http://dx.doi.org/10.4314/bajopas.v6i2.3

Bayero Journal of Pure and Applied Sciences, 6(2): 10 – 18
Received: March 2013
Accepted: September 2013
ISSN 2006 – 6996

RELATIONSHIP BETWEEN SPECIES COMPOSITION AND HOMEGARDEN SIZE IN ODEDA LGA OF OGUN STATE NIGERIA

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ABSTRACT
Studies on correlation between species composition and homegarden size in thirty (30) house gardens in Odeda Local Government Area of Ogun State, Southwestern Nigeria was conducted. Plants grown and maintained by household members and the diversity of vegetal species and their uses were assessed using semi-structured questionnaire and structured interview. A total of 120 different plant species belonging to 50 Families were documented. From the data, Euphorbiaceae, Solanaceae, Rutaceae, Malvaceae, Caesalpiniaceae, Poaceae and Apocynaceae (in order of decreasing number of species) were the most frequent Families. Taxa such as Musa species, Vernonia amygdalina, Citrus species, Psidium guajava and Terminalia catappa were found to be the common food/medicinal plants as evidenced by their densities in the study sites. The household members cited most of the plants as food; others as medicinal and ornamentals. Miscellaneous uses include cosmetics, ceremonial and scouring. Homegarden products serve alimentary purposes and represent promising base materials for poverty alleviation and may also help to augment "fresh" food nutrient intake. Pearson Correlation analyses indicated no statistically significant association between species composition and homegarden size (Simple correlation=0.289, P=0.122). Species composition and homegarden structures as well as plant uses are discussed.
Key words: Homegarden, Odeda, Southwestern Nigeria, Species composition

INTRODUCTION

Homegarden has a significant social function. It represents land-use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses (Fernandes and Nair, 1986) and are the central points of biodiversity conservation. Homegardens are traditional agroforestry systems with complex structure and multiple functions (Das and Das, 2005) and are viewed as an alternative to the ever increasing demand for food (Soemarwoto *et al.,* 1985) particularly in West Africa. Hoogerbrugge and Fresco (1993) defined homegarden as "a small scale, supplementary food production system by and for household members that mimics the natural, multilayered ecosystem". An addition to the definition to include the role of medicinal plants by Agelet *et al.* (2000) is worth considering.

Investigations on Agroforestry in tropical areas have focused on homegardens; reports from these have been described as prototype for sustainable ecological systems (Albuquerque *et al*., 2005; Lamont *et al.,* 1999; Padoch and De Jong, 1991). Species diversity in tropical homegardens is reported to be very high due to species having different life forms, height and canopy structure (Babu *et al.,* 1982; Soemarwoto and Conway, 1991). Research involving biological diversity in rural communities has intensified in recent years and its scope now extends to the semi-urban centres but mainly to locales that maintain richness of vegetation and animals such as parks, arboretum and flower gardens. The species diversity sheltered by these locales provide resources and alternative resources for food, decoration, construction and medicinal uses (Brito and Coelho, 2000; Semedo and Barbosa, 2007; Amaral and Guarim-Neto, 2008), as well as contributing to flood control and protecting against soil erosion (Soemarwoto, 1987). With the development of the environmental sciences, scientists have now understood the significance of the relationship between humans and nature in the rural and/or urban environment. As a matter of fact most previous studies were carried out in temperate regions; forests (tropical) may be considered the orphans of the Nigerian eco-region.

Recently, just as in Agro-forestry, Ethnobotany (as a discipline) has dedicated increasing attention to the theme of conservation of homegarden biodiversity. The diversity found in homegardens is a source of genetic variability that has been accumulated by the local populations, constituting a valuable patrimony for food security and even a source of genetic material for the improvement of species for commercial purposes (Soemarwoto *et al.,* 1985; Valle, 2000). Structure and floristic composition vary in homegarden establishment.

This study, part of a wider project on ethnobotany in the Nigeria biome, is designed to contribute to our knowledge about the structure, usage and floristic composition of home gardens located in the Southwestern Nigeria, the relationship between homegarden size and species composition, the diversity of plant life form and the floristic variation

associated with native plant use. This paper provides useful reference on the biodiversity of home gardens and the need for their conservation.

Hypothesis:
There is no significant relationship between species composition and home garden size.

