RIVERS STATE UNIVERSITY
PORT HARCOURT

PLANTS:
ENABLERS OF SUSTAINABILITY AND GROWTH OF MAN

AN INAUGURAL LECTURE

BY

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Professor of Plant Physiology

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DEDICATION

My husband, Engr. Dienye Tamunodiari Jaja (Late)
and to our Jewels, Lolia and Dienye.
In life and in death, you have kept me standing and believing that "I can do all things through Christ who strengtheneth me". *Philippians* 4:13. KJV

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PROTOCOL

The Vice Chancellor and Chairman of this occasion, Sir,
Chairman and Members of the University Governing Council,
The Deputy Vice Chancellor (Academic),
The Deputy Vice Chancellor (Administration),
The Registrar and Secretary to Council and Senate,
The University Librarian,
The University Bursar,
Former Vice Chancellors and Emeriti Professors,
Former Deputy Vice Chancellors,
Heads of the Various Campuses of the University,
Provost of the College of Medicine,
Dean of the Postgraduate School,
Deans of Faculties and Directors of Institutes and Centres,
Heads of Departments and Units,
Distinguished Professors and Members of Senate,
Academic, Administrative and Technical Staff,
Great Students of Rivers State University,
Ministers of God,
Your Royal Majesties, Highnesses and Chiefs
Honourable Local Government Chairmen and Commissioners,
My Family Members and Friends,
Distinguished Ladies and Gentlemen.
I humbly welcome you to this Inaugural Lecture titled "Plants: Enablers of sustainability and Growth of Man".

1.0 PREAMBLE

Mr. Vice Chancellor Sir, It is a great pleasure and honour for me to deliver the 87th Inaugural Lecture in the Series of this great University and the very first from the Department of Plant Science and Biotechnology. How did I get here? How did I navigate the snaps and snares? Who am I that the Lord is so mindful of me? These and many more are the questions that keep reverberating through my mind. But then, I hear the voice that keeps telling me that "all things worketh together for good for them that love the Lord" (Romans 8:28) and in Jer. 29:11. He says "I know the thoughts that I think toward you, thoughts of peace and not of evil to give you an expected end". Mr. Vice Chancellor, Sir, ladies and gentlemen, it has been said that every professorship has a story, mine was no different but events started unfolding much earlier with my doctoral degree. That ASUU is apolitical is a fact many find difficult to accept so, every action they give a political coloration

I became Chairman of ASUU, RSUST, Port Harcourt and the attendant challenges surfaced. First, they came in trickles, then the tsunamis!! It really was a bleak period as all machinery and arsenals were brought out and put to work. Exodous 14: 14 says "The Lord shall fight for you and you shall hold your peac".So I held my peace . My doctoral degree studies spanned through

my ASUU chairmanship tenure. Thereafter, I successfully defended my PhD Dissertation with the subsequent Postgraduate Board approval but no stone was left unturned to truncate the award of my Doctorate Degree. The word of God is always Yea and Amen, for "when the enemy shall come in like a flood, the Lord shall lift up a standard against him" (*Isaiah* 50:19). How they fought but the Lord used angels in human form , eminent and notable Professors of the University to build a fence round about me: ASUU, my ASUU, through thick and thin you stood by me. SSANU, NAATS and NASU were not left out. Thank you. "This vision is yet for an appointed time, but at the end it shall speak, and not lie; "though it tarry, wait for it; because it will surely come, it will not tarry". Alas, five (5) years down the line the Doctoral (PhD) degree was awarded in June 2015, thereby qualifying me, after due process, for elevation to the post of READER in PLANT PHYSIOLOGY, and finally in 2018, I was appointed PROFESSOR OF PLANT PHYSIOLOGY, making me the first Professor of Plant Physiology in this University.

I competed favorably with David in the composition of Psalms during this wilderness journey. The day a very close friend was sent to warn me about possible assassination especially against the backdrop that I was a widow with no helper, my refrain was and still is:

I will lift up my eyes unto the hills from whence cometh my help, my help cometh from the Lord who made heaven and earth. The Lord is my shepherd, I shall not want. Even though I walk through the valley of the shadow of death, I will fear no evil, for thou annointest my head with oil, my cup runneth over. Truly my cup shall run over.

Mr. Vice Chancellor and this esteemed audience, can you imagine the person standing before you being a threat to even a baby? A man was asked to describe himself and he described himself as a "Simpleton – trying to be modest. Poor man, he only meant to say he was a simple man but my GS 101 said it all …" a little learning is a dangerous thing, drink deep or not at all". Unlike the man, I will say "I am a simple individual, not trying to "form" as the youths will say but just being me, myself and I.

When people describe me as a "strong woman", I laugh, I laugh because they don't know the secret tears I shed. I choose not to wear my heart on my sleeve, not to be an object of pity. As the song writer said, "it is a long and hard way to travel. Being a naturally happy person helped me turn my lemons into lemonade. God has been sufficient unto me, I give Him thanks

Mr. Vice Chancellor and this distinguish audience, it is with awe, humility and gratitude that I stand before you to give this

87th Lecture in the Inaugural Lecture Series. A Professor of Plant Physiology who was predestined to be by the Almighty.

2.0 INTRODUCTION

2.1 Background Review

Vice Chancellor Sir, I am immensely grateful for your approval which has made this Inaugural Lecture presentation possible. My gratitude also goes to the Chairman, Senate Inaugural Lectures Committee, Prof. N. Hudson Ukoima, members of the Committee, Prof. J. Jaja, Prof. J. Ohaka, Prof. N. Nwafor and the Secretary of the Committee, Mr. E. Egbuchu. Thanks for the slot to present this 87th Inaugural Lecture in the Lecture series and the first (1st) in the Department of Plant Science and Biotechnology (Unique PSB). .

I recognize and appreciate this esteemed audience, without your presence inaugural lecture will not be taking place. I feel so honoured to be standing before you to deliver this lecture.

The theme for this lecture, PLANTS: ENABLERS OF SUSTAINABILITY AND GROWTH OF MAN is actually a story of sustenance of life. Plants are the fulcrum of life, they are the rung in the food chain – they provide food, purify the air, give healing, protection and, where degradation occurs, remediate the soil (phytoremediation).

I am aware than an inaugural lecture is given to draw attention to

the subject matter, in this case **Plant science and Biotechnology** and **Plant physiology** in particular. Its theoretical and practical contribution to humanity and all its resources. An inaugural lecture is not meant to be given with all the jargon of the subject matter but is meant to bring "Gown to Town" in its simplest form.

The import of the metaphor "**All flesh is grass**" (*Isaiah* 40:6) well explains plants' importance to life. The trees are meant for life, giving out food, medicine and water purification. They give comfort, beauty and emotional relief. There is no gainsaying that PLANTS dominate the world. They are great contributors to world economy. Plants are all around us no matter where we live. In the tropics, they grow luxuriantly hiding the earth beneath our feet. During brief summers of the Artic zone, rock crevices and pockets where the ice melts give forth brilliant flowers. High above the line where trees can grow on mountain tops, small plants find the means to survive and reproduce in harmony with the rigorous environment (Onofeghara, 1985). Plants have played such tremendous roles that Fiona Stafford (2018) was prompted to state in the book **The Brief Life of Flowers**

> But flowers have also played a key part in forming the past, and may even shape our future Some have served as symbol of monarchs, dynasties and nations

– from the ward of the Roses to the order of the Thistles. And while the poppy is often associated with the First World War, it was the Elderflower that treated its wounded soldiers, joining a long line of healing flowers that have helped develop modern medicine, including lavender and foxgloves.

