JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCE

DEPARTMENT OF BIOLOGY

DIVERSITY AND COMPOSITION OF WOODY PLANTS IN JIMMA UNIVERSITY MAIN CAMPUS

BY: ZEYITU KEMAL

A RESEARCH OF SENIOR PAPER TO BE SUBMITTED TO DEPARTMENT OF BIOLOGY, JIMMA UNIVERSITY, NATURAL SCIENCES COLLEGE, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE B.SC DEGREE IN BIOLOGY

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ABSTRACT

Woody plant is a plant that produces wood as its structural tissues. Woody plants are usually either trees or shrubs. These are usually perennial plants whose stems and larger roots are reinforced with wood is structural cellular adaptation that allows woody plants to grow from above ground stem year after year. This study was conducted to identify species diversity, composition and identification of woody plants. A cross-sectional study was undertaken to determine diversity, composition and identification of woody plant in Jimma University main campus. The study was done by observation, sample (specimen) collection and processing in Herbarium and use of Gudelines in flora of Ethiopia and Eriteria. In the study a total of 21 species of woody plants were identified in which the exotic species took dominance 11(52.38%) the indigenous plant species 10(47.62%) significant species diversify. Proper management and conservation practices should be given due attention to utilize the plants for research, recreation and other purposes.

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Abbreviations and Definition of terms

CBD	Convention on Biological Diversity
EFAP	Ethiopian Forestry Action Plan
UNCED	United Nations conference on Environment and Development
JU	Jimma University

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CHAPTER ONE

1. Introduction

1.1 Back ground of the Study

Ethiopia is country enriched with biological diversity. The country is of great geographical diversity with high and rugged mountains, fhat-topped plateau and deep gorges incised river valley and rolling plains. The size of the Ethiopian higher plant flora is estimated to be more than 7000 species out of which about 12% are probably endemic to Ethiopia (Taye *et al.*, 2001). The total number of woody plants is estimated to be 1000 out of which about 300 are tree species (Sisay *et al.,* 2001). These numbers might increase when compilation of the woody species is complete. However, the unconcerned utilization of these resources has resulted in the declining of the country's biodiversity at a much faster rate. The currents annual rate of deforestations is estimated between 150,00 – 200,000 ha (EFAP 1994).

A woody plant is a plant that produces wood as its structural tissues. Woody plants are usually either trees shrubs, or lianas. These are usually perennial plants whose stems and larger roots are reinforced with wood is a structural cellular adaptation that allows woody plants to grow from above ground stems year after year, thus making some woody plants the largest and tallest plants. Woody is primarily composed of xylem cells with cell walls made of cellucose and lignin. Xylem is a vascular tissue which move water and nutrients from the roots to the leaves. Most woody plants from new layers of woody tissue each year, and so increase their stem diameter from year to year, with new wood deposited on the beneath the bark (Mark, 2004).

However, is some monocotyledons such as Palms and draceensas, the woody is formed in bundles scettered through the interior of the trunk (Mark, 2004).

Studies about the diversity of plant and species are important to know the relative importance of an area for conservation of Biological diversity and diverse ecosystems (Tadesse *et al.,* 2000). Diversity has become a more and a more popular topic with in discussion of sustainability in the last decade, through the maintenance of diversity of forest ecosystem is required since many years (swindle *et al.,* 1984), especially stressed in the Rio decloration (1992) and renewed by the Lisbon conference in 1998. The species diversity is an expression often used when what it is really meant species richness. Diversity is the measure of the relative abundance of species or the way in which individuals represent each species. Species diversity is composed of two components the number of species in a community (species richness) and species evenness or equitability (how abundance is distributed among species).

So, since many species diversity & composition of woody plants are found in Jimma University main campus it is very crucial and interesting to study them by identifying their species correlating with their scientific name.

1.2 Statement of the problem

1. The local names of natural vegetation in Jimma University main campus is not reported yet.

2. Those both exotic and indigenous plant species are categorized under which families or what are the respective families of these plants.

3. What are their current abundance in Jimma University main campus.

1.3 Significance of the study

The purpose of this research study is intented to conduct ecological studies with particular reference to diversity, composition and identification of woody plants. In addition the main requirement of this study is to assess the distribution and abundance of woody plant species in Jimma University main campus.

1.4 Objective

1.4.1 General objective

To identify diversity and composition of woody plants in Jimma University main campus

1.4.2 Specific objectives

- ✓ To identify woody plant species in the Jimma University main campus
- ✓ To identify tree species & shrub plants in the campus

1.5 Delimitation of the study

Jimma University was established to carry out higher educational institution and in turn conserves the natural (indigenous) plants in the demarcated land of the main campus. However, due to the expansion of buildings and roads, many natural woody plants were depleted and replaced by various exotic plant species.