METHODS

Study area

This study was carried out in Odeda Local Government Area of Ogun State Nigeria (Fig. 1). The local government has a land area of 1547.29km square with a population of 109, 449 (NBS, 2006). The headquarters of the LGA is at Odeda on the A5 highway 7°13′00″N 3°31′00″E. The climate favours the cultivation of a wide range of food crops such as rice, maize, cassava, yam, cocoyam, oil palm, vegetables and fruit trees. The economy of the areas studied is subsistence. However, surpluses are taken to markets or neighbouring towns.

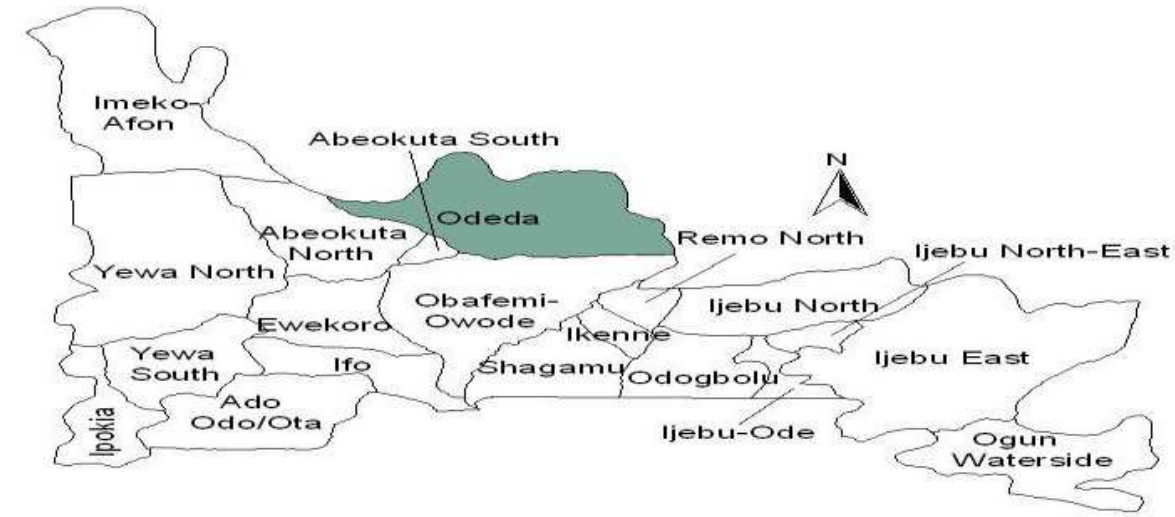

Figure 1: Map of Ogun State, Nigeria showing the study area.

Informed consent

The purpose of the study was explained to household members in the Local Government Area. Informed consent was obtained from each of the respondents.

Floristic study

Fieldwork was conducted between March 2012 and June 2012 in Odeda, Southwestern Nigeria. Locations selected for the survey were Obantoko, Osiele, Odeda, Olodo, Ageri, Adewusi, Kila and Orile-Ilugun (Fig. 2). A total of 30 homegardens were surveyed and household members interviewed using semi-structured questionnaire to gather information on the uses of the species present in the gardens. The questionnaire was in two sections. Section 1 dealt with basic demographic information. Section 2 consists of species present, local name, plant form, parts used and uses. Plant specimens were collected and identified in the field. Specimens not identified in the field were taken to Forestry Herbarium, Ibadan (FHI) for identification.