From the personal to the political, flowers play a part in all aspects of life: the right rose, according to the Victorian language of flowers, might need a broken heart, while sunflowers may just save our planet.

Plants are the only part of creation to which the Good Lord gave specific instructions. For in *Genesis* 2:8-10 "… The Lord God planted a garden eastward of Eden, and there put the man whom he had formed. And out of the ground made the land to grow every tree that is pleasant to sight, and good for food; the tree of life also in the midst of the garden, and the tree of knowledge of good and evil man in the midst of the garden, had his needs met; food to nourish the body with all the nutrients and nourishments required for life. The Tree of life for medicinal effect of plants for curative case is seen in 2 *Kings* 20:7 where Isaiah said "take a lump of figs and they took and laid it on the boil (of King Hezekiah) and he recovered. For emotional healing, plants were used in *Genesis* 43:11 by Jacob to appease Joseph when he sent his children to "take of the best fruits in the land in your vessels

and carry down the man a present, a little balm, and a little honey, spices and myrrh, nuts and almonds.

Mr. Vice Chancellor Sir, and this noble audience, looking through and around this auditorium, I see PLANTS, their derivatives and beneficiaries. As we take this undertake journey, we will realize how versatile plants are in life.

2.2 Specializations in Plant Science and Biotechnology

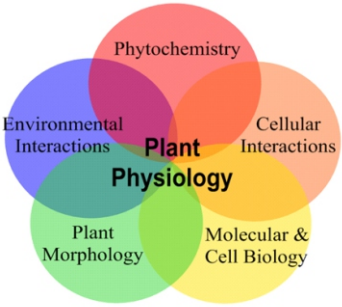
The study of Plant Science and Biotechnology is subdivided into various areas of specialization, namely:

1. **Plant Anatomy:** Plant Anatomy is the study of the shape, structure and size of plants. Plan anatomy focuses on the structural or body parts and systems that make up a plant. A typical plant body consists of three major vegetative parts: the roots, the stem and the leaf as well as a set of reproductive parts that include flowers, fruits and seeds.
2. **Plant Taxonomy and Bio-systematics:** This is the science of naming and classifying organisms. It is the study of the diversification of organisms, both past and present, and the relationship among those organisms through time.
3. **Plant Physiology:** Study the relationship between plants and function. It includes many aspects of plant life, including nutrition, movement and growth.

4. **Plant Ecology:** Examines the relationship between plants and their physical and biotic environment. The distribution and abundance of plants and the interactions between plants and environmental factors and organisms.
5. **Plant Biotechnology:** the study of application of engineering principles and biological sciences to produce modern materials from raw products of plant origin to solve problems of living organisms by modification of constituents of living cells to improve biotic and abiotic environment for the benefit of humans, animals and plant life.
6. **Plant Cytogenetic:** The study of hybrid science which combines cytology (study of cells) and genetics (the study of inheritance).
7. **Plant Breeding:** Science of changing the traits of plants in order to produce desired characteristics. It involves the improvement of the genetic patterns of domestic plant populations. They are involved in the manipulation and improvement of plants for man's needs.
8. **Plant Pathology:** The scientific study of diseases in plants caused by pathogen and environmental conditions.

My specialization, Mr. Vice Chancellor Sir, and this noble

audience (assembly) is Plant Physiology. Plant Physiology is the study of natural phenomena in living plants. It is the science concerned with processes and functions, the responses of plants to changes in the environments and the growth and development which result from the responses (Onofeghara, 1982).
It is next to impossible to isolate Plant Physiology from other specialties in Plant Science.



(Source: Wikimedia commons. Accessed April 17, 2023)

It integrates plant breeding (external forms of plants and their organs, morphology, anatomy (structure of internal), plant pathology (plant diseases), Cytogenetics, Genetics, Molecular Biology and Cell Biology. A combination of all or some of these areas of study gives a comprehensive analysis of growth and all developmental processes of the plant Physiology. Physiology of all branches of Plant Science is found to be the most implicated plant life. The Physiologist occupies a comfortable position in life's

studies. Plants are the pivot of life starting with food, shelter, clothing.

2.3 Concerns of the Plant Physiologist

Plant physiology is a branch of botany that studies how plants work, or their physiology. Plant morphology (shape), plant ecology (interactions with the environment), phytochemistry (biochemistry of plants), cell biology, genetics, biophysics, and molecular biology are all closely connected sciences. Plant physiologists research fundamental processes like photosynthesis, respiration, plant nutrition, plant hormone functions, tropisms, nastic movements, photoperiodism, photomorphogenesis, circadian rhythms, environmental stress physiology, seed germination, dormancy, and stomata function, which are both parts of plant water relations.

Plant physiology is the study of all of a plant's internal functions, including the chemical and physical processes that are connected with life in plants. This involves research on a wide range of size and time scales. Molecular interactions of photosynthesis and internal diffusion of water, minerals, and nutrients occur at the smallest scale. Plant development, seasonality, dormancy, and reproductive control are all activities that occur on a huge scale. Phytochemistry (the study of plant biochemistry)

and phytopathology are two major sub-disciplines of plant physiology (the study of disease in plants). Plant physiology as a discipline can be broken down into three primary research topics.

Plant physiology, thus, is concerned with the interactions of cells, tissues, and organs inside a plant. Physically and chemically, different cells and tissues are specialized to fulfill different roles. The purpose of the roots and rhizoids is to anchor the plant and acquire minerals from the soil. In order to create nutrition, leaves capture light. Minerals from the roots must be delivered to the leaves, and nutrients generated in the leaves must be transported to the roots, for both of these organs to remain alive. Plants have created a variety of mechanisms to perform this transport, such as vascular tissue, and plant physiologists study how these varied forms of transport work.

Plant physiologists, on the other hand, investigate how plants govern and regulate their internal activities. Hormones are created in one area of the plant to tell cells in another section of the plant to respond, just as they are in mammals. Because of light-sensitive chemicals that respond to the length of the night, many blooming plants bloom at the right time, a phenomenon known as photoperiodism. The plant's production of the gas ethylene

regulates the ripening of fruit and the loss of leaves in the winter.

Finally, environmental physiology is a branch of plant physiology that studies how plants respond to different environmental situations and how they change. Water loss, changes in air chemistry, and crowding by other plants can all cause a plant's function to change. Genetic, chemical, and physical factors may all influence these alterations. Hormones and other growth regulators are produced by plants to indicate physiological responses in their tissues. They also create light-sensitive chemicals like phytochrome, which help to induce growth or development in response to environmental signals.

Plant physiology is an important topic in horticulture and agriculture, as well as food science, when it comes to fruits, vegetables, and other consumable sections of plants. Climate needs, fruit drop, nutrition, ripening, and fruit set are among the topics researched. The study of plant physiology, which includes themes like optimal planting and harvesting periods, post-harvest storage of plant products for human consumption, and the creation of secondary goods like pharmaceuticals and cosmetics, is also important in the production of food crops. Crop physiology takes a step back and examines an entire field of

plants rather than individual plants. Crop physiology studies how plants interact with one another and how to maximize outcomes such as food production by controlling factors like planting density.

