SELECTING TROPICAL ORNAMENTAL TREES FOR USE AS HEDGE PLANTS

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Abstract: *Soft landscape elements play key roles in the built environment. It is usually a combination of hedges, trees, shrubs plantings and turfs that set the tone of the soft landscape and defines the outdoor living space. A study conducted by Palmer (1989) and Smardon (1988) in Syracuse, NY, USA, to assess the preference of a simulated front yard landscaping alternatives with combination of trees, turf, flower beds, shrubs and hedges along the front foot path showed that hedges were the most preferred. (Kendal et. al, 2008). Kumasi as an urban center is made up of several tropical ornamental trees. However, very few hedges have been explored from these trees. With Kumasi as the main setting, this research project therefore sought to explore the selection of candidate tropical ornamental trees for use as hedges. Twenty (20) sample questionnaires were sent out to commercial nurserymen within the metropolis to ascertain trees species available on sale, and hedge plants that were highly patronized. Responses from 15 nurseries concluded that Ixora was the highly patronized hedge plant. An observational study of West-Nhyiaeso, a high-class residential area in the Kumasi Metropolis, also provided names of different tropical trees. A comparative study of the tropical ornamental trees and the physical characteristics of Ixora such as leaf size, crown density, top-down cover, leaf colour, light requirement and drought resistance was then conducted. This was hence used as a selection criterion from which hedges could be chosen. Ten (10) tropical ornamental trees were explored as potential trees for use as hedges as these had similar physical characteristics to that of Ixora. It was recommended that the selected trees be tested as hedges.*

KEY WORDS*:* hedges, tropical tree, preference, explore, physical characteristics, potential, patronize.

INTRODUCTION

Architecture over the years has seen enormous transformation. From ground zero of a building to the highest level, building structures that are described as intelligent have come to stay. Clients now give specifications to their building intents and it is the duty of the designer to ensure that they are met. As one of the nations described as developing, Ghana has not been left out of these changing trends. One aspect of design and architecture as whole which cannot be overlooked is the landscape as it has direct positive impacts on the environment: built and unbuilt. As the famous architect Frank Lloyd Wright right put it "a good building is not the one that hurts the landscape but one which makes the landscape more beautiful than it was before the building was built". Soft landscape elements used in urban design include trees, turf or lawns, shrubs, flowers and hedges.

Cumulative influences of human have resulted in the invasion of many species on new regions at unimaginable degree, which has exercised strong impacts on the human wellbeing and the ecosystem as well. (Mooney et al. 2005). Howes (1946) stated that in the warmer parts of the world, a greater number of possibly more than five hundred species of plants are used as hedges. Some of these are vastly distributed in cultivation and sometimes expected to be found naturalized wherever conditions favor them. Others appear to be strong to a country and remain to be wildly adopted as hedge.

Kendal et al., 2008 presented that few studies were conducted to explore people's response to urban landscaping elements where hedges were found to be the most desired landscape treatment in both home and public spaces over others as flowers and turf. A study was again conducted by Smardon (1998) in Syracuse, New York, U.S.A to evaluate the preference of a virtual front-yard landscaping substitutes where trees, flower beds, shrubs, turf and hedges were assembled beside the front path. The hedge once again appeared to be the most preferred. (Kendal et. al, 2008)Hedge plants are therefore an imperative and universal component of the many residential, public, commercial landscape (Dave et al., 2008) and many may be grown for varying purposes: purely ornamental effect or as screens for privacy or to hide unappealing objects or parts of a building, to indicate boundaries, as shelter for livestock, or as barriers to exclude trespassers or and wild domestic animals from fields or crops. (Howes, 1946).

The importance of growing hedges as part of the landscape treatment goes beyond aesthetics and those afore mentioned. Besides enhancing the well-being of humans with regards to the creation of employment, hedges cultivated also help to develop the ecology of the cities. Hedges also control local temperatures by absorbing heat during the day. Certain hedge species can be grown in wide range of soils in all countries that come under tropical, subtropical, and in some specific nations that fall within the temperate zones. (Islam et al., 2011).

Kumasi in the Ashanti region of Ghana is one of the transitional forest zones in the country that is endowed with beautiful landscape treatments. (Tipple, 1987). This research therefore documents on plants that are used as hedges in Kumasi, identify their popularity ratings and by comparing their physical characteristics with other tropical trees, explore new candidate trees from which hedges can be created.

Problem Statement
Developments in Ghana for the last decade have all come in the way of infrastructure and commerce. (Asare, 2013). Encroachments, infrastructural development and population growth have all resulted in the continued loss of much of Ghana's urban green space. (Dumenu, 2013). Kumasi lies second to Accra with respect to physical development (Sarkodie, 2010). But the city is arguably one of the few places in the country endowed with green coverage. However, there is little to be said in terms of progresses in its urban greenness in recent times. Kumasi got the accolade "Garden City of West Africa" after the 1945 city plan was put in place (Korboe, 2001) because of its floral enhancement of the city (Oppong and Dunster, 2008). As the second largest city of the country, the entire cover of Kumasi Forest Reserve has been lost with only fragments of it remaining. (Dumenu, 2013. A pure indication of where the city is heading towards.

Though there exist numerous plants for hedges, very few are seen across the city. The Kwame Nkrumah University of Science and Technology and high-income residential areas such as Nhyiaeso are few areas in Kumasi that can boast of developments in its landscape with respect to hedge growing.