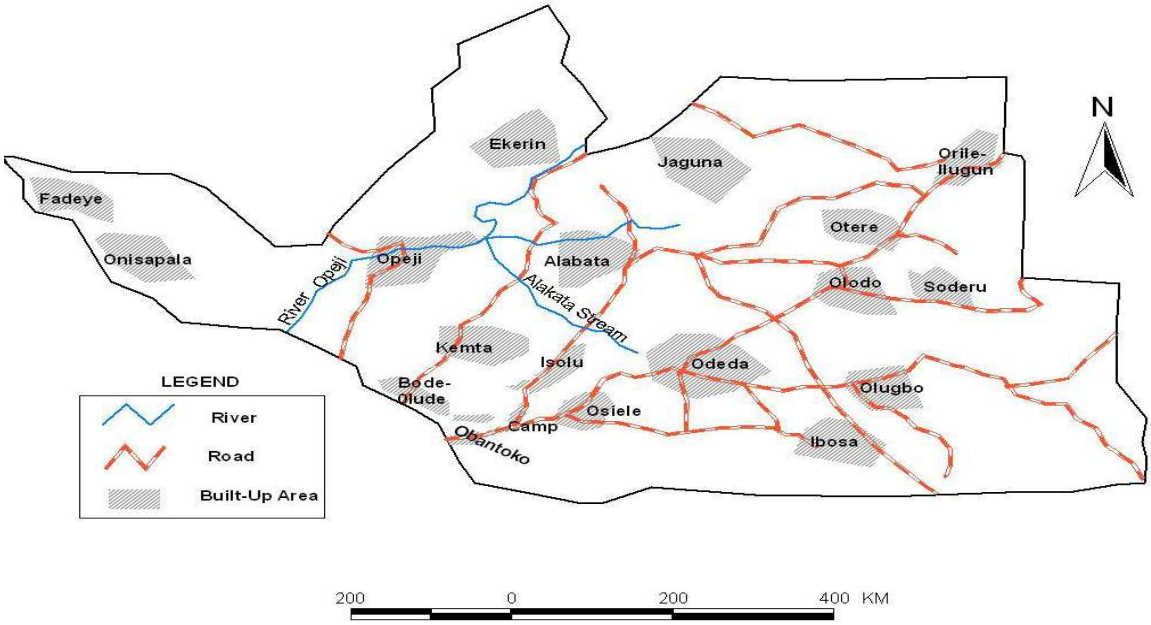

Figure 2: Geographical localization of the study sites. Source: Taiwo *et al.* (2011).

Data analysis

Data obtained from the questionnaires were entered into the computer and analyzed using Epi6-info version 6.04 (CDC, Atlanta, GA, USA) (Dean et al., 1994). Inferential statistical technique used to analyze data was Pearson Correlation Analysis.

RESULTS

The majority of the respondents were females (Table 1). The level of education of household members interviewed ranged from Primary School Certificate (PSC), Junior Secondary School Certificate (JSSC), senior category (SSC), Nigeria Certificate in Education (NCE) to First Degree (FD). The ethnic groups identified are the Yoruba and Igbo. The latter incorporates the Nupe (from Benue State). All the interviewed members are lettered but a good percentage are self-employed.

Table 1: Demographic structure of respondents.

Parameter	Specification	N (%)
Age	1 - 20	0 (0)
	21 - 40	8 (26.7)
	41 - 60	12 (40)
	>60	10 (33.3)
Gender	Male	12 (40)
	Female	18 (60)
Religion	Christianity	15 (50)
	Islam	8 (26.7)
	Traditional	7 (23.3)
Level of Education	PSC	16 (53.4)
	JSSC	1 (3.3)
	SSSC	7 (23.3)
	NCE	2 (6.7)
	FD	4 (13.3)
Nationality	Nigerian	30 (100)
	Non-Nigerian	0 (0)
Ethnic Identity	Yoruba	27 (90)
	Igbo & Nupe	3 (10)
Occupation	Teaching	7 (23.3)
	Transporting	1 (3.3)
	Farming	11 (36.7)
	Trading	9 (30)
	Technician	2 (6.7)

N = Number of respondents, **%** = Percentage of respondents

Homegardens studied proved to be a basic agroforestry system mainly to hold food, medicinal and ornamental plants, and occupied an area between $53m^2$ and $583m^2$ with a mean of $158.5m^2$ and standard deviation 162.42. The shape, size and number of species varied for each homegarden but were most commonly rectangular (63%); square (13.3%) (not perfect), triangular (3.3%). Irregular shapes (20%) were also identified. Structurally, vertical dimension took the largest percentage (53.3%) while horizontal (26.7%) and random settings (20%) were also encountered. All the species sighted were reported to be useful for several purposes. The respondents cited most as alimentary (40%). Others as medicinal (28%), ornamental (25%), shade (4.7%) and miscellaneous uses (2.3%). Some plants considered as food are also used in culinary while some others serve both as fruit plants and shade such as *Terminalia catappa, Mangifera indica, Cocos nucifera* etc. From the 30 homegardens studied, 120 different species of plants were found and these are distributed among 50 Families (Tables 2&3). The most represented families are Euphorbiaceae, Solanaceae, Rutaceae, Malvaceae, Caesalpiniaceae, Poaceae and Apocynaceae in order of decreasing number of species (Fig. 3). The species composition of homegardens is independent of the size but related to the needs of the owners (Figure 4).

