low (91), High (9)	Restricted (100)	Low
S. biafrae	Low (93), High (7)	Restricted (100)	Low
C. crepidioides	Low (98), High (2)	Restricted (100)	Low
L. taraxacifolia	Low (99), High (1)	Restricted (100)	Low
P. guineense	Low (91), High (9)	Restricted (100)	Low
S. macrocarpon	Low (84), High (16)	Restricted (100)	Low
S. aethiopicum	Low (80), High (20)	Restricted (100)	Low
S. nigrum	Low (90), (High 10)	Restricted (100)	Low
S. scabrum	Low (98), High (2)	Restricted (100)	Low

DOC = Degree of consumption; EOC = Extent of consumption; CIC = Cash income capacity.

Table 5: Cash income capacity, degree and extent of consumption of commonly cultivated leafy vegetables

Vegetables	DOC (%)	EOC (%)	CIC
A. caudatus	Low (2), High (98)	Cw (96), Restricted (4)	High
A. hybridus	Low (38), High (62)	Cw (76), Restricted (24)	Low
A. viridis	Low (16), High (84)	Cw (68), Restricted (32)	Low
B. diffusa	Low (54), High (46)	Cw (12), Restricted (88)	High
C. argentea var. argentea	Low (40), High (60)	Cw (14), Restricted (86)	Low
C. argentea var. cristata	Low (6), High (94)	Cw (10), (Restricted 90)	High
C. olitorius	Low (2), High (98)	Cw (38), Restricted (62)	Low
O. gratissimum	Low (2), High (98)	Cw (24), Restricted (76)	Low
T. triangulare	Low (0), High (100)	Cw (100), Restricted (0)	Low
T. occidentalis	Low (2), High (98)	Cw (92), Restricted (8)	Low
V. amygdalina	Low (14), High (86)	Cw (64), Restricted (36)	Low

DOC = Degree of consumption; EOC = Extent of consumption; CIC = Cash income capacity; and CW = Countrywide.

Table 6: Cash income capacity, degree and extent of consumption of commonly used leafy vegetables non-indigenous to South-West Nigeria

Vegetables	DOC (%)	EOC (%)	CIC
P. mildbraedii	Low (70), High (30)	Cw (12), Restricted (82)	Low
G. latifolium	Low (84), High (16)	Cw (8), Restricted (92)	Low
L. africana	Low (78), High (22)	Cw (4), Restricted (96)	Low
G. africanum	Low (62), High (38)	Cw (20), Restricted (80)	Low
H. crinita	Low (46), High (54)	Cw (4), Restricted (96)	Low

DOC = Degree of consumption; EOC = Extent of consumption; CIC = Cash income capacity; and CW = Countrywide.

Genetic conservation

The documented leafy vegetables yielded good-quality DNA when electrophoresed as shown in Figure 3. Spectrophotometric analysis of the DNA also showed absorbance ratio of 1.09 as the minimum and 1.80 as the maximum, indicating the purity level of the DNA (Figures 4–6). The low absorbance ratio recorded in some of the species could be as a result of contaminants present in the DNA which may also affect the visibility of the bands. These were further purified and deposited at the University of Lagos DNA Bank.

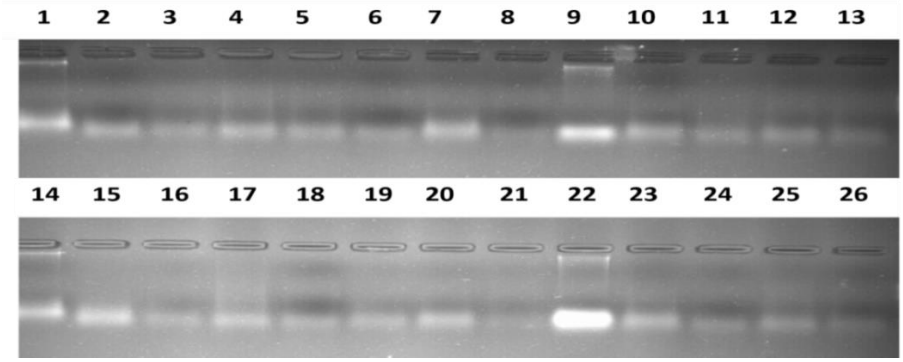

Figure 3: Electrophorogram of leafy vegetable samples in South-West Nigeria. (1) *Murraya koenigii*, (2) *Basella alba*, (3) *Solanecio biafrae*, (4) *Crassocephalum crepidioides*, (5) *Launaea taraxacifolia*, (6) *Piper guineense*, (7) *Solanum macrocarpon*, (8) *Solanum aethiopicum*, (9) *Solanum nigrum*, (10) *Solanum scabrum*, (11) *Amaranthus caudatus*, (l2) *Amaranthus hybridus*, (13) *Amaranthus viridis*, (14) *Boerhavia diffusa*, (15) *Celosia argentea var. argentea*, (16) *Celosia argentea var. cristata*, (17) *Corchorus olitorius*, (18) *Ocimum gratissimum*, (19) *Talinum triangulare*, (20) *Telfairia occidentalis*, (21) *Vernonia amygdalina*, (22) *Pterocarpus mildbraedii*, (23) *Gongronema latifolium*, (24) *Lasianthera africana* (25), *Gnetum africanum*, *and* (26) *Heinsia crinite*.