Plants, like mammals, fungi, bacteria, and even viruses, are made up of the same chemical elements as all other life forms: carbon, oxygen, hydrogen, nitrogen, phosphorus, sulphur, and so on. Only the specifics of their chemical architectures differ. Plants develop a broad assortment of chemical molecules with unique qualities that they use to adapt with their environment, despite their fundamental similarities. Plants employ pigments to absorb or detect light, and people extract them to use in dyes.

Other plant products could be used to make economically valuable rubber or biofuel. Plant chemicals with pharmacological activity, such as salicylic acid, which is used to make aspirin, morphine, and digoxin, are among the most well-known. Phytopathology, the study of plant illnesses and the ways in which plants resist or cope with infection, is one of the most economically important areas of research in environmental physiology. Plants are vulnerable to the same pathogens that affect animals, such as viruses, bacteria, and fungus, as well as physical invasion by insects and roundworms.

3.0 PLANTS IN THE LIFE OF MAN

3.1 Plants - The Mother of All Food

Plants are a source of a wide variety of nutrients required to keep the human body in perfect working condition. Humans consume everything from roots of some plants like carrots and stem-like lettuce and sugarcane, spinach leaves, mango fruit, groundnut seed. Hibiscus flower is used as flavourings in various foods in various ways (Table 1).

Table 1: Parts of plants eaten for Food

Part of Plant Eaten	Plants
Root	Carrot, radish, beetroot, sweet potato, turnip.
Stem	Onion, potato, ginger, garlic, turmeric
	Flowers of banana plant, pumpkin plant, sunflower, Jasmine
Fruits	Apple, orange, mango, pears, banana, plum, grapes, guava
Seeds	Wheat, rice Maize, millet, Peas, pulses, mustard, groundnut, soyabean
Sprouts	The seeds of Moong, Chana, and Moth are usually converted into sprouts in our homes for food.

How much of plants have you consumed today? Plants die for us to live. Plants die for herbivorous animals to live. Still plants have to die for plants to live – manure. Plant is the mother of all food.

According to the United Nations Food Agency plants make up

80 percent of the food we eat and produce 98% of the oxygen we breathe. In recognition of this, the year 2020 was designated as the International Year of Plant Health.

3.2 Plants - Shelter for Man

Shelter is one of the elements of survival, along with food and water. Shelter offers people safety and security.

3.3 Plants - Shelter for Animals

The tropical rainforest provides shelter to over 20% of the world's species of animals. Animals use shelter for two reasons: protection and places to hunt from. Many animals use shelters to keep them from becoming another animal's lunch, while others use shelter to wait for prey to walk by. Humans have developed many different names for different types of animal shelters. Try to list what animals live in the following shelters: den, nest, cave, lodge, and burrow. Because there are so many layers of the rainforest, shelter in the rainforest takes many different shapes. Most of the arboreal animals, or animals that live in the trees, take shelter in nests or dens carved, dug, and built into the trees. These shelters offer good.

3.4 Plants - Shelter for Plants

Contrary to popular belief plants need shelter. Plants in the rainforest are generally very particular. Because there are so many species in the rainforest, there is a great deal of competition between plant species. Also, in order to survive and

proliferate, plants have developed areas and regions that best allow them to grow.

Plants often shelter one another by blocking sunlight or allowing sunlight to reach the plant. In the tropical rainforest, the under-story is dark and wet, receiving less than 5% of the sunlight. The plants and trees above the under-story offer shade to the plants below. If many of the plants in the under-story were given direct Equatorial sunlight, they would wilt and die.

3.5 Fossil Fuels – Coal and Oil

i. Coal

Even at death plants still contribute to our Economy. Coal is formed through a process called coalification. Coal is made of decomposed plant matter in conditions of high temperature and pressure. Coal formed millions of years ago when the earth was covered with huge swampy forests where plants - giant ferns, reeds and mosses grew (Figure 1). The large pteridophyte forests are responsible for the formation of coal deposits, mainly in Europe, Asia and North America and Africa (Taylor *et al*., 2009). It is not a uniform substance; its composition varies from deposit to deposit. Factors that cause this variation are the types of original plant matter, and the extent the plant matter decomposed. Coal formation begins as peat and ends as Anthracite coal (Ajayi and Ajayi, 1981).

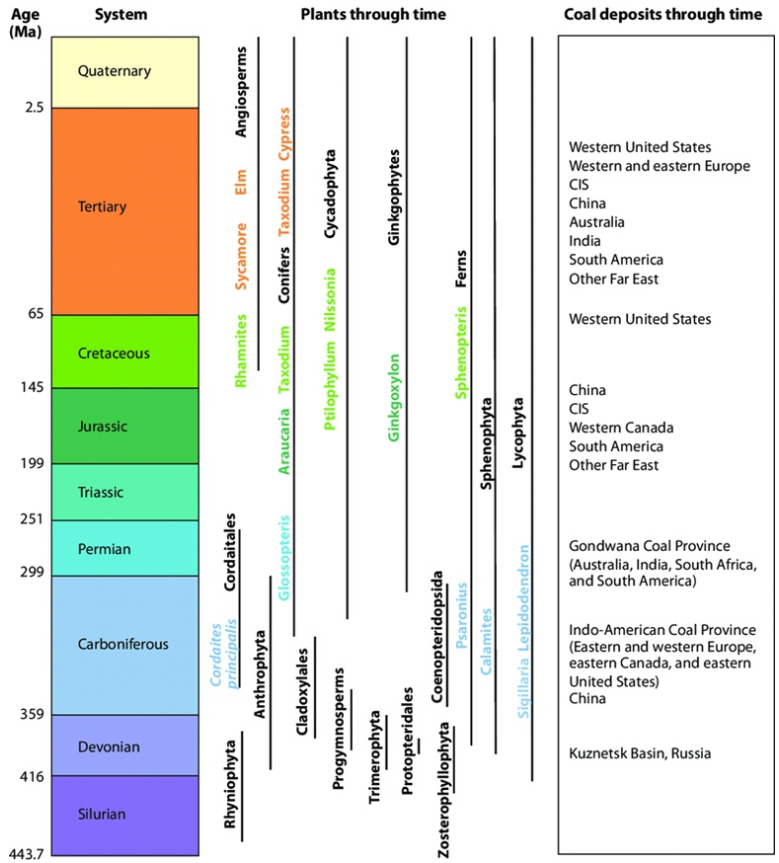


Figure 1. Plants in Coal formation (Source:Taylor et al., 2009).

Nigeria is endowed with a large coal deposit, most of which are reported to be mostly within the Benue Trough (Carter *et al*., 1963 and Obaje *et al*., 1994) (Table 2). Plate 1 shows open cast coal mine at Okaba, Kwara State

Table 2. Nigerian coal reserves by location

State	Location	Indicated in situ reserves (Mt)	Inferred reserves (Mt)	Overall reserves (Mt)
Anambra	Enugu	54	200	254
	Ezinmo	56	60	116
	Inyi	20	Unknown	20
Benue	Onikpa	57	75	132
	Okaba	73	250	323
	Ogboyoga	107	320	427
Delta	Asaba	250	Unknown	250
Plateau		22	Unknown	22
Other states			1160	1160
Total		639	2065	2704

Source: Nigerian Coal Corporation.