1.6 Limitation

To perform this study effectively and efficiently many challenges were encountered. Some of them were the following. These were:-

- Due to shortage of time it was not possible to study all plants rather than woody plant species.
- It was difficult to obtain recent information about existing number of woody plant species, due to lack of recorded reference about woody plant species in this campus as well as lack of information form specialized expert.

CHAPTER TWO

2. Literature Review

This parts includes the advent of the concept of biodiversity, defining biodiversity, species richness, ecosystem diversity, the solution to preserving biodiversity, global change and biodiversity.

2.1 The Advent of Biodiversity

By the early 1980's scientists around the world had begun to recognize that species extinctions was occurring on global scale, the rate of these extinction surpassed those of the eretaceous period 05 million years ago when many species, including dinogours become extinct (Hill, 2001). Throughout the 1980's and 1990's the scientific community, the media, the public and governmental agencies worldwide began working to presence the biological diversity of terrestrial system. Issues such as deforestation of tropical forest, over exploitation of species, pollution, habitat loss, invasions by introduced species, and ether issues that addressed habitat preservation & conservation were brought into public focus (Hill, 2001).

Much of the recent global attention on biological diversity emanated from the united nations conference on Environment and development (UNCED), held in 1992, and the resultant convention on Biological Diversity (CBD), which entered into force in 1993 (Perlis, 2002). The goals of the CBD are conservation of Biological diversity, te sustainable use of components of biological diversity, and the fair and equitable sharing of benefits arising from the genetic resources.

Though biodiversity is currently given due attention, biodiversity and conservation are not new subject. Herodofus in 450 BC was aware of the importance of intraspecific variation in tree species although he did not know the word "genetic" (Perlis, 2002).

The entry by force in to the convention of on Biological diversity, in December 1993, is illustrative not only for the recognition but also a change in the overall strategy in conserving biodiversity (Heywood, 1995). It signals move to a more practical position that simultaneously seeks to meet people's needs from biological resources while ensuring the long-term sustainability of Earth's biological capital(Heywood, 1995).

2.2 Defining Biodiversity

The vast wealth of life is unified by common strand: DNA, All living things owe their forms and functions to the molecular make up of their DNA. Biological diversity – biodiversity is one of the central themes of conservation. Simply put, biodiversity may be defined as the measure of how healthy our ecosystems are healthy ecosystem support high biological diversity; while stressed or highly disturbed ecosystems do not (Newmark, 2002).

Strictly speaking the word bio diversity refers to the quality, range or extent of differences between the biological entitles in a given set. In total it would thus be the diversify of all life and is a characteristic or property of nature not an entity or resource (Heywood, 1995).

2.3. Species Richness

Species richness is the measure of the number of species, which occurs within a particular taxanomic level (i.e, genus, level, family level, etc) in a geographic area. Variation among species is of special concern to taxonomists, ecologists, and conservationists and includes the number, abundance or rarity, and endemicity of species; it has been commonly treated as synonymous with the original term 'diversity' used by theoretical ecologists when discussion competition and coexistence of species (Pielou, 1994).

2.4 Ecosystem diversity

Ecosystems are the collection of all plants and animals with in a particular area each differing in species composition, physical structure and function. The variation among ecosystems and the way, in which species interact among themselves with their environment, is a major subject of ecologists but it is especially important to ecosystem/land scope managers as it includes the global and local importance of the composition, structure and function of ecosystems, and the existence of so-called 'hot spots' of biological variability (Perlis, 2002).

Forest ecosystem diversity is a function of site diversity (Perlis, 2002). Therefore, examining soil and site conditions provides key information for silvicultural planning and development of biologically diversified and stable forest ecosystem. Classification of plant associations as well as site and stand descriptions are important as the basis for shaping and protection of forest biological diversity at all levels.

2.5 Valuing Biodiversity

The value of bio diversify to society depends on many factors besides its ecological significance, & these factors tend to vary from one country to another and one culture to another (Heywood, 1995) valuation helps environmental authorities to make informed decision about biodiversity conservation where there are alternative ways of treating resources. It helps, for example, to determine what development opportunities different societies need to give up if they wish to protect biological resources. Economist generally use one of the two methods to estimate the value of non-marketes to reveal the value people implicitly place on the resource (Perlis, 2002).