In Kumasi, some hedge plants are perceived to be more popular than others, these perceptions have however not been exhaustively documented on. A base study which was conducted by the author in November 2014 prior to the research suggested that many people in Kumasi Metropolis are of the view that growing hedges is mere luxury and are for the high-income earners only. However, there abounds tree species that can be explored by people to widen the range of choice as most trees and shrubs have the potential to make hedges (Royal Horticulture Society, 2014)

Justification

An estimated 51.5% of Ghanaians live in urban areas and that by 2025, the figure would have shot up to 65% (World Statistics Pocketbook, 2010). This indicates that there is more destruction of the urban green spaces for physical infrastructure developments which would automatically cause reduction in nature areas for leisure and recreation. The economic cost of these disasters may dwarf the cost of providing and sustaining pockets of urban green spaces. (Dumenu, 2013).Our urban centers have been woefully dominated with concrete with less green areas due to rapid and unintended urbanization, infrastructural developments and high rise in population. (Dumenu, 2013). With the increasing effects of global warming, one way to reduce the negative tendencies is through the natural method. As a natural and most preferred landscaping element, (Dave et al., 2008), it is therefore vital that explorations be made to enhance the choice of selecting trees for hedges. Most plants have the tendency to make a hedge. Hedge plants are inexpensive, cool to plant and form good-looking periphery more rapidly. It again provides structure to gardens, they can be impeccable for wildlife and particularly nesting birds. (Royal Horticulture Society, 2014)

Aims and Objectives

The aim of the research is to identify the popularity ratings of the hedge plants on sale by commercial nurserymen in Kumasi and use the physical characteristics of these hedges as selection criteria from which candidate trees grown in Kumasi can be selected as hedges. To achieve the aim of the study, the following questions have been developed;
1.   What are the popularity ratings of hedge plants grown in Kumasi?
2.   What are the physical characteristics of the highly rated hedges?
3.   How can candidate trees be selected for use as hedges?

THEORETICAL FRAMEWORK

One of the more crucial issues of architecture since its inception has got to do with the fact that buildings and structures are not designed in isolation. All architects must consider the immediate surroundings within which their designs will sit, and these include the soft landscape treatment as hedges

Definition of Hedges

Hedgerows are fine groups of woody plants and related vegetation that distinct fields. Hedge is sometimes used similarly to hedgerows but generally has the slimmer sense hedgerow collected of vegetation that is low dense (shrubs and trees) which is grown and managed as well (Forman and Baudry, 1984).Pollard et al. (1974) also gave a clear distinction between a fencerow and shelterbelt where it was stated that the former referred to the hedgerows where a barrier is or was present and the latter was spoken of as a planted strip made up of numerous rows of woody plants

A hedge is a wall made up of plants of which some are purely decorative while others primarily serve as a practical function, (Beaulieu, 2014). Hedge is a line of closely spaced shrubs and trees species that are planted and trained to form barrier or to mark the boundary of and area (Royal Horticulture Society, 2014). Daniel Abbiw, a Ghanaian expert in plants in 1990 described a hedge as a fence of bushes and serves as boundary, screen and noise breaker.

History of hedges or hedgerow

Hedgerows or hedges are considered as artefacts of unique structures of an agricultural landscape which is entirely made by man. As hedges are not invulnerable from natural processes such as succession, there is now indication that some hedges are even more natural in that they may be ruins of old woodlands. (Pollard, 1962). Forman and Baudry (1984) stated that hedgerows emerged from and co-exist with agriculture. And by way of origin, their internal structure as well as species differ varyingly; farming practices in nearby fields and refine art of hedgerows management. Several hedgerows types are forest-edged and seemingly none is restricted to hedgerows. Hedgerows which are wide, consist of trees and bushes that seem to function as passageways for movement of countless animals and plants from corner to comer of a landscape. (Foreman and Baudry, 1984). Hedges were created to act as windbreaks and property boundaries using plants such as barriers in the early farming days. A common plant adopted for such a purpose was the hawthorn which was an Ideal tree due to its green low branches, relatively shortheight and long thorns. It was used as barriers for cattle and other domestic animals because of its form as it grew.

Hedgerows continue to offer ultimate wildlife cover for birds and fur-bearing animals. In Britain for instance, many hedges as part of their landscape were initially established as barriers or fence to house livestock. Others were grown as borders or to fill Parliamentary Act in 1995. Some hedges are the remnants of antique woodlands where trees removed for pastures or crops, creating a thin strip of woodland as a borderline. Birds that dropped seeds by perching on wire fences have made hedges to be self-grown Suggestions concerning the methods of dating of hedgerows or hedges have been made and the Hooper's Rule for example evaluates the estimated age of a hedge by counting the number of woody species per yard 27meters stretch. The number of species is roughly equal to the region of equal to the age of the hedge in centuries.

In the beginning, grazing animals were kept, and certain plant species were planted as hedges to keep the animals. They were made up of one or quite a lot of species that

were often planted on a bank or with an end-to-end trench. (Nhm.ac.uk., 2014). The Royal Society for the protection of birds (RPSB), state that early humans both hunters and gatherers of wild fruits and animals such as rhinoceroses, deer, antelopes and the like as food. And the only hedgerows were that of dead bushes made of thorns and refined twigs(branches) for safety from attacks.

Woodlands were cleared to make fields by the first Bronze Age (3000-4000 B.C.) farmers and occasionally they left strips of woodlands to connote their boundaries. These are tour firstborn hedgerows and usually on today's Parish boundaries. These are unique fragments of living history which more regularly are the best hedgerows for wildlife. It may be a rich mixture of forested shrubs such as hazel, digwood, guilder rose and spindle. In ancient hedgerows, pol larded trees were recurrently found and they made splendid boundary indicators in outdated times as they were static. New hedgerows planting sprang up around the Roman times and continued off through the mid-eighteenth (18th) century. Within that period the Enclosure Act established, impelled a great spurt in hedge planting, frequently around the English Midlands. In the event of Napoleon's wars, Britain was snowed under and threatened Policies were made by the government cheered hedge elimination to safeguard that Britain was autonomous with respect to food after the World War II.