Plate 1: Open cast coal mine at Okaba, Kwara State (Photo by Eze, C.L, 2022).

ii. Oil

Oil and gas are formed from organic material (Plants and Animals) mainly deposited as sediments on the seabed and then

broken down and transformed over millions of years. If there is a suitable combination of source rock, reservoir rock, cap rock and a trap in an area, recoverable oil and gas deposits may be discovered there.

As the microscopic phytoplankton died, they sank to the bottom and accumulated in large quantities in the oxygen-free sediments. Over time, they were buried deeper and subjected to a long process of chemical conversion by bacterial decomposition and maturing under a thickening pile of sediment. This caused the formation of liquid and gaseous hydrocarbons in the source rock.

Nigeria's oil and condensate reserves status as at January 1, 2022 was 37.046 billion barrels representing a slight increase of 0.37 per cent compared to 36.91 billion barrels as at January 1, 2021. On the other hand, the national gas reserves status as of January 1, 2022 was 208.62 trillion cubic feet, representing an increase of 1.01 per cent compared to 206.53TCF as at January 1, 2021 (NUPRC, 2023). In all these plants have played important roles. After serving us, plants die to contribute to our salaries and other earnings.

3.6 Geobotany - Plants in Mineral Exploration

Geobotany is the use of indicator plant species or assemblages to detect the possible presence of mineral deposits. It is also used to map fresh water and saline aquifers.

This is based on the limits-of-tolerance principle. It assumes that only specialized species can withstand metal-contaminated soils or that some species will die off completely with concentrations above their tolerable limit. The exploration could also be based on the analyses for the minerals in the plant parts. *Rumex acetosella* and *Minuartia verna* are confined to mineralized ground in Macedonia. These plants contain relatively high concentrations of heavy metals such as copper, zinc, lead and manganese, and are to that extent, valuable indicators of sulphide mineralization (Kelepertsis and Andrulakis, 1983).

3.6.1 Exploration for Copper

Elsholtzia haichowensis Sun., Commelina communis Linn., and Rumex acetosa Linn, are the dominant species known to grow over the copper mining spoil heaps and copper-contaminated soil of the areas along the middle and lower streams of the Yangtze River (Figure 2). The highest concentration copper was found in *R. acetosa* with the leaf copper concentration ranging from 340 to 1102 mg/kg and averaging 601 mg/kg (dry weight basis). *C. communis* also contained high copper concentration in its leaves ranging from 19 to 587 mg/kg and averaging 157 mg/kg. *E. haichowensis* has the lowest copper concentration in its leaves from 18 to 391 mg/kg and averaging 102 mg/kg. These plants serve as pioneer species for reclamation of copper mined

land and can be used for geochemical prospecting for copper (Shirong *et al*., 1999).

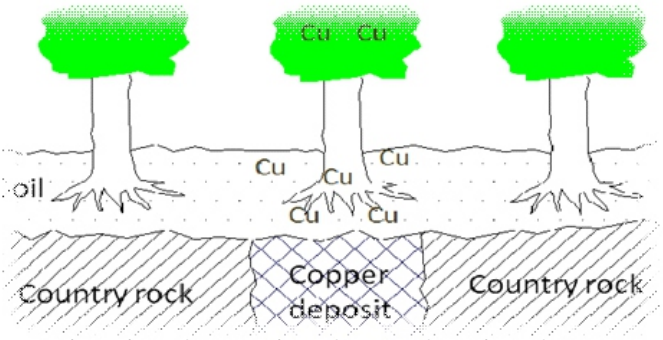


Figure 2. Prospecting for Copper with Plants

3.7 Aquifers and Plant Indicators

Phreatophytes are indicators of potable groundwater. The term phreatophyte is used to designate, a plant that habitually obtains its water supply from the zone of saturation, either directly or through the capillary fringe. The term is obtained from two Greek roots and means a-"well-plant." Such a plant is literally a natural well with pumping equipment, lifting water from the zone of saturation. Some phreatophytes have a low tolerance for salt, indicating freshwater. This can be a valuable guide to the location of drinking and agricultural water in arid and semiarid areas. Trees like the **ash**, the **alder**, the **willow** and the **poplar** are also useful in this regard. These trees generally grow in freshwater aquifers where the water table depth is not more than

ten meters.

3.8 Hemoglobin vs Chlorophyll

Hemoglobin and Chlorophyll have similar structures (Figure 3). The main difference is that hemoglobin is built around iron (Fe), whereas chlorophyll is built around magnesium, (Mg). The primary function for hemoglobin is to transport oxygen from the lungs to other parts of the body. Hemoglobin is composed of four elements- carbon, hydrogen, oxygen and nitrogen. All four are organized around iron. Chlorophyll is composed of the same elements, which are organized around magnesium (Hendry and Jones, 1980).

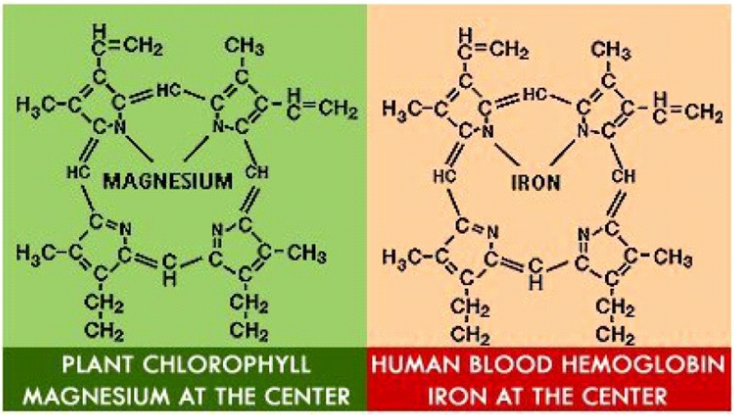


Figure 3: Structural Comparison of Plant Chlorophyll and Human Blood Hemoglobin (Source: Nicole Moseley, 2012)

3.9 Anti-anemia Effect of Chlorophyll from Katuk (*Sauropus androgynus*) Leaves on Female Mice Induced Sodium Nitrite

Sampurna *et al*., (2016) conducted a research on the anti-anemia effect of chlorophyll from Katuk (*Sauropus androgynus*) leaves on female mice induced sodium nitrite. Their findings indicated the hemoglobin (Hb) decreased after $NaNO_2$ induction treatment group for 18 days. In contrast, mean of, MDA, ferritin level, and schistocytes percentage's in mice which were induced with $NaNO_2$ induction increased draw on the control group level. Control group showed normal erythrocytes, whereas in the group induced NaNO2 found schistocytes. Katuk chlorophyll and Cu-chlorophyllin group showed the lower schistocytes percentage compared with the group with the induction of $NaNO_2$. Adduction of Katuk leaves chlorophyll and Cu-chlorophyllin proven to increase Hb level in mice. Although it has been induced by $NaNO_2$. Adduction of Katuk leaves chlorophyll and Cu-chlorophyllin proven to reduce MDA level in mice. Although it has been induced by $NaNO_2$, the levels were approaching the level of MDA in the control group after treatment, even Mann Whitney statistical test shown that MDA level of Katuk leaves treatment was not different from the level of control group ($p>0.05$). Moreover, MDA level of Katuk leaves was equal to that of Cu-chlorophyllin from K-Liquid,

with the statistical test result shown there was no differences between them ($p>0.05$), proving that chlorophyll from Katuk leaves as effective as chlorophyll from market products. One Way Anova test resulted that there were no differences in ferritin levels between all groups. However, the level in Katuk leaves (67.45 ± 8.03) tend to be higher than those of control group and other groups, followed by Cu-chlorophyllin from K-Liquid (64.74 ± 7.80).