Table 2: List of plant species found in homegardens in Odeda Area, Southwestern Nigeria.

Species	Family	Habit	Part(s) used	Use(s)
Citrus sinensis	Rutaceae	Tree	Fruit	f
Lawsonia inermis	Lythraceae	Tree	Leaf	cs
Calotropis procera	Asclepidiaceae	Shrub	Milky latex	fp
Jatropha gossipifolia	Euphorbiaceae	Shrub	Leaf	m
Jatropha curcas	Euphorbiaceae	Shrub	Leaf	m
Acalypha ornata	Euphorbiaceae	Herb	Whole plant	or
Acalypha ciliata	Euphorbiaceae	Herb	Whole plant	or
Aloe vera	Asphodelaceae	Herb	Leaf	or, m
Aloe barbadensis	Asphodelaceae	Herb	Leaf	or. m
Psidium guajava	Myrtaceae	Tree	Fruit/Whole plant	f, sh
Ocimum gratissimum	Lamiaceae	Shrub	Leaf	c, m
Musa paradisiaca	Musaceae	Herb	Fruit	f
Musa sapientum	Musaceae	Herb	Fruit	f
Corchorus olitorius	Tiliaceae	Herb	Leaf	f
Vernonia amygdalina	Asteraceae	Shrub	Leaf	m, c
Amaranthus hybridus	Amaranthaceae	Herb	Leaf	f
Celosia argentea	Amaranthaceae	Herb	Leaf	f
Capsicum chinensis	Solanaceae	Shrub	Fruit	c
Capsicum fruitescens	Solanaceae	Shrub	Fruit	c
Ananas comosus	Bromeliaceae	Herb	Fruit	f, m
Carica papaya	Caricaceae	Tree	Fruit/Leaf	f, m
Abelmoschus esculenta	Malvaceae	Herb	Fruit	f, c
Nicotiana tabacum	Solanaceae	Herb	Leaf	sn, m
Cajanus cajan	Papilionaceae	Tree	Leaf	m
Zea mays	Poaceae	Grass	Seed	f
Dieffenbachia amoena	Araceae	Herb (Cane)	Whole plant	or
Theobroma cacao	Sterculiaceae	Tree	Seed	b
Citrus medica	Rutaceae	Tree	Fruit	m
Morinda lucida	Rubiaceae	Tree	Leaf	m
Lycopersicon esculentum	Solanaceae	Shrub	Fruit	c. f
Cocos nucifera	Arecaceae	Tree	Fruit (Endosperm)	f. m
Cymbopogon citratus	Poaceae	Grass	Leaf	m
Ficus exasperata	Moraceae	Tree	Leaf	m, sc
Mangifera indica	Anacardiaceae	Tree	Fruit	f
Bougainvillea speciosa	Nyctaginaceae	Climber	Whole plant	or
Tabebuia rosea	Bignoniaceae	Tree	Whole plant	or
Bryophillum pinnatum	Crassulaceae	Herb	Leaf/Whole plant	m, or
Duranta repens	Verbenaceae	Shrub	Whole plant	or
Croton zambesicus	Euphorbiaceae	Tree	Whole plant/Leaf	or, m
Annona muricata	Annonaceae	Tree	Fruit	f
Eugenia uniflora	Myrtaceae	Shrub	Whole plant	or
Eucalyptus toreliana	Myrtaceae	Tree	Whole plant	or
Hibiscus rosa-sinensis	Malvaceae	Shrub	Whole plant	or
Caesalpinia pulcherima	Caesalpiniaceae	Shrub	Whole plant	or
Delonix regia	Caesalpiniaceae	Tree	Whole plant	or
Spondias mombim	Anacardiaceae	Tree	Fruit	f
Gossypium hirsutum	Malvaceae	Shrub	Fruit	m
Zingiber officinale	Zingiberaceae	Herb	Rhizome	m, c
Anacardium occidentalis	Anacardiaceae	Tree	Fruit	f
Telfaria occidentalis	Cucurbitaceae	Climber	Leaf	m, c
Tectona grandis	Verbenaceae	Tree	Whole plant	sh
Annona squamosa	Annonaceae	Shrub	Fruit	f
Artocarpus communis	Moraceae	Tree	Fruit	f
Kalanchoe tomentosa	Crassulaceae	Herb	Whole plant	or
Glyphaea brevis	Tiliaceae	Shrub	Stem	ce
Citrus aurantifolia	Rutaceae	Tree	Fruit	m
Abrus precatorius	Papilionaceae	Climber	Leaf	m
Newbouldia laevis	Bignoniaceae	Tree	Leaf	ce
Ricinus communis	Euphorbiaceae	Shrub	Seed (oil)	m
Cycas circinalis	Cycadaceae	Palm	Whole plant	or
Cycas revoluta	Cycadaceae	Palm	Whole plant	or