The value of bio diversify may be direct (they are used in consumption or production) or indirect (they support resources which have direct value). The use value of biodiversity is generally an indirect use value, and derives from the

role of the mix of species in supporting either individual organisms (the value of habitat) or ecological services (the value of ecosystem functions) (Heywood, 1995). This includes ecological function, protection functions, waste assimilation function and wide function such as micro climate stabilization and carbon storage. The key point in valuing biodiversify is that by using the individual values of as many different species as possible we can obtain a greater total value (Plotkin and Famolare, 1992).

Tropical forests, for example, provide not only the direct use value of timber, other forest products; medicines plants, plant genetics, hunting and fishing, recrection and tourism: they also provide indirect use value of forests including habitat provision, soil conservation and soil productivity (through nutrient cycling), soil conservation and watershed protection with derivative services of water supply and storage, flood control, micro-climatic effects and carbon sequestion (Heywood, 1995).

2.6. The Solution preserving Biodiversity

In order to ensure biological diversify it must be recognized that our natural resource base, our economic development, our food, our medicine, our clothing, and the air we breathe; indeed our very existence on this planet is dependent on the life around us. In preserving biological diversity we are simply ensuring our own continued prosperity and survival (Hill, 2001).

The question why biodiversity should be maintained is frequently addressed and disputed. It is obvious that nature provides human with abroad array of services and values, of which some are fundamental for the existence of mankind.

Moreover, although not fundamental for survival, aesthetics, wilderness experiences, etc., also contribute to the general welfare. Diversify among biological kinds (species, genes, etc) is sometimes considered to provide stability in ecosystems and is needed to maintain ecosystem function (Lemas,

1996). A part from utilization of biological resources today, a strong incentive for preserving biodiversity is their potential use in the future.

2.7 Global change and Biodiversity

Superimposed on all the regional and short-term pressure on biotic diversity is the recently recognized phenomenon of global climatic change, particularly that resulting from the green house effect; (Huntley, 1989). The possible impatcs of global warming on maintaining biotic diversity in the medium term-to twenty-second century will for outweigh any of the current crises of deforestation, desertification, expanding human populations, waste management, population and resource depletion (Huntley, 1989). The national forum on Biodiversity, held in 1986 (Wilson, 1988) only one or the 57 papers dealt with the effect of global climatic change on natural communities (Peters, 1988). That the problem has now been widely recognized is illustrated by the plethora of conference, workshops and international collaborative research programmes that have been convened since 1986. Attention was focused specifically on the topic of the consequence of the green house effect for biological diversity at a conference convened under that title in Washington in 1998 (Peters, 1989).

2.8 Threats to Biodiversity

Maintaining biological diversity is a major conservation dilemma and land managers and policy makers in many countries have to balance the needs of rural communities for food, shelter, fiber, living space and employment against the requirement of conservation of biodiversity (Keenon *et al.,* 1997). This problem is perhaps most acute in moist tropical areas because of the biological richness of the tropical forests and because they are being subjected to rapid land use changes.

The factors, which threaten biodiversity, are: over exploitation, physical alteration of habitat areas, alien species introductions, and changes in the atmospheric composition. Other threats to the survival of the life on earth are

continuous increase in size of the human population, lack of knowledge and poor management. Habitat degradation, which occurs as the result of these problems, inevitably leads to loss of species from an ecosystem, and thus a loss of biodiversity.

Biotic improve rishment which is the loss of the characteristic diversity of species, genes, and biological communities in a region is an almost inevitable consequence of the ways in which the human species has used and misused the environment the course of its rise to dominance; the factors that have led to the expanding ecological niche of humans are indirect causes of the loss of biodiversity (Heywood, 1995).

CHAPTER THREE

METHODOLOGY

3.1 Study Area and Period

The study was conducted in Jimma university main campus, which is one of the higher Academic Institutions in the country. It is located in Jimma town, Oromia region, located at 353kms to South West of capital city of Ethiopia, Addis Ababa and characterized by humid tropical climate with relatively reliable rain fall that range from 1,200 to 2,000nm per annual. The rain fall pattern is normally distributed with the major rains extending from February to October. The maximum temperature ranges between 25oc, which is higher than other place of the Ethiopia high lands. The study was conducted April 01 to May 10, 2013.

3.2 Study Design and Data Collection

A cross-sectional study was undertaken to determine the diversity, composition and identification of woody plant in Jimma University main campus. The study was done by observation, sample (specimen) processing in Herbarium and use of collections in the Herbarium and Guidelines as indicated in Flora of Ethiopia and Eriteria. Part of plants branch, leaves were taken accordingly for characterization and identification.

3.3 Source of Data

Both indigenous and exotic species of woody plants in Jimma University main campus were collected and taken to Herbarium for proper identification.