They concluded that the antioxidant activity of chlorophyll from katuk leaves are able to decrease schistocytes percentage's and MDA level. The increasing of Hb and ferritin level indicates its potential in the treatment of hemolytic anaemia.

3.10 Plants as Bio-indicators

Bio-indicators are living organisms including plants, which are utilized to screen the health of the natural ecosystem in the environment. Instead of simply working as gauges of natural change, taxa are utilized to show the impacts of natural surrounding changes, or environmental change. They are used for assessing environmental health and biogeographic changes taking place in the environment (Gerhardt, 2002). They can also detect changes in the environment due to the presence of pollutants which can affect the biodiversity of the environment, as well as species present in it. Plants are used as very sensitive tools for prediction and recognition of environmental stresses.

In recent time, due to industrialization and urbanization the problem of contamination of water and water pollution has intensified. Marine plants provide valuable information to predict the status of oceanic environment, as they are immobile and rapidly obtain equilibrium with their natural surroundings. The presence or absence of some specific plants or other vegetation provides ample information about environmental health (Holt and Miller, 2010). Lichens generally found on the trunks of trees and rocks are composed of algae and fungi both. They react to ecological changes in forests, including changes in the structure of the forest, air quality, and climate.

3.10.1 Lichens as Air Quality Indicators

Lichens are frequently used to monitor air contamination. Both, Lichens and Bryophytes are powerful Bio-indicators of air quality on the grounds that they have no roots, no fingernail skin, and acquire all their supplements from immediate introduction to the climate. of a certain region or the level/degree of contamination (Khatri and Tyagi, 2015; Jain *et al*., 2010; Joanna, 2006). Lichen species composition is an important tool of information gathering about changes in climate, air quality and biological processes. They respond quickly to environmental changes through changes in their diversity, abundance, morphology and physiology (Denise and Thompson, 2014). Lichen communities show changes in

response to air pollutants, particularly sulphur dioxide (SO_2), fluoro-compounds (F), deposition of nitrogen compounds andozone (O_3).

Bako *et al*., (2008) evaluated the occurrence and distribution of bryophytes and lichens in relation to air pollution in Nigeria. Three species lichens (*Parmelia tinctorum*, *Physcia* sp. and *Trentifolia* sp.) were encountered. The number of species (diversity) and frequency of occurrence increased as one moved further away from the source point. The plant species which are more sensitive act as biological indicators of air pollution whereas tolerant plants can be used for urban greening with an aim of improving the air quality (Hamza, 2017).

4.0 PLANTS HIDDEN LIFE

4.1 The Language of Plants

4.1.1 Herbivory-Induced Plant Volatiles (HIPVs)

According to the Webster dictionary definition, language is what people use when we talk to each other (Figure 4). Looked at it this way, we may feel that trees do not communicate because it is limited to talking. Trees, it turns out, have a completely different way of communicating: they use scent. The concept of scent as a means of communication is not is not totally unfamiliar to us. Why else would we use deodorants and perfumes? For example, four decades ago, scientists noticed

something on the African savannah. The giraffes there were feeding on umbrella thorn acacias, and the trees did not like this one bi and they started pumping toxic substances into their leaves to rid themselves of the large herbivores. The giraffes got the message and moved on to other trees in the vicinity (Simard *et al*., 1997; Wohlleben, 2015). The acacia trees that were being eaten gave off a warning gas (specifically, ethylene) that signaled to neighboring trees of the same species that a crisis was at hand. Right away, all the forewarned trees also pumped toxins into their leaves to prepare themselves.

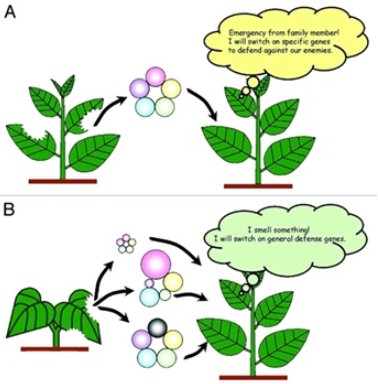


Figure 4. Plants and their Languages

A plethora of studies is available highlighting the versatility of VOCs and in particular of herbivory-induced plant volatiles (HIPVs). Apart from activating direct and indirect plant defenses against herbivores, HIPVs are also known to mediate a

diverse array of interactions between plants and insects (Hoballah and Turlings, 2001). In numerous plant species HIPVs are involved in repelling herbivores, attracting their predators of a higher trophic level as well as upregulating and priming defense responses (Arimura and Pearse, 2017).

4.1.2 Wood Wide Web

Dr. Suzanne Simard of the University of British Columbia in Vancouver has discovered that plants also warn each other using chemical signals sent through the fungal networks around their root tips. Over centuries, a single fungus can cover many square kilometers and network an entire forest. The fungal connections transmit signals from one tree to the next, helping the trees exchange news about insects, drought, and other dangers. Plant Science has adopted a term first coined by the journal Nature for Dr. Simard's discovery of the "**Wood Wide Web**" pervading our forests (Simard *et al*., 1997).

4.2 Do Plants React to Human Voices?

In a study conducted by the Royal Horticultural Society, research demonstrated that plants did respond to human voices. In this study, there were 10 tomato plants, 8 of which had headphones placed around their pots. Over the course of one month, scientific and literary texts would be read by both male and female voices to the plants each day. By the end of the month, the results concluded that plants who were read to grew

more than the plants that were not read to. Additionally, the results revealed that the plants which listened to female voices grew about 1 inch more than those who listened to male voices.

4.2.1 The Tree I Spoke To

To further buttress the fact that plants can hear and respond to our feelings and spoken words, I experimented with this mango tree in my compound. I was advised to cut down this mango because it was known not to bear fruits. I took the advice. However, in the appointed day for the cutting, I had a change of mind and declared "Tree you will produce fruits for me" This statement I repeated from time to time. Picture here shows a mango tree fully laden with fruits. The tree heard my voice (Plate 2).

Plate 2: The Tree that heard my Voice on Campus

4.3 Dendrolatry – The Worship of Plants

Dendrolatryisthe veneration or worship of trees. Tree Worship refers to the tendency of many societies throughout history to worship or otherwise mythologize trees (Arakelova, 2014). Plate 3 illustrates tree worship in our society. Trees have played an important role in many of the world's mythologies and religions, and have been given deep and sacred meanings throughout the ages. Human beings, observing the growth and death of trees, the elasticity of their branches, the sensitivity and the annual decay and revival of their foliage, present them as powerful symbols of growth, death and resurrection. The most ancient cross-cultural symbolic representation of the universe's construction is the world tree.

Plate 3a: Plants as Deity

Plate 3b: Plants as Deity

Table 3. Symbolisms of trees in various religions

Tree	Culture/Religion
Tree of Life	folklore, culture and fiction
Banyan and the Peepal	Hinduism
Christmas Tree	Christianity
Tree of Knowledge	Judaism and Christianity
Bodhi Tree	Buddhism

The image of the Tree of life is also a favourite in many mythologies. Various forms of trees of life also appear in folklore, culture and fiction, often relating to immortality or fertility. These often hold cultural and religious significance to the peoples for whom they appear. For them, it may also strongly be connected with the motif of the world tree.