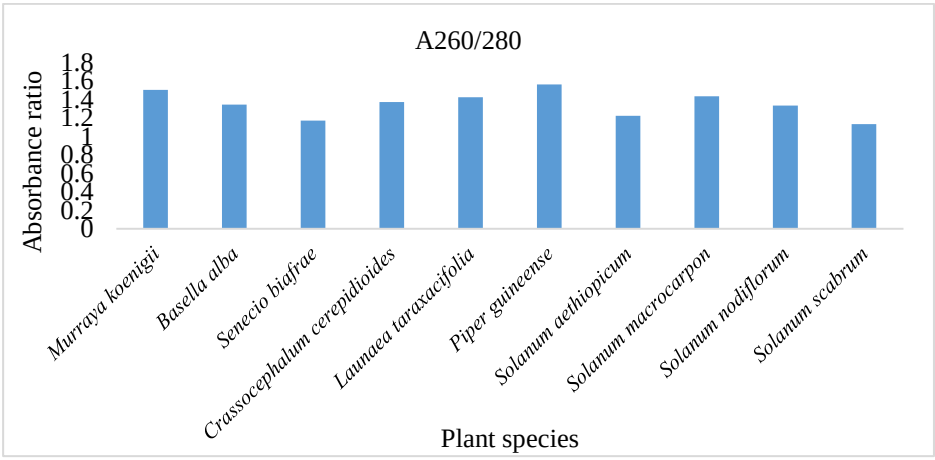

Figure 4: Spectrophotometric readings of neglected and underutilized leafy vegetable samples.

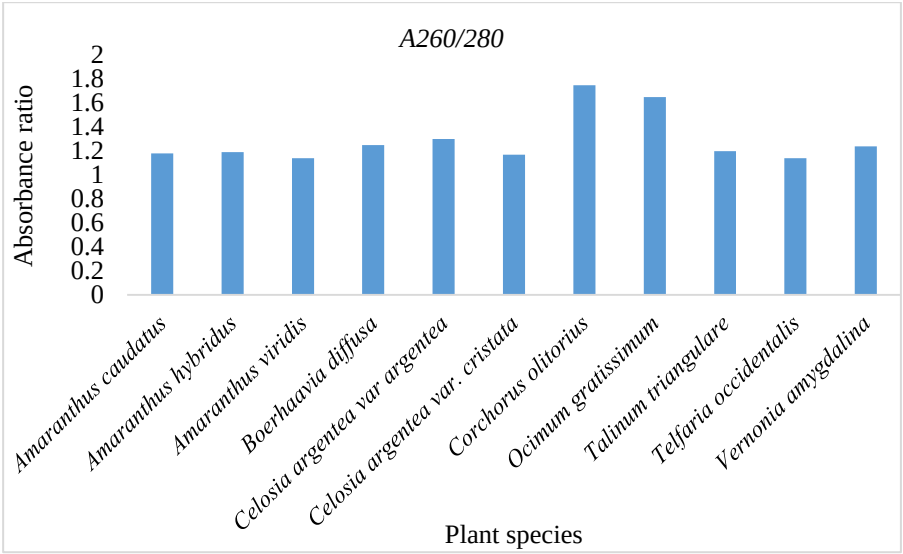

Figure 5: Spectrophotometric readings of commonly cultivated leafy vegetable samples.

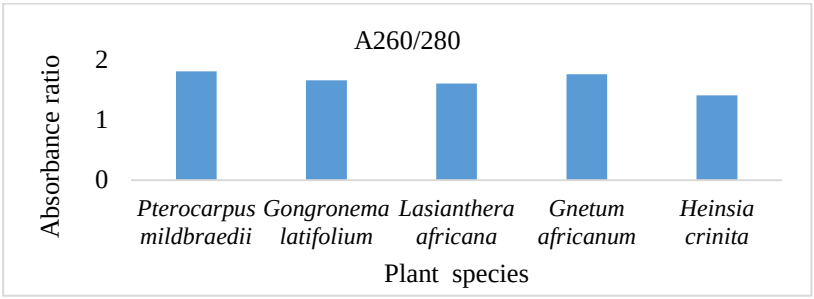

Figure 6: Spectrophotometric readings of samples of leafy vegetables non-indigenous to South-West Nigeria.