CHAPTER FOUR

4.1 RESULT

During this study the species of woody plants which were found in Jimma University main campus were observed, identified and collected at herbarium regarding their diversify, composition and abundance.

Table 1 Woody plant species found in Jimma University main campus Jimma University, April 2013.

S.No.	Scientific Name	Genus	Family	Order	Class	Division	Kingdom
1	*Acecia abssinica*	*Acaciamill*	Fabaceae	Fabales	Magnoliopsida	Magnoliophyta	Plantae
2	*Auracaria Biramulata*	*Aracaria*	Araucariaceae	Araucarida	Pinopsida	Pinophyta	Plantae
3	*Brucea anti dysenterica*	*Brucea*	Simaroubaceae	Sapindales	Eudicot	Engiosperm	Plantae
4	*Coffea Arabica*	*Coffea*	Rubiaceae	Gentienales	Eudicot	Angiosperm	Plantae
5	*Casuarina equise tifolia*	*Casuarinas*	Casuerinaceae	Fagales	Eudicot	Angiosperm	Plantae
6	*Cupress lucitanica*	*Cupressus*	Cupressaceae	Pinales	Pinopsida	Dinophyta	Plantae
7	*Cordia Africana*	*Cordial*	Boraginaceae	Asterids	Eudicots	Angiosperm	Plantae

8	*Ehertia cymosa*	*Ehretia*	Boraginaceae	Asterids	Eudicots	Tracheophyta	Plantae
9	*Ficus vasta*	*Ficus*	Moraceae	Rosales	Eudicots	Engiosperm	Plantae
10	*Juniperus procera*	*Juniperus*	Cupressaceae	Pinales	Pinopside	Pinophyta	Plantae
11	*Jacaranda mimo sifolia*	*Jacaranda*	Bignoniceae	Lamiales	Eudicots	Engiosperm	Plantae
12	*Maesa lanceolata*	*Maesa*	Myrsinaceae	Ericales	Eudicot	Engiosperm	Plantae
13	*Mangiferaindica*	*Mengifera*	Anacardiaceae	Sapindales	Eudicot	Angiosperm	Plantae
14	*Pinus patula*	*Pinus*	Pinaceae	Pinales	Pinopsida	Pinophyta	Plantae
15	*Dodocarpus fakatus*	*Podocarpus*	Podocarpaceae	Pinales	Pinopsida	Geminosperm	Plantae
16	*Psidium guojava*	*Psidium*	Mytaceae	Myrfales	Magnoliopsa	Tracheophyta	Plantae
17	*Thuja occidentelis*	*Thuja*	Cupressaceae	Pinales	Pinopsida	Pinophyta	Plantae
18	*Rhamnus prinoids*	*Rhamnus*	Phamnaceae	Rosales	Eudicot	Angiosperm	Plantae
19	*Vernomia amygdaline*	*Vernomia*	Asteraceae	Asterales	Eudicot	angiosperm	Plantae
20	*Eucolyptus Sp*	*Rosid*	myrfaceae	myrfales	Eudicots	Angiosperm	Plantae
21	*Avocado*	*Perseae*	lauraceae	Laurales	Magnoliods	ingiosperm	Plantae

Taxonomically plants can be known by scientific name and vernacular or local name. These names have crucial role in identification, characterization and even to know the environmental condition in which the plant can grow and develop.

Table 2. Woody plant scientific name, local name and growth habit, Jimma University, April 2013

S.No.	Scientific Name	Local Name	Growth habit	Origin of Species
1	*Acacia abssinica*	Lafto	Tree/Shr	indigenous
2	*Auracaria Bilamulata*	Not given	Sh	exogeneous
3	*Brucea antidysenterica*	Qomanyo	Sh	indigenous
4	*Coffea Arabica*	Buna	T/Sh	indigenous
5	*Casuarina equisetifolia*	Not given	T	exogeneous
6	*Cordia Africana*	Wanza	T	indigenous
7	*Cupress lucitanica*	Not given	T	exogeneous
8	*Ehertia cymosa*	Ulaga	T	indigenous
9	*Ficus vesta*	Qilxu	T	indigenous
10	*Jacaranda mimosifolia*	Not given	Sh	exogeneous
11	*Juniperus procera*	gattira	T	indigenous
12	*Maesalanceolata*	Abayi	T	indigenous
13	*Mengifera indica*	Mango	T	exogeneous
14	*Pinus patula*	Shawshawe	T	exogeneous
15	*Podocarpus felcatus*	Birbirsa	T	exogeneous
16	*Psidium guajava*	Zeytuna	Sh	exogeneous
17	*Thuja accidentals*	Not given	T	exogeneous

18	*Rhamnus prinoids*	Gesho	Sh	indigenous
19	*Vernomia amygdalina*	Ibicha	T	indigenous
20	*Eucalyptus sp.*	Bergamo	T	exogeneous
21	*Avacado americana*	Avodado	T	exogeneous

** Key: T- represent the growth habit of woody plant

i.e. tree and Sh- represent Shrub

T/Sh- Tree or Shrub

From the above table the percentage of exogenous species were higher than indigenous species, that was 11(52.38%) and 10(47.62%), respectively.