Historical Druidism as well as Germanic paganism appear to have involved cultic practice in sacred groves, especially the oak. The Oak tree, which can live to be 1000 years, is one of the most venerated trees in the world (Borokini, 2015).

4.4 Impact of Plants on Human Psychology

4.4.1 Psychology of Plants

Plants relieve physiological stress and negative psychological symptoms (Chang *et al*., 2005, Coleman and Mattson, 1995, Field, 2000). Lee *et al*., 2015 carried out a study on the effect of interaction with indoor plants on psychological and

physiological stress. Their results showed that active interaction with indoor plants can reduce physiological and psychological stress compared with mental work. This is accomplished through suppression of sympathetic nervous system activity and diastolic blood pressure and promotion of comfortable, soothed, and natural feelings.

4.5 Importance of Indoor Plants

The living space of modern people has moved from outdoors to indoors - more than 85% of a person's daily life is spent indoors. Indoor plants have drawn the attention of the scientific community because of their various benefits (Lee *et al*., 2015).

i. They enhance job satisfaction in office workers (Dravigne *et al*., 2000). Their findings indicated that individuals who worked in offices with plants and windows reported that they felt better about their job and the work they performed (Plate 4). This study also provided evidence that those employees who worked in offices that had plants or windows reported higher overall quality-of-life scores.

Plate 4: Embellishment of an office workspace with plants

ii. Plants and trees not only detoxify the environment and potentially reduce air pollution, but they also reduce noise pollution, the accumulation of dust and airborne particles, and provide visual and physical aesthetic enjoyment to people in densely populated areas. (Plate 5).

Plate 5: Detoxification of the Environment Using Plants

Plate 6: Plants Used to Minimize the Harmful Effects of Sick Building Syndrome

Active interactions such as gardening have been shown to provide both psychological and physiological benefits, including **increased self-esteem**, reduced stress levels, and **improved social interaction** (Waliczek *et al*., 2005).

The presence of plants in the room help **reduce mental fatigue**, increased attentiveness, **lower blood pressure**, and increase productivity (Lohr *et al*., 1996).

4.6 The Doctrine of Signatures

The **doctrine of signatures**, dating from the time of Dioscorides and Galen, states that herbs resembling various parts of the body can be used by herbalists to treat ailments of those body parts. With this plant classification system in their head, illiterate people with no access to a printed herbal could encounter a plant they had never seen before and divine its medicinal properties. A theological justification, as stated by botanists such as William Coles, was that God would have wanted to show men what plants would be useful for (Pearce, 2008).

Plants have been used for medicinal purposes since ancient times, and the Doctrine of Signatures is a way of understanding the **medicinal properties** of plants based on their appearance. For example, a plant that looks like a heart may be used to treat heart conditions, and a plant that looks like a liver may be used to treat liver conditions (Bennet, 2007).

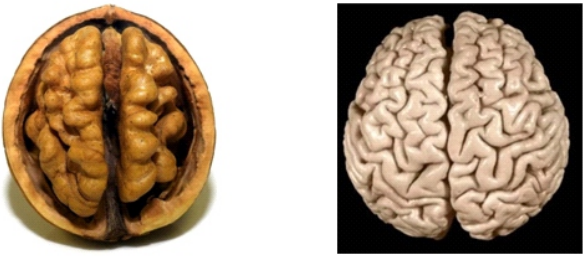
The concept of signatures is reflected in the common names of

some plants whose shapes and colors reminded herbalists of the parts of the body where they were thought to do good, as for instance:

- Eyebright, used for eye infections
- Hedge woundwort, thought to have antiseptic qualities
- Liverwort, either *Marchantiophyta* or *Hepatica* – used to treat the liver
- Lungwort – used for pulmonary infections
- Spleenwort, *Asplenium* – used to treat the spleen
- Toothwort, *Dentaria* – used for tooth ailments

In a nutshell, this doctrine says that God "imprinted" His signature on various medicinal plants, fruits, and vegetables to help us understand what organ of the body they strengthen.

(i). Walnut and The Brain (Plate 7).



(a) Walnut *(b) Brain*

Plate 7: Resemblance of Walnut and Brain

Walnuts resemble both the human head (skull and brains) and

are a prime example of 'The Doctrine of Signatures'. In fact, the 17th-century herbalist William Coles, author of *The Art of Simpling and Adam in Eden*, stated that walnuts were good for treating head ailments because "they have the perfect Signatures of the Head." Nutritional science now confirms walnuts contain nutrients that are necessary for healthy brain function, such as omega-3 fatty acids and vitamin E.

(ii). Carrot and The Eye (Plate 8).

(a) Carrot *(b) Eye*

Plate 8: Resemblance of Carrot and Eye

A sliced carrot looks like the human eye. The pupil, iris and radiating lines look just like the human eye and science now shows that carrots greatly enhance eye health.

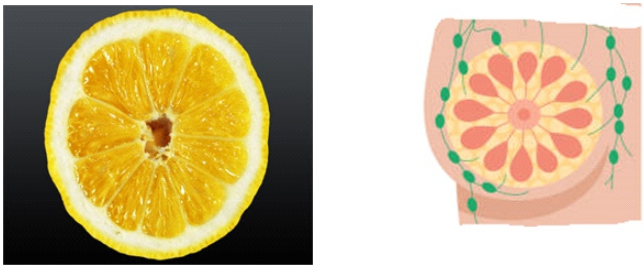
(iii). Pacific Bleeding HeartFlower, Tomato and The Heart

(a) Pacific Bleeding HeartFlower *(b) Tomato* *(c) Tomato*

Plate 9: Resemblance of Pacific Bleeding-Heart Flower, Tomato and Heart

Pacific Bleeding HeartFlower have the shape of a heart external. Slice open a tomato and you will notice it has multiple chambers that resemble the structure of a heart, and it is red. Research shows tomatoes are indeed pure heart and blood food. Studies have found that because of the lycopene in tomatoes, there is a reduced risk for heart disease in men and women who eat them (Bennette, 2004).

(iv). Citrus Fruits & Mammary Glands



(a) Citrus Fruits *(b) Mammary Glands*

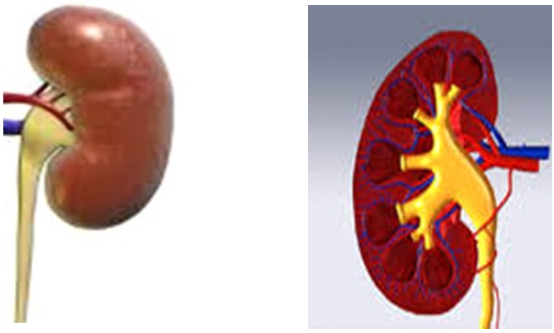
Plate 10: Resemblance of Citrus Fruit and Mammary Gland

Cut in half one could say the pattern of citrus fruit resemble mammary glands. Deep inside the white rind and membranes of these fruit are the miraculous group of plant compounds of bioflavonoid, citric acids and pectin. Lemon, orange, lime and grapefruit are the foods to eat for cancers, in particular breast cancer cells.

The similarity between round citrus fruits like lemons and grapefruit—and breasts may be more than coincidental.

"Grapefruit contains substances called limonoids, which have been shown to inhibit the development of cancer in laboratory animals and in human breast cells (Bennette, 2004).

(v). Kidney Beans & Kidneys (Plate 11).