Machinery that could weave its way through small fields was developed courtesy financial incentives made available to remove hedgerows. Nowadays, there is a wide credit these policies encouraged farmers to go very far and there are allowances to push planting and safety of hedgerows. In the 18th and 19th centuries, hedge planting prospered as communal land used for grazing and farming was reassigned to private ownership. (Anon, 2014). In recent times hedgerows still perform the old conventional functions of serving as barriers but this time round not to livestock and farmers through the few that exist in the system which could be found outskirt towns and cities but to urban structures by providing both security and aesthetics.

The roles hedges play as landscape element.
From the farmer who needs it to keep his livestock from drifting, the town planner who needs to offer amenities that must serve tangible functions, the man who grows fruits to keep out animals that trespass, all the way to the gardener who seeks to provide privacy or to form a background to flower borders, hedges are shown interest from people from every corner of the world (Anon, 2014).

The Royal Horticulture Society (2014) rightly put forward that a densely grown hedge will provide some form of security to a certain extent. However, security is not the only practical role that a hedge is noted for but could also serve as privacy and windbreaks.
In that case plants are left to propagate naturally. rather than being trimmed to a certain shape and size. Around habitat conservation, hedges have the likelihood to play an important part for the reason being that they (hedges) are widespread for wildlife. (Baudry et al., 2000). Many offer vital living quarters for several plants, invertebrates, birds, and mammals within otherwise rigorously managed landscapes. (Wehling and Diekmann, 2009). In the tropical and sub- tropical regions for instance, agriculture is most often

practiced by peasant cultivators who cannot afford barbed wires. Therefore, the only alternative they rely on is to use hedges as barriers to their farms. (Howes, 1946).

Hedges contribute immensely to services such sustainable urban drainage reduction in airborne particles, have the capability of taking out greenhouse gases through carbon storage if the hedges can grow and expand in size. (Hedgelink.org.uk., 2014). For sure any loss intensifies climate to some degree., atmospheric pollution as well as. Varshney et al., (1993) agree to the fact roadside hedges established principally for visual purposes reduce noise, increase the micro-climate and efficiently cuts down dust pollution. Soil erosion, as result of rainwater is a worldwide issue more especially in the tropics where rainfalls are heavy and rampant. Although there are several approaches to controlling soil erosion because of water, the growth of hedges has on contours of sudden slopes have turned out to be more efficient, (Young, 1987, Young 1997 and Angima et al., 2002). A reduction of 48-58% in soil loss through hedge growing have been observed in Kenya, Nigeria and Columbia (Angima et al., 2000).

Tropical Plants for the Ghanaian Landscape.
Leakey (1991) stated about 36 wild and cultivated plants recommended by D.K Abbiw that are useful for growth as hedges in Ghana: *Acalypha wilkensia, Bauhiania tomentosa, Bauhinia rufescens, Bixa Orellana, Breynia nivosa, Birdelia stenocarpa, Caesalpinia pulcherrima, Callophyllum inophyllum, Carrisa edulis, Dodonaea viscosa, Cassia bucapsularis, Duranta repens, Dracaena arborea Eugenia cronata, Eugnia leonensis, Euphorbia lateriflora, Ficus liprieuri, Flacourtia -flavescens, Haematoxylon campechianum, Jatropha curcas, Lantara camara, Lawsonia -inremis, Leucaena leucocephala, Chionanthus abyssinica, Parkinsonia aculeate, Pisonia aculeate, Pithecellobium dulce, Securinega vinosa, Steganotaenia araliacea, Thevetia peruviana, Thunbergia erecta, Tecoma stans, Ximenia Americana, Ziziphus mauritania.*

Considerations for hedge plant selection
As it applies to any form of gardening, one must select plants that are suited to climatic conditions of the environment. (Bramwell, 2014). Light, soil conditions, colour, fruits, and the type of hedges are all considerations pertaining to the selection of plants as hedges. (Anon, 2014). Depending on the growth habits, some plants are best suited or selected over other hedge-type (Witt et al., 2014). Hedges could be selected for formal and informal purposes, as barrier or screening and for coastal or seaside locations (Ashridgetrees.co.uk, 2013). As easy as selecting plants for hedge may sound, there are endless varieties of plants which makes it rather a difficult task. This is because what is right plant for on application as well as climate may just not be necessarily the right plant for all. (www.nurseriesonline.co.uk). Several factors that account for the selection of plants for hedges include;

• Size of plant; this highlights on the final height and width of the plant when its fully matured. For instance, Ixora lutea (red) grows faster and higher than the Ixora dwarf if they are all planted at the same time.

• Climate: Plants have different abilities to thrive in one climate better than others an in some cases cannot survive at all. It is of no use trying to grow a temperate plant in the tropics where the plant cannot withstand humidity levels.

• Density of foliage: Some plants can fuse together such that seeing through them is very difficult. An example is Ixora which may be right for private spaces.

- Other factors include light requirement of the plant, type of soil, moisture requirements, maintenance and cost of planting.