To identify woody plant species, the whole plant body play a crucial role. E.G. leaf morphology, type of branch and branch arrangement.

Table 3. Woody plant leaf morphology with respective genus, Jimma University, April 2013.

S. No	Genus	Leaf morphology	
		Venation	Leaf arrangement
1	*Maesa*	Netted	Alternative
2	*Mengifero*	Netted	Alternative
3	*Cordio*	Netted	Alternative
4	*Ehretia*	Netted	Alternative
5	*Aracaria*	Parallel	Opposite
6	*Psidium*	Netted	Opposite
7	*Vernamio*	Netted	Alternative

8	*Brucea*	Netted	Opposite
9	*Acaciamill*	Netted	Opposite
10	*Casurina*	Parallel	Alternative
11	*Pinus*	Parallel	Whorhled

Table 4. Class of woody plant species found in Jimma University main campus with their abundance in percentage, Jimma University, April 2013.

Number of class	Abundance in percentage
Eudicot	12(57.14%)
Megnoliopsida	2(14.28%)
Pinopsida	6(28.57%)

From Table 4, eudicot woody plants were found in high percentage followed by pinopsida and magnoliopsida.

4.2 Discussion

Due to its geographical variation, Ethiopia has a great diversify of woody plants (Alemayehu, 2002), with great value of their economical importance, social and environmental benefits.

Jimma is one of the part of south western Ethiopia which were enriched with natural vegetation of woody plants and also Jimma University is one of the higher institution found in this area, in Jimma town. Eventhough many species of the indigenous of buildings were destroyed by human entervention,

today Jimma University is beautified and green colored by its exotic and indegeneous woody plants which were mostly planted by human beings.

For the case of this study, the species of woody plants found in Jimma University main campus were identified and analyzed.

Depending on environmental requirement woody plants have different uses. For example as Gemedo *et al.*, 2006 stated, the importance of woody plants to house hold had the broad range of use. While construction represented, the most wide spread use as well as the importance of tree and shrub as forage sources for live stocks were crucial for the survival and sustainability of live (Gemedo *et al.,* 2001). But in case of this study the use of woody plants were specially for educational, research and recreational.

There are many edible species of woody plants in Ethiopia (Teshome *et al.,* 2012). In Jimma University main campus there are also few species of woody plant identified which include species like *Mangifera indica* (common mango), *Ficus vasta* (locally known as Qilxuu), cordial Africana (Vernacular name: Weddeessa), *Avocado Americana* (Avocado).

From the woody plant found in this area, trees were the most diversified, with high composition and mostly identified followed by shrubs woody plant species. The percentage of tree species accounts for 14(66.6%), shrub 5 (23.8%) and tree/shrub 2(9.5%). The most tree class abundant is Eudicot class of plants. The most shrub class identified in the study was pinopside when it was purposely observed the woody plant abundance and distribution were spercely distributed around the roads and building in the campus and add their beautiness for the observer and they were the fate of mind for refreshment and conditioned air environment. Species with the highest basal area can be taken as the most important species in that area (Tamrat, 1993). But in this study case out of the identified species Eudicot exotic woody plants are the dominant species in this campus.

CHAPTER FIVE

5. Conclusion and Recommendation

5.1 Conclusion

Jimma University main campus has many woody plant species that made the campus evergreen and attractive area with its many diversify and composition by exotic and indigenous species of plants.

In the campus the species diversify of exotic woody plants were dominant over the indigenous depending on their diversity abundance and composition. In this study, there were about 21 species of woody plant, categorized under in to 18 families.

5.1 Recommendation

In order to improve the species diversify and conserve the resource in an efficient manner and sustainably the following recommendation are proposed.

- As exotic species were conserved, it is also better if the indigenous plants of the country will be given better attention for conservation and used for research purposes widely.
- The status of conservation of trees and shrub in Jimma University should be applied to other areas.
- Promotional work should be worked out to enhance public awareness on the values of woody plants as in Jimma University for other community found in other Institutions.

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