(a) Kidney Bean *(b) Kidney*

Plate 11: Resemblance of Kidney Bean and Kidney

Kidney beans actually heal and help maintain kidney function—and they look exactly like human kidneys. Kidney beans provide many of the nutritional qualities that promote kidney health. They contain lots of soluble and insoluble fiber and are low in fat, sodium, sugar and cholesterol, and they are an excellent source of protein. Kidney beans also provide magnesium and potassium. Deficiencies in magnesium and potassium can increase the risk of developing kidney stones.

(vi). Avocado and the Uterus (Plate 12).

(a) Avocado *(b) Uterus*

Plate 12: Resemblance of Avocado and Uterus

Avocados target the health and function of the womb and cervix of the female—they look just like these organs. Avocados help women balance hormones, shed unwanted birth weight, and deter cervical cancers. It takes exactly nine months to grow an avocado from blossom to ripened fruit.

(vii). Mushroom and the Ear (Plate 13).

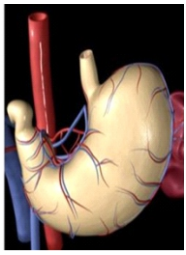
(a) Mushroom *(b) Ear*

Plate 13: Resemblance of Mushroom and Ear

There is a certain species of mushroom that closely resembles a human ear. Mushrooms have been found to improve hearing, as mushrooms are one of the few foods that contain vitamin D. This particular vitamin is important for healthy bones, even the tiny ones in the ear that transmit sound to the brain.

(viii). Ginger and the stomach (Plate 14).

(a) Ginger



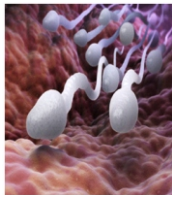
(b) Stomach

Plate 14: Resemblance of Ginger and Stomach

Ginger often looks just like the stomach. So it's interesting that one of its biggest benefits is aiding digestion. The Chinese have been using it for over 2,000 years to calm the stomach and cure nausea, while it is also a popular remedy for motion sickness.

(ix). Bean Sprouts and The Sperm (Plate 15).

(a) Bean Sprouts

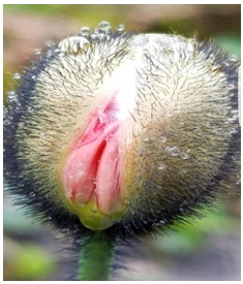


(b) Sperm

Plate 15: Resemblance of Bean Sprouts and Sperm

The addition of the diluent sprouts extract tris-yolk quail can maintain the quality of frozen semen after cow Holstein Freisian thawing (Sumarmin *et al*., 2008)

(x). Papaver and the Vagina (Plate 16).



Papaver

Plate 16: Resemblance of Papaver and Vagina

A wonderful creation of mother nature, the flower buds of this plant bear an uncanny similarity to female genitalia. Its blooms are often red and pink in color.

(xi). Heliconia episcopalis, Magnolia and Penis (Plate 17).

(a) *Heliconia episcopalis*

(b) Magnolia

Plate 17: Resemblance of Heliconia episcopalis, Magnolia and Penis

The Bishop's *Heliconia* has brightly colored bracts resembling bird feathers which also make it look like a penis. The Magnolia tree has large, showy flowers that bloom in shades of pink, purple, white, and yellow and has fruits that contain seeds and look like a penis.

(xii). Psychotria elatra and Lips (Plate 18).

(a) Psychotria elatra

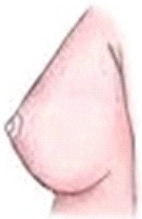
(b) Human lips

Plate 18: Resemblance of Psychotria elatra and Human Lips

Psychotria elata is commonly known as girlfriend kiss. It is most notable for its distinctly shaped red bracts and is consequently nicknamed "Hot Lips". Just like human lips, the hot lips plant comes in a variety of shapes and forms offering a vast array of plants.

(xiii). Loofah and Breasts (Plate 19).

(a) Loofah Vietnam



(b) Human Breast

Plate 19: Resemblance of Loofah Vietnam and Human Breast

Loofah appearance shape is similar to a person breast. Loofah origin is from Vietnam, but today loofah fruit can be gotten across country. Loofah fruit has a pink color with a side end so enlarged and have a black bulge similar to the nipple on the breast.

If you are breastfeeding, increase consumption of fruit loofah may help you to produce milk. For some women who experience irregular menstrual cycles, pain during menstruation, eating loofah fruit will help.

(xiv). Snapdragon and Human Skull (Plate 20).

(a) Snapdragon

(b) Human Skull

Plate 20: Resemblance of Snapdragon and Human Skull

Snapdragon is a unique and creepy flower that looks like thehuman skull.

(xv) The Naked-Man Orchid (*Orchis italica*) (Plate 21).

Plate 21: Resemblance of Naked-Man Orchid and Small Naked Man with Penis

The Naked-Man Orchid is a species known for its unique flowers resembling small, naked men with a penis.

4.7 Plants in Medicine

The phytochemicals may be synthesized, compounded or otherwise transformed to make pharmaceuticals. Examples of such derivatives include aspirin, which is chemically related to the salicylic acid found in white willow. The opium poppy is a major industrial source of opiates, including morphine. Few traditional remedies, however, have translated into modern drugs, although there is continuing research into the efficacy and possible adaptation of traditional herbal treatments (Shukla, *et al*., 2000). Plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. Some modern prescription drugs are based on plant extracts rather than whole plants.

4.7.1 Phytochemical and Ethnobotanical Study of *Newbouldia laevis* (Ogirishi)

The art of natural healing is one beautiful art that heals slowly but perfectly. The realities of life are found in nature so we cannot overemphasize the beauties of natural therapies. Ogirishi as the king of herbs in Africa is one of the most important and prestigious herbs that works from the etheric photosphere of human beings, it helps adjust the physical, emotional, mental bodies of man, If studied properly by man it would be a great

hope to mankind in salvaging man from so many diseases, be it physical or spiritual.

God in his infinite love and mercy gave man this miraculous/ wonder plant for the upkeep of man. The aura of a man is basically his immunity from the physical to the higher bodies and OGIRISHI has the potentials to align them to a better level.

Some traditionalists use the bark, root and leaves of *Newbouldia laevis* for treating patients suffering from epilepsy, paralysis, convulsions and spasm.

The leaves and bark can be prepared as a decoction for treating children suffering from epilepsy and convulsions. In some parts of Africa the plant is called "fertility plant" and as such has been used extensively to correct any form of fertility issues. Practical experience with Ogirishi has proved its efficiency in readjusting the inborn child even in protecting the unborn from sex-exchange by some spiritual hoodlums.

Ogirishi can be prepared as an infusion or decoction for treating dysmenorrhea and uterine colic. The bark of *Newbouldia laevis* tree can be used for treating stomach problems. It's analgesic properties is used when the dried bark is grounded together with *Piper guineense* fruit this preparation can be used for treating headache, sinusitis and migraine. The bark can also be boiled and patted on the head with soft cloth for treating headache, chest pain, and toothache.

The *Newbouldia laevis* extracts can be gargled for treating toothache. Antimalarial *Newbouldia laevis* can be used for treating patients suffering malaria. Cough Syrup, OGIRISHI bark can be boiled in palm-wine or water added with pure honey for treating cough. Due to wrong lifestyle, medication and gas in the body Heartburn is becoming a very serious issue in the health industry, OGIRISHI mixed with salt can be taken as a remedy for this condition. Ogirishi is used the treatment of sore throat by chewing the end of the leaf (the point of attachment to the stem) with alligator pepper.