Kendal et al., (2008) mentioned that a-seven selection criteria for hedge species was put forward by Hitchmough (1994a). These were based on the characteristics of the plants to be chosen:

- Ability to withstand harsh pruning,
- Ability to retain basal foliage
- Ability to have high root density
- Relatively small leaves
- Ability to form quickly and grow slowly
- Hedges that have the capacity to grow freely from serious pest and disease problems
- Genetic uniformity

METHODOLOGY

The initial stage of the research is to review and understand the subject of the research which is to explore hedges from tropical ornamental trees. Then it was followed by the formulation of the study aim and objectives. The next stage of the study was literature review. This stage included the history of hedges and the roles of hedge plants in the urban setting, tropical trees available for selection as hedges in the Ghanaian landscape and selection criteria for hedge plants. Data was then collected through questionnaires distributed to commercial nurserymen in city of Kumasi. One week of personal observation was also carried out at West-Nhyiaeso, a suburb of Kumasi to ascertain the type of hedges grown, as this area is perceived to have occupants who could afford growing hedges.

Data analysis was conducted using Microsoft Excel software. The statistical analysis carried out include frequency distributions tables and bar graphs which were used for data presentation. The frequencies were calculated according to the range of hedge plants by counting the number of times a range of hedge plants occurred and the number of times they were preferred based on sales. The ranges were grouped as 1-5, 6-10, 11-15, 16-20 and above 20. The percentage of each range was obtained using the formula;

(Frequency of a range/Total frequency) x 100%

Study 1: Identify the popular hedge plants grown in Kumasi.
Primary data needed to achieve this objective was through questionnaires that were distributed to commercial nurserymen who were tasked to provide the names of hedge plants available for sale and further rate the hedge plants based on sales. 20 questionnaires were distributed due to the limited number of commercial nurseries within the Metropolis. Personal observations of West Nhyiaeso, a high- class residential area in Kumasi also helped in identifying some hedges widely used. Secondary data was also collected through books from the Kwame Nkrumah University of Science and Technology Main Library and online journals where trees for use as hedges in the Ghanaian landscape were outlined.
The data was captured through sample questionnaires below and site photographs. Then the data was sorted, and the highly rated category was applied in objective two.

Table 3.1 Popularity rating of hedge plants in the Kumasi Metropolis

Name of hedge plant		Nursery Rating		
Scientific	common	1 (Most Patronized)	2 (Patronized)	3(Least Patronized)

Study 2: Identify the physical characteristics of highly rated hedges plants.

After obtaining the popularity ratings of the hedge plants in objective 1, the factors for determining the physical characteristics of hedge plants was then obtained from online literature and research journals. These included leaf size, crown density, growth rate, leaf colour, drought resistance, and to-down cover. The data was captured in the table below where the hedge plants identified as the most patronized were matched against matched against Table 3.2 to finally develop a selection criterion for use in objective 3.

Table 3.2 Physical characteristics of hedge plants

Name of hedge plant		Physical characteristics						
scientific	common	Leaf size	Top-down cover	Crown density	Leaf colour	Flower colour	Growth rate	Light requirement

Study 3: Selecting candidate trees for use as hedges

List of non- hedge tree species available in the Kumasi Metropolis were obtained through questionnaires distributed to commercial nursery men and through author's observation of West Nhyiaeso. Both responses from the questionnaires and author's observations were used to fill table 3.3 below. The physical characteristics of the highly rated hedge plants were compared against the physical characteristics of the tropical ornamental trees list to select trees as candidate or potential hedge plants.

DISCUSSION

Table 3.4. Summary of the respondent from commercial nurseries.

Category of respondent	Questionnaires issued	Questionnaires received	Percentage response (%)	Percentage relative to total questionnaires received
Commercial nurseries	20	15	75	75
Total	20	15	100	100

(Source: Questionnaire survey, 2015)

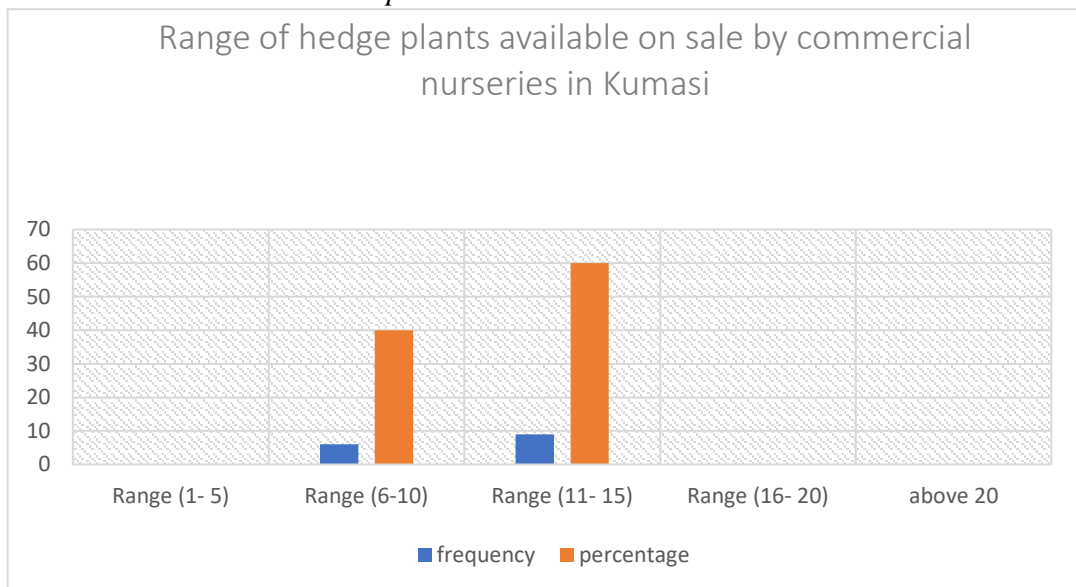*Range of hedge plants available on sale by commercial nurseries*

Based on the data from the questionnaire survey conducted nine (9) out of the fifteen (15) response gave the range of 11-15 as plants that are available on sale as hedges representing 60% of the total response. This was followed by 6 nurseries that gave the range 6-10 making up 40% of the total response as well. Ranges 0-5, 16-20 and above 20 hedges recorded zero (0). Five out of the nine that represent the highest majority are located on the main Accra Kumasi highway. The remaining four (4) are however situated within the commercial and residential areas of the Metropolis. Those that constitute the range 6-10 are observed to be nurseries that were established within the last five years and hence are trying to gain feet in the

business. They were located within Ahodwo, T.U.C Junction, and Santasi as these areas are gradually fusing with the Central Business District of Kumasi.