Table 2 ***(continued).***

Species	Family	Habit	Part(s) used	Use(s)
Colocasia esculenta	Araceae	Herb	Corm	f
Saccharum officinarium	Poaceae	Culm	Stem	f
Citrus reticulata	Rutaceae	Tree	Fruit	f
Terminalia catappa	Combretaceae	Tree	Fruit/Whole plant	f, sh
Basella alba	Chenopodiaceae	Climber	Leaf	c
Citrulus lunatus	Cucurbitaceae	Creeper	Fruit	f
Sorghum bicolor	Poaceae	Grass	Seed	f
Ipomoea batatas	Convolvulaceae	Creeper	Tuber	f
Euphorbia milli	Euphorbiaceae	Herb	Whole plant	or
Acalypha wilkesiana	Euphorbiaceae	Herb	Whole plant	or
Sanseveria laurentii	Liliaceae	Shrub	Whole plant	or
Hibiscus sabdarifa	Malvaceae	Shrub	Leaf	m, be
Talinum triangulare	Portulacaceae	Herb	Leaf	c
Moringa oleifera	Moringaceae	Tree	Leaf	m
Ficus benjamina	Moraceae	Tree	Whole plant	sh
Gmelina arborea	Verbenaceae	Tree	Whole plant	sh
Ixora coccinea	Rubiaceae	Shrub	Whole plant	or
Ixora ludiflora	Rubiaceae	Shrub	Whole plant	or
Elaeis guinensis	Arecaceae	Tree	Seed (Oil)	c
Murraya paniculata	Rutaceae	Shrub	Whole plant	or
Codiaeum variegatum	Euphorbiaceae	Herb	Whole plant	or
Thuja occidentalis	Cupressaceae	Tree	Whole plant	or
Senna alata	Caesalpiniaceae	Shrub	Leaf	m
Azadiractha indica	Meliaceae	Tree	Leaf	m
Solanum macrocarpon	Solanaceae	Herb	Fruit	f
Dioscorea alata	Dioscoreaceae	Climber	Tuber	f
Heliotropicum indicum	Boraginaceae	Herb	Leaf	m
Thymus bifida	Lamiaceae	Herb	Leaf	c
Leucena leucocephala	Mimosaceae	Tree	Leaf	m
Basella rubra	Chenopodiaceae	Climber	Leaf	c
Parquetina nigrescens	Asclepidiaceae	Climber	Leaf	m
Lactuca taraxacifolia	Asteraceae	Herb	Leaf	m
Glyricedium sepium	Papilionaceae	Tree	Leaf	m, sh
Solanum dasyphylum	Solanaceae	Shrub	Fruit	m
Talinum paniculata	Portulacaceae	Herb	Leaf	c
Hura crepitans	Euphorbiaceae	Tree	Whole plant	or
Senna siamea	Caesalpiniaceae	Tree	Whole plant	sh
Agave americana	Amaryllidaceae	Herb	Whole plant	or
Indian forma	Lauraceae	Shrub	Whole plant	or
Manihot esculentum	Euphorbiaceae	Shrub	Tuber	f
Croton variegatum	Euphorbiaceae	Shrub	Whole plant	or
Crassocephalum crepidiodes	Asteraceae	Herb	Leaf	c
Canna indica	Cannaceae	Herb	Whole plant	or
Euphorbia laterifolia	Euphorbiaceae	Herb	Whole plant	or
Mirabilis jalapa	Nyctaginaceae	Herb	Whole plant	or
Cordyline terminalis	Liliaceae	Shrub	Whole plant	or
Phyllanthus amarus	Euphorbiaceae	Herb	Leaf	m
Thevetia peruviana	Apocynaceae	Shrub	Whole plant	or
Polyalthia longifolia	Annonaceae	Tree	Whole plant	or
Sesamum indicum	Pedaliaceae	Herb	Seed (Oil)	m
Alstonia boonei	Apocynaceae	Tree	Leaf/Whole plant	m, sh
Cnidoscolus acontifolius	Euphorbiaceae	Shrub	Leaf	c
Rauvolfia vomitoria	Apocynaceae	Shrub	Leaf	m
Plumera alba	Apocynaceae	Herb	Whole plant	or
Cactus spp.	Cactaceae	Herb	Whole plant	or
Dracaena manni	Liliaceae	Herb	Whole plant	or
Hyptis bracteolate	Lamiaceae	Herb	Leaf	m
Thaumatococcus danielli	Maranthaceae	Herb	Leaf	m
Crecentia cujete	Bignoniaceae	Tree	Fruit	m