Discussion

Our survey showed a high percentage of female respondents largely because they are the primary marketers of leafy vegetables in the market areas. This observation is consistent with reports by other scientists including Ayodele (2005) and Onuminya et al. (2018). South-West Nigeria is currently experiencing significant political and economic changes which pose significant threats to the plant genetic resources in the region (de Sousa and Solberg 2020, Tanimonure 2021). Our sampling revealed 26 leafy vegetables belonging to 15 families. Over half (50%) belong to only three families, which in decreasing order of abundance, are Amaranthaceae, Asteraceae and Solanaceae. This suggests that genetic resources of some of these leafy vegetables are fast diminishing and are sparsely represented in the South-West Nigeria collections as species recorded earlier by other researchers could not be retrieved in this study. Since these gaps are known, this study identified ten underutilized/neglected leafy vegetables, eleven commonly cultivated vegetables, and five non-indigenous leafy vegetables in southwestern Nigeria to safeguard the vegetable genetic resources as well as facilitate access for research and plant breeding as highlighted in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA 2001).

Vegetables are a very important part of a healthy diet. They support body functions and help in physical, mental, and social well-being at all ages (WHO and FAO 2005, Afshin et al. 2019). Several authors have

reported that leafy vegetables contain some appreciable amounts of essential nutrients, such as minerals, low dietary energy, protein, high fibre content, and phytochemicals (Ihekoronye and Ngoddy 1985, Shiundu 2002, Adebooye and Opabode 2004, Ayodele 2005, Tanimonure et al. 2021). One explanation is that leafy vegetables being neglected or underutilized implies them not being in focus so, one could argue that such leafy vegetables have little value or ethnobotanical uses. This study showed that all the recorded vegetables have appreciable levels of ethnobotanical uses which could serve as a useful tool in the discovery of new sources of drugs. The results also suggest that these leafy vegetables can be recommended for patients as good dietary habits. Again, the view that adequate intake of leafy vegetables may reduce the severity of some infectious diseases is supported (Ayodele 2005, Tanimonure et al. 2021). For instance, though leafy vegetables will not protect humans against viral infections such as COVID-19, recovery from infectious diseases is better when consuming fruits and vegetables than with diets low in this food group (Onuminya et al. 2018, Chowdhury et al. 2020).

The relatively low DOC and EOC of neglected/underutilized leafy vegetables recorded in this study were not surprising as it corroborates the reports of Adedoyin and Taylor (2000) and Hart et al. (2005) who observed low levels of vegetable consumption in Nigeria, especially among the Yoruba ethnic group, and attributed this to socio-cultural beliefs and individual's food habits coupled with the low nutritional knowledge of the people. Adedoyin and Taylor (2000) also opined that the deliberate cultivation and consumption of locally and commonly available micronutrient-rich leafy vegetables in Nigeria and other developing countries is a major step geared towards eliminating micronutrient deficiencies in rural and urban communities.

Of the commonly cultivated leafy vegetables, *T. triangulare, A. caudatus, C. olitorius, O. gratissimum,* and *T. occidentalis* recorded high DOC. According to Ejoh and Samuel (2016), these leafy vegetables are widely cultivated in the South-West Nigeria in all seasons, therefore accounting for their mass availability in the rural and urban settlements through diverse channels and in seasons when they are less cultivated, they could be purchased from the markets. The differences observed in the DOC of each leafy vegetable underscore the cultural diversity in the South-West regions of Nigeria. *A. hybridus* has 62% DOC in our study similar to Ejoh et al. (2021) who recorded > 70% households consumption but in contrast to Hart et al. (2005) who only recorded 4% households consumption of the vegetable.

Vegetable production serves as a significant source of income for farmers and is directly proportional to consumption patterns (Tanimonure 2021, Tanimonure et al. 2021). The low CIC recorded in the study reflects the low DOC and EOC observed. This suggests that an increase in leafy vegetable consumption will increase farmers' and traders' CIC.

According to Pearce et al. (2020), genetic resources of leafy vegetables outside their cultivated areas are a priority for ex-situ conservation, especially neglected and underutilized ones that are vulnerable to extirpation. This study deposited the collected leafy vegetables at the University of Lagos herbarium. Furthermore, their genomic DNA was preserved in the DNA bank in order to play a major role in sustainable agricultural development, with a vivid focus on safeguarding the genetic variations of the gene pools of leafy vegetable species with high potential for food and nutrition.

Many herbarium records have shown clearly that people may have abandoned the cultivation, collection, and consumption of some leafy vegetables species or will do so in the near future because of trends in food production, consumption, and rural-to-urban migrations (Dawson et al. 2019, Pilling et al. 2020). The sensitization on the use of these leafy vegetables most especially the neglected/underutilized species in communities, in combination with capacity building on sustainable cultivation and

harvesting, can help improve their in-situ conservation and complement ex-situ conservation of these leafy vegetables. The goal to enrich South-West leafy vegetable repositories is also in alignment with the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). Total neglect and underutilization of these leafy vegetables pose questions about the future well-being and healthiness of mankind in South-West Nigeria.

Conclusion

Leafy vegetables in South-West Nigeria have a high potential for food security, nutrition, and medicine. This study has revealed enormous ethnobotanical uses of leafy vegetables in South-West Nigeria and also their relatively low degree and extent of consumption which could be exacerbated if proper and urgent attention is not given. There have been limited conservation measures that could support breeding for genetic engineering purposes and future cultivation. Developing more conservation hotspots for these vegetables in South-West Nigeria in line with international best practices should be highly encouraged.

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