Table 4.1 Range of hedge plants available on sale by commercial nurseries in Kumasi

Range	Frequency	Percentage (%)
1-5	0	0
6-10	6	40
11-15	9	60
16-20	0	0
Above 20	0	0
Total	15	100

Graph 4.1*Bar graph showing the range of hedge plants available on sale by commercial nurseries in the Kumasi Metropolis*

4.3

Range of hedge plants available on sale by commercial nurseries

Question two of the sample questionnaires discussed about the names of plants obtained from the respondents from the commercial nurseries. During the survey, twenty -three (23) different names of plants were stated by commercial nursery men as plants that were available on sale as hedges. This number is however thirteen and twenty -four (24) less of what Abbiw (1990) stated and Norman (1971) stated as useful plants for the Ghanaian landscape. The respondents only indicated the common names as these were the names they were familiar with. The author then through literature ascertained their scientific names:
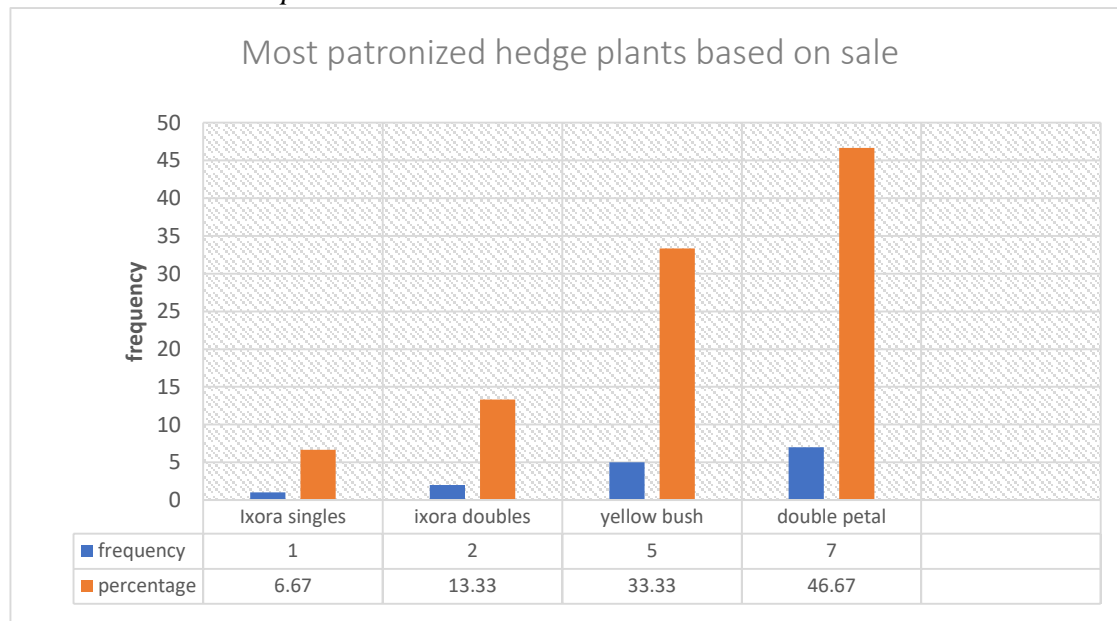
Acalypha tricolor, Aricaria, Bauhinia, Purple Bougainvillea, Bromelaid, Double Petal, Yellow bush, Christ Thorns, Weeping fig, Gardenia, Heather ice, Hibiscus, Ixora double (yellow/red), Ixora dwarf (pink/white), Ixora singles (red/yellow), Lady of the night, Olianda, Petunia, Madras thorn, Panax, Queen of villi, Snow white and Violet. Out of these, *Ixora* constituted the plant with most varieties: dwarf, singles and doubles. Each of these also have variegated

red, yellow, white and pink. This was followed by *weeping fig* with green, greenish-white and yellow variegations.

Most patronized hedge plants

For the most patronized hedge plants, a total of 4 different plants were stated by the 15 respondents from the commercial nurseries. These included the *Double petal, Yellow bush, Ixora singles* and *Ixora doubles. Ixora singles* recorded the highest figure with a total of seven (7) nurseries selecting it as the most patronized based on sale constituting 46.67% of the total respondents. 33.33% of the respondents making up five (5) nurseries gave *Ixora Doubles* as the highly patronized. Two respondents (13.33%) chose *Yellow Bush* as the most patronized. *Double petal* was chosen once as the most sold out hedge plants from the response gathered during the survey representing 6.67% of the total response of the questionnaires.

Graph 4.2 shows the most patronized hedge plants with respect to sales by commercial nursery men in Kumasi Metropolis.