Conventions: m = medicinal, **c** = culinary/condimental, **or** = ornamental, **sh** = shade, **sc** = scouring, **sn** = snuff, **be** = beverage, **ce** = ceremonial, **f** = food, **co** = cotton, **fp** = food processing.

Table 3: Plant distribution according to families.

Family	No of species
Euphorbiaceae	15
Solanaceae	6
Rutaceae	5
Apocynaceae	4
Malvaceae	4
Caesalpiniaceae	4
Poaceae	4
Myrtaceae	3
Lamiaceae	3
Asteraceae	3
Papilionaceae	3
Rubiaceae	3
Moraceae	3
Anacardiaceae	3
Bignoniaceae	3
Verbenaceae	3
Annonaceae	3
Liliaceae	3
Asclepidiaceae	2
Amaranthaceae	2
Asphodelaceae	2
Musaceae	2
Tiliaceae	2
Araceae	2
Arecaceae	2
Nyctaginaceae	2
Crassulaceae	2
Cucurbitaceae	2
Cycadaceae	2
Portulacaceae	2
Chenopodiaceae	2
Lythraceae	1
Bromeliaceae	1
Caricaceae	1
Sterculiaceae	1
Zingiberaceae	1
Combretaceae	1
Convolvulaceae	1
Moringaceae	1
Cupressaceae	1
Meliaceae	1
Dioscoreaceae	1
Boraginaceae	1
Mimosaceae	1
Amaryllidaceae	1
Lauraceae	1
Cannaceae	1
Pedaliaceae	1
Cactaceae	1
Maranthaceae	1
Families=50, Species=120	

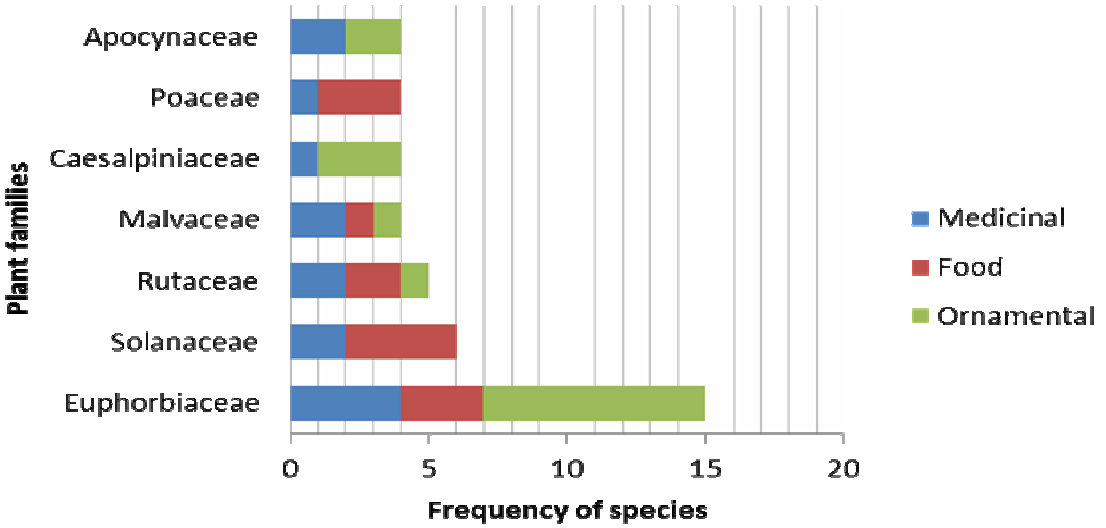

Fig. 3: Most represented botanical families and their reported uses by frequency.