Most patronized hedge plants based on sale

|	Ixora singles	ixora doubles	yellow bush	double petal	
■ frequency	1	2	5	7	
■ percentage	6.67	13.33	33.33	46.67	

4.4

Response rate of patronization of hedge plants

In attempt to obtain the response rate of patronization of hedge plants sold, several hedge plants were each identified by respondents from the commercial nurseries of which each of these plants were rated on the levels of least patronized, patronized and most patronized. 11 different hedge plants were identified on the rate of patronization at the end of the data collection. These included: Bauhinia, Double petals, Yellow bush, Euphorbia splendens, weeping fig (variegated green), weeping fig (variegated white), Hibiscus, Ixora doubles, Ixora dwarf, Ixora singles, and Madras thorns.
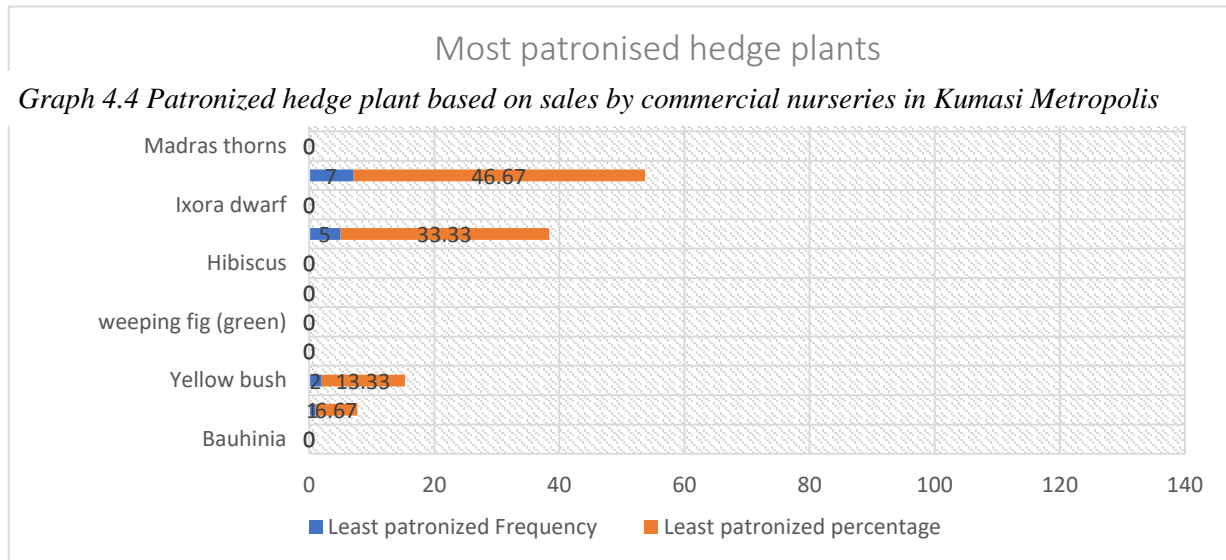
Table 4.2 Rate of patronization of hedge plants in Kumasi Metropolis

Hedge plant	Least patronized		Patronized		Most patronized	
	Frequency	percentage	Frequency	percentage	frequency	percentage
Bauhinia	4	16.67	0	0	0	0
Double petals	0	0	4	11.11	1	6.67
Yellow bush	1	4.17	8	22.22	2	13.33
Euphorbia splendens	6	2.5	0	0	0	0
weeping fig (green)	1	4.17	0	0	0	0
weeping fig (white)	7	29.17	3	8.33	0	0
Hibiscus	0	0	1	2.78	0	0
Ixora doubles	0	0	8	22.22	5	33.33
Ixora dwarf,	0	0	4	11.11	0	0
Ixora singles	2	8.33	6	16.67	7	46.67
Madras thorns	3	12.5	2	5.56	0	0
Total	24	100	36	100	15	100

From Table 4.2, it can be deduced that the least patronized hedge plant is weeping fig (variegated white) which made a total frequency of seven representing 29.72% of the total frequency. With choice of colours for hedges white can therefore be concluded as the least colour based on the statistics provided. The table also provides the patronized hedge plants as Yellow bush and Ixora doubles with total frequency of 8 out of the 36 making a percentage of
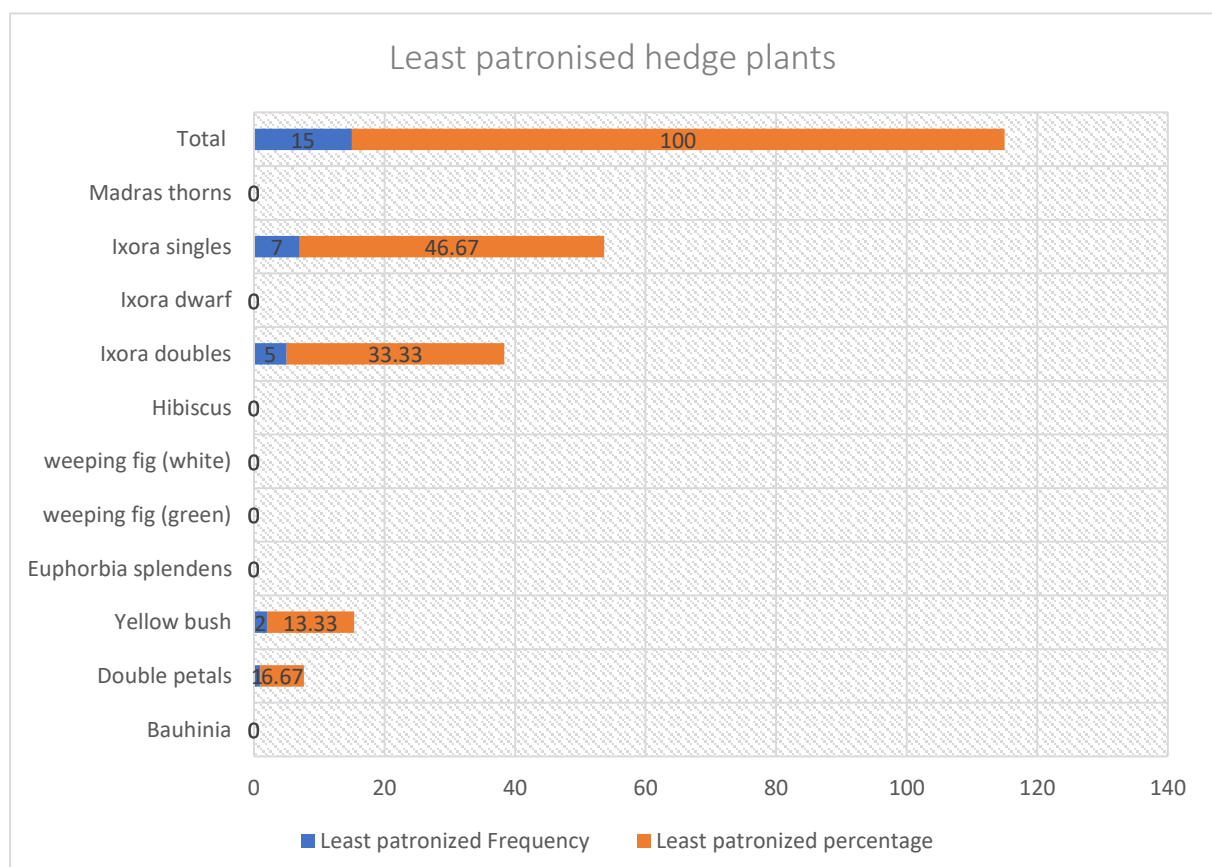
22.22% respectively. The most patronized hedge plant is however, Ixora singles with a total

Graph 4.4 Patronized hedge plant based on sales by commercial nurseries in Kumasi Metropolis

frequency of 7 out of the 15 respondents which constitute 46.67%.

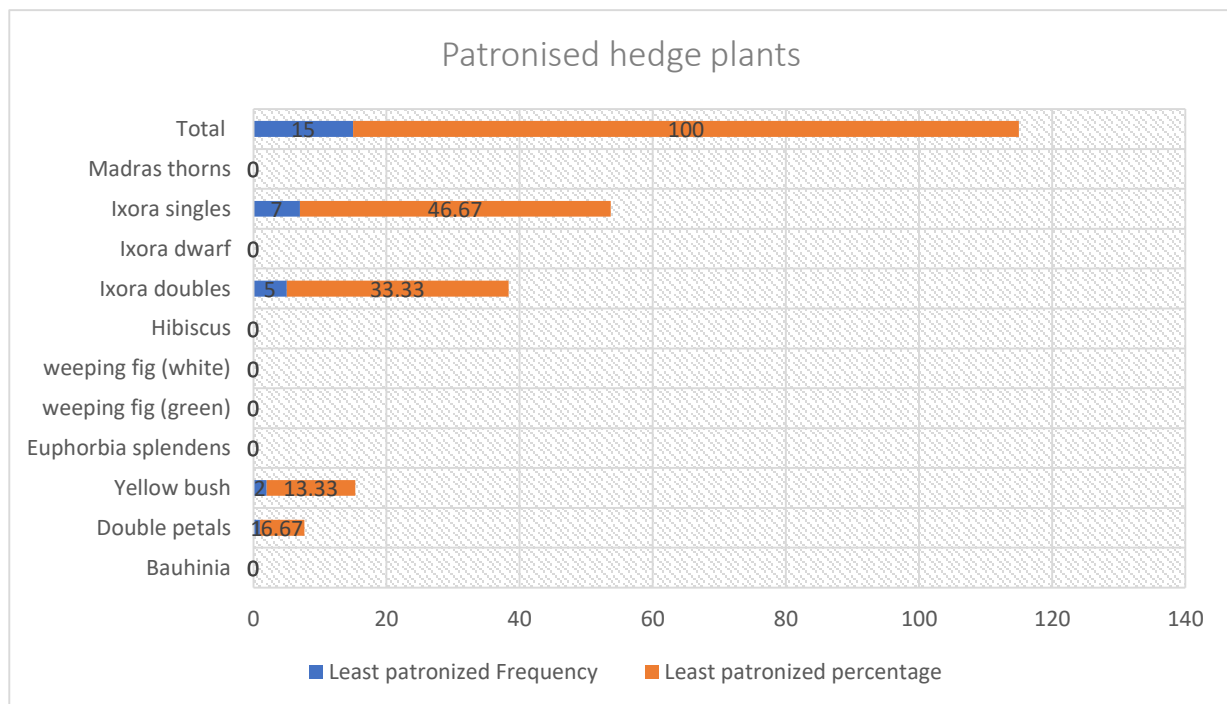*4.4 Most patronized hedge plant based on sales by commercial nurseries in Kumasi Metropolis*

Table 4.3. Rate of patronization of hedge plants and their images

Plant name		Rate	Image
Scientific	**Common**		
Ficus benjamina	Weeping fig	Least patronized	
Ixora splendens	Ixora double	Patronized	
Duranta erecta	Yellow bush		
Ixora	Ixora singles	Most patronized	

Observational Study at West Nhyiaeso, Kumasi

On the twenty-first of March 2015, an observational study of the residential area of West Nhyiaeso was carried out by the author to establish hedge plants and trees grown within the vicinity. At the end of the study it was revealed that 90% of the plants patronized at the commercial nursery men were seen grown within the area. The area is regarded as high-income and therefore its residence afforded the luxury of growing hedges in their homes and private gardens. Contrary to the findings from the nursery men on the most patronized hedge plants, Bauhinia and Yellow Bush were found to dominate within the area. Bauhinia looks neat with small green leaf sizes and have high foliage density hence its preference. Duranta has brightly yellow leaves and can be grown easily by planting branches cut from parent plants. The hedges identified were either grown as for aesthetics or as screening houses from public view. Others were combined with dwarf sandcrete block walls as the main fencing to individual homes.