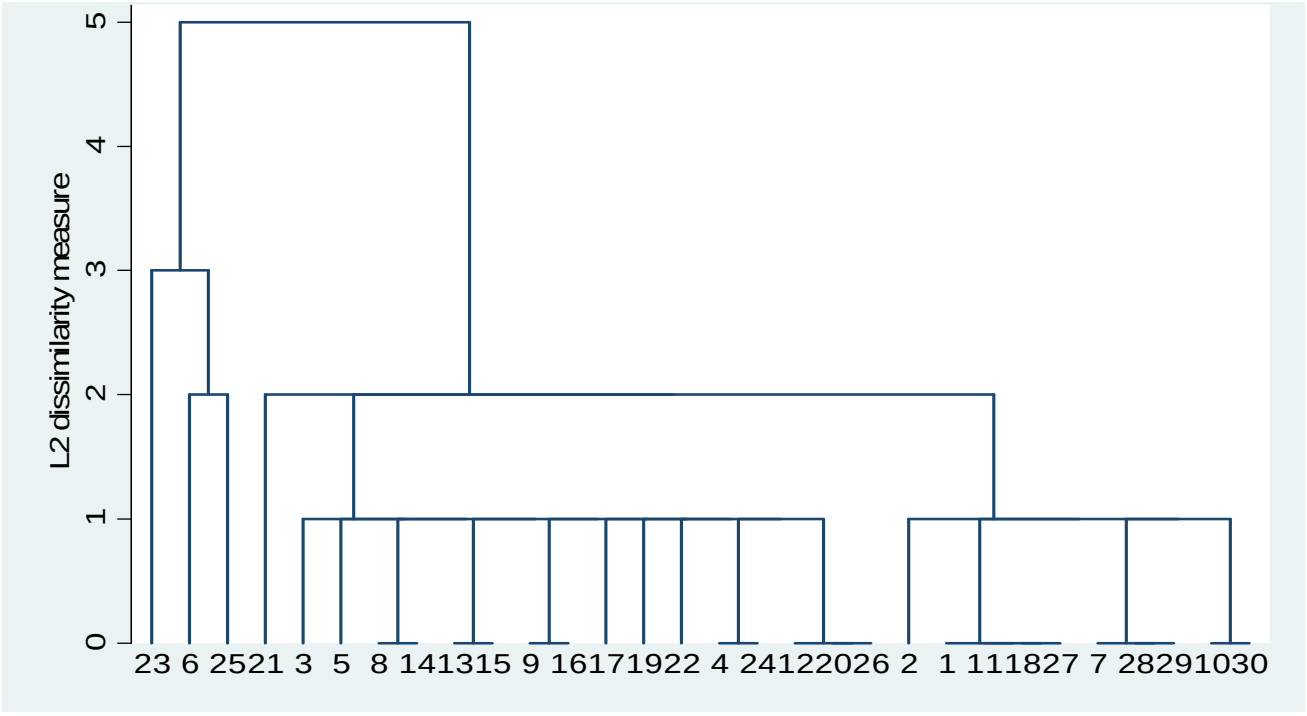

Fig. 4: Cluster analysis showing relationships between the 30 homegardens based on homegarden size and species composition.

Two groups of plants were found in the studied sites. **Group 1:** plants grown and maintained. **Group 2:** naturally established plants but maintained. In the latter case, plants cited were *Ficus exasperata, Nicotiana tabaccum, Newbouldia laevis, Gmelina arborea, Azadirachta indica, Glyricedium sepium.* Others include *Talinum triangulare* and *Phyllanthus amarus* (only used, not maintained). Some of the plants are grown because of their seasonal importance. Such plants include *Zea mays, Saccharum officinarium, Sorghum bicolor and Dioscorea* species. Variation in species composition was not large throughout the 30 homegardens studied. Most of the homegardens considered have common plant species with the exception of few; this has ecological implication. Taxa such as *Musa* spp., *Vernonia amygdalina, Citrus* spp., *Psidium guajava* and *Terminalia catapa* were found to be the common food/medicinal plants across homegardens surveyed and had the highest density. All plant life forms were duly represented (Table 4) with herb taking the largest share (31.6%) and culm (0.8%) the lowest. Table 5 shows the plant parts used and their frequencies. The leaves form the major part of plant used followed by whole plant - as ornamentals. Ornamental species such as *Delonix regia, Dieffenbachia amoena, Acalypha ornata, A. ciliata, Aloe vera* etc. are often arranged in courtyards or at the frontage of buildings.