Figure 4.1 Map of study area at West Nhyiaeso (Source: author's construct)
4.6 Physical characteristics of the most patronized hedge plants

Physical characteristics such as leaf size, top-down cover, crown density, drought resistance, leaf colour, flower colour and light requirements of Yellow bush, Ixora doubles, Bauhinia and Double petals which were identified since these were   selected as the most patronized hedges from respondents during the data collection process. The table below indicates a summary of the 4 most patronized hedge plants in Kumasi and their physical characteristics.

Table 4.4 Physical characteristics of most patronized hedge plants

Name of hedge	Physical characteristics						
	Leaf size	Drought resistance	Top-down cover	Crown density	Leaf colour	Flower colour	Light requirement
Duranta plumeiri (Yellow bush)	Type 1	high	complete	thick	yellow	yellow	Full sun
Ixora double	Type 2	high	complete	thick	green	variegated	Full sun
Bauhinia	Type 1	medium	complete	thick	green	N/A	Full sun
Double petals	Type 2	high	complete	medium	green	red	Full sun

Classification

Leaf size: type 1 like Yellow Bush, Ixora Dwarf, Weeping fig

Type 2 like orange tree, fruit of Persia, Acalypha tricolor

Type 3 like Indian almond, monstera

Crown density: thick (Ixora dwarf, Yellow bush)

Medium (Hibiscus, Madras thorns, Breynia nivosa)

Low (Cassia siamea)

Top- down cover: complete, mid to top, top alone

Light requirement: Full sun, semi shade, shade

4.6 Physical characteristics of tropical ornamental trees found

This part of the study gathered names of tropical trees from the commercial nurseries through questionnaires dispensed and through site observation study of West Nhyiaeso. Their physical characteristics through online literature were obtained Eleven tropical trees were found. Their physical characteristics such as leaf sizes, crown densities, drought resistance were identified through online literature. Availability of these tropical ornamental trees were also considered as a factor for selecting candidate trees.

Table 4.5 Physical characteristics of the tropical ornamental trees.

Name of hedge plant		Physical characteristics			
		Leaf size	Drought resistance	Availability of planting material	Crown density
Scientific	Common				
Temnalia catappa	Indian almond	Type 3	high	high	light
Temnalia mantally	Mantally	Type 1	high	high	thick
Acaria auriculiformis	Earleaf acacia	Type 2	high	high	thick
Mimusops elengii	Mimusops	Type 1	high	medium	thick
Lignum vitae	Tree of life	Type 1	high	high	thick
Polyathia longifolia	Weeping willow	Type 2	high	high	thick
Milletia thoningii		Type 2	high	high	thick
Blighia sapida		Type 2	high		thick
Pettophorum pterocarpum		Type 1	high	high	medium
Double petals	Rust tree	Type 1	high	high	medium
Azadirachta indica	Neem tree	Type 1	high	high	medium

Selection Criteria
From the findings in objective two (2Ixora singles was the most patronized hedge plant with the following characteristics
Leaf size**: *Type 1-2***, Crown density: ***Thick***, Top-down cover**: *Complete***, Leaf colour**: *Green*
Flower colour: ***Red***, Drought resistance: ***High***, Light requirement: ***Full sun***
 These characteristics were therefore established as the criteria for selecting candidate hedges from the tropical ornamental trees found within Kumasi. The characteristics of each of the 11 tropical trees were hence compared against the selection criteria.

Candidate tropical ornamental trees explored in Kumasi
Ten out of the eleven tropical trees after comparisons with the selection criteria were explored as candidate trees that can be used as hedge plants in Kumasi. This represent 90.91% of the total number of trees obtained. Temnalia catappa commonly called the Indian Almond was the only which was not selected on the basis that its leaf size was Type 3 which fell beyond the selection criterion. Other characteristics however matched exactly with the selection criteria. The table below gives a summary of the tropical ornamental trees explored as candidate hedges plants for selection.

Table 4.6 potential ornamental trees explored as hedge plants

Name of potential hedge plants	
Scientific	**Common**
Temnalia mantally	Mantally
Acaria auriculiformis	Earleaf acacia
Mimusops elengii	Mimusops
Lignum vitae	Tree of life
Polyathia longifolia	Weeping willow
Milletia thoningii	
Blighia sapida	
Pettophorum pterocarpum	
Double petals	Rust tree
Azadirachta indica	Neem tree

CONCLUSION

The progress of this study vividly revealed the need to consider hedge plants as vital components of our soft landscape in urban designs. The results of the findings identified ten tropical ornamental trees that for one reason or the other were not considered as potential hedge plants. Table 4.6 shows these potential plants that have been explored through the research. Since the study was of the explorative nature, recommendations were therefore made that more practicable study on the candidate trees obtained through the selection criteria that was carried out to find out how it is feasible. Trees that have been identified could also be studied to know which one are right suited for the various urban spaces, private and semi-private spaces.

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