Table 4: Plant life form and their frequency

Habit	Frequency
Herb	38
Tree	37
Shrub	30
Climber	7
Grass	3
Creeper	2
Palm	2
Culm	1

Table 5: Frequency of plant parts used

Plant part	Frequency
Leaves	42
Whole plant	39
Fruits	25
Seeds	6
Stem	2
Tuber	3
Milky latex	1
Corm	1
Rhizome	1

DISCUSSION

Ethnobotany makes clear the connection between human cultural practices and plant utilization. In the study of Ethnobotany today, homegardens and their roles as biodiversity conservation centres cannot be over-emphasized. Gispert and Gomez (1986) reported that from ancient times, kitchen gardens, house gardens or homegardens have played fundamental roles in the supply of food products. Plant domestication represents a major achievement. The study of indigenous cultivation, food production, local medicinal knowledge and varied use of vegetal species has implications for food nutrient augmentation as well as discovering new medicines. The diverse use of plants indicated in this study point to the fact that gardens have been used to cultivate not only vegetables, but also medicinal and other miscellaneous uses. Cosmetics, scouring and ceremonial are classified in this work as miscellaneous or rare uses. All the alimentary species from the family Lamiaceae were used as condiments, indicating their important role in diversifying the flavour of food. The gardens studied are subsistence in nature [based on their mean size and according to the classification of Fernandes and Nair (1986)]. Homegardens have the function of guaranteeing subsistence as well as complementing the household income, for instance, taxa such as *Amaranthus* and *Celosia* species are cultivated on small commercial scale. The most representative families in this study have also been cited in previous studies that were focused on old urban homegardens by Eichemberg *et al.* (2009) and Albuquerque *et al.* (2005). The most widely used medicinal plants (*Vernonia amygdalina, Jatropha* spp., *Cympobogon citratus*) have again been implicated in this study. The leaves form the most used plant part. This is in line with similar ethnobotanical studies by Adekunle (2008), Ayodele (2005) and Erinoso and Aworinde (2012).

The physical appearance of homegardens is species composition dependent. The changes in structure and function are primarily related to subsistence as homegardens function to fulfill the varied daily needs of the owner; other factors include improvement programs such as intensification and commercialization (Karyono, 2000). The horizontal and vertical arrangements of species form the two structural components of homegardens (Millat et al., 1996). A systematic distribution pattern was not recognized in this study as against the pattern reported by Caballero (1992) as some gardens have plant species haphazardly distributed; typical of random pattern. This is in line with the submission of Karyono (2000) that homegarden may present the appearance of a haphazard combination of trees, shrubs, herbs, climbers and creeping plants. The lack of unified methodology in the study of homegarden (Albuquerque *et al.,* 2005) makes homegarden structure to vary in different regions (Soemarwoto *et al.,* 1985). Women play a significant role in homegarden maintenance, although the idea of establishment is solely that of men. This is evidenced from the number of females interviewed. They tend to maintain the aesthetic feature of their environment. Most of the ornamentals especially the herbaceous species are potted. Not all the medicinal plants sighted are grown. Some were naturally established but later maintained when the use value was discovered. These plant species may have been introduced by agents of dispersal such as birds, wind and explosive mechanism, especially those ones that are propagated by seeds.

CONCLUSION

This study has once again proved that homegardens are useful sources of plant germplasm. But together with the germplasm conserved in the homegardens, as suggested by Valle (2000), it is extremely important to maintain the knowledge regarding these species and varieties. And as such new generations should be encouraged to recover and re-energize the productive capacity of homegardens.

Acknowledgement
The authors would like to thank all the people interviewed in the rural/semi-urban communities of Odeda for the opportunity to use their homegardens as study sites; for information given as well as hospitality and accommodation.

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