Table 4. Array of plants with their medicinal values

Scientific Name	Common Name	Description	Picture
Acacia senegal	Gum arabic	A natural gum sourced from hardened sap of various species of acacia tree used in ancient birth control as well as a binder and emulsifier for medicinal compounds.	
Allium sativum	Garlic	Purported use to lower blood cholesterol and high blood pressure.	

Aloe vera	Aloe vera	Leaves are widely used to heal burns, wounds and other skin ailments.	
Apium graveolens	Celery	Seed is used only occasionally in tradition medicine. Modern usage is primarily as a diuretic.	

Scientific name	Common Name	Description	Picture
Cannabis sativa	Hemp, Cannabis, Marijuana, Indian hemp, Ganja	Used worldwide since ancient times as treatment for various conditions and ailments including pain, inflammation, gastrointestinal issues such as IBS, muscle relaxation, anxiety, Alzheimer's and dementia, ADHD, autism, cancer, cerebral palsy, recurring headaches, Crohn's disease, depression, epilepsy, glaucoma, insomnia, and neuropathy among others.	
Capsicum frutescens	Chili	Its active ingredient, capsaicine, is the basic of commercial pain-relief ointments in Western medicine. The low incidence of heart attack in Thais may be related to capsaicine's fibronolytic action (dissolving blood clots).	

Carica papaya	Papaya	Used for treating wounds and stomach troubles.	
Citrus limon	Lemon	Along with other citruses, it has a long history of use in Chinese and Indian traditional medicine. In contemporary use, honey and lemon is common for treating coughs and sore throat.	
Curcuma longa	Turmeric	Spice that lends its distinctive yellow color to Indian curries, has long been used in Ayurvedic and traditional Chinese medicine to aid digestion and liver function, relieve arthritis pain, and regulate menstruation.	
Psidium guajava	Guava	It has a rich history of use in traditional medicine. It is traditionally used to treat diarrhea; however, evidence of its effectiveness is very limited.	
Zingiber officinale	Ginger	Ginger is effective for the relief of nausea.	

4.7.2 Phytochemical and Proximate analysis of *Phyllanthus urinaria* (Linn.) (Stone Breaker)

Alambo and **Jaja** (2021) carried out a work, the aim of which was to investigate the phytochemical constituents and proximate composition of *Phyllanthus urinaria* leaves extract. The proximate and mineral composition was determined using standard method. Quantitatively, Saponin was found to be the most abundant constituent making about 5.26%, followed by Flavonoid and Alkaloid constituting 4.8% and 2.67% respectively. According to research works carried out by other scientists it has been observed that saponins have antitumor, antioxidant and anti-mutagenic activities and can lower the risk of human cancers by inhibiting the growth of cancer cells, therefore *P. urinaria* would possess all of these abilities all of these abilities because of its high saponin content. The Quantitative proximate showed the leave extract contained carbohydrate, protein, lipid, crude fibre, moisture and ash while the quantitative analysis result was presented as carbohydrate with 4.89%, protein 5.69%, liquid 1.61%, moisture 58.81% crude fibre 25.55% and ash content 1.61%. According to research works carried out by other scientists it has been observed that saponins have the presence of these nutrients in conformity to already existing researches proves that *P. urinaria* can be used as food supplement.

4.7.3 Phytochemical Analysis and Pharmacological Properties of *Euphorbia hirta Linn.*

Euphorbia hirta belongs to the family *Euphorbiaceae* and it is well known for its medicinal properties, due to this it is commonly called "Astma plant". This study was carried out on *E. hirta* leaves to determine the phytochemical and proximate characters of the plant. The leaves of the plants were collected and taken to the laboratory, peeled and crushed and standard methods for phytochemical and proximate screening was used. The result showed that the leaves extracts contained some phytochemicals like: Alkaloids, cyanogenic glycosides, Tannins, saponins and flavonoid. And the proximate analysis showed the presence of carbohydrate, protein, ash, lipid and moisture. In conclusion, the leaf of *E.hirta* showed high level of secondary metabolites, which can be used in pharmacological activities as traditional medicine (Ezebuchi and Jaja, 2021)

4.7.4 Phytochemical and Proximate Analysis of *Ageratum conyzoides* (Linn.) (Goat Weed)

The aim of this study was to investigate the phytochemical constituents and proximate composition of *A. conyzoidez* leave extract. The analysis of *Ageratum conyzoidez* for various phytochemical and the proximate composition, was carried out using laboratory methods. Quantitatively, Flavonoid was found to be the abundant constituent making about 2.74%, followed by

Saponin and Alkaloid constituting 2.45% and 0.81% respectively. According to already existing research works flavonoid is a potent water-soluble antioxidant and free radical scavenger, which prevent oxidative cell damage and also have strong anticancer activity, therefore *A. conyzoidez* can be utilized for the prevention of cell damage because of its high percentage of flavonoid. The Quantitative proximate showed the leave extract contained carbohydrate, protein, lipid, crude fiber, moisture and also the result as carbohydrate with 2.45%, protein 5.26%, lipid 1.45%, moisture 78.63% crude fiber 10.81%, moisture content 78.63% and ash content 1.43%. The presence of these constituents according to already existing researches proves that *A. conyzoidez* is highly nutritious and can be further utilized in the production of food and drugs (Lawrence and Jaja, 2021).

5.0 MAN'S INPUT TO PLANT PRODUCTIVITY

5.1 Organic and Inorganic Fertilizers in Food Production System in Nigeria (Jajaand Barber, 2017)

Food production systems must operate to be socially acceptable, environmentally sustainable and economically viable. As the availability of land and water resources is rapidly declining, there is need to increase the productivity of remaining natural

resources, including energy while at the same time observing nutritional and environmental needs of our people. The single most efficient and cost-effective input that can increase the productivity of land in Nigeria is fertilizer-be it organic or inorganic. Fertilizer can increase food, root/tuber, nuts/vegetables and grain production, release marginal lands from production and reduce environmental degradation including the risk and uncertainty associated with the production of agricultural products. Efficient management of plant nutrients ensures that fertilizers are used in the most environmentally acceptable and sustainable way and that crops are supplied with all essential plant nutrients at the appropriate time and in the required quantity to avert environmental pollution.

There is no doubt that organic products are beneficial, however; there is no such thing that too much is enough. All nutrients whether they originate from organic or inorganic forms go through the same processes and transformations in the soil thus meaning that organic products when applied at excessive rates can cause just as much harm to the environment as inorganic products. Furthermore, a lack of certainty as to the exact nutritional breakdown of specific organic products may exacerbate this factor with the end result potentially being a net detrimental effect to the environment as opposed to the intended

beneficial effect.

Jaja and Barber (2017) studied the most efficient way of usingorganic and inorganic fertilizers in food production system in Nigeria. We found out that site specific nutrient use, integrated plant nutrient supply, nutrient placement including fertigation and synchronizing nutrient supply with demand, etc are some of the means by which fertilizers can be used more efficiently. All these will help to make more economical the use of natural resources, protect the environment and improve public image of farming and the fertilizer industry in Nigeria especially now that the land fallow systems which helped in building soil fertility have reduce to one or two year rotation.

5.2 Effect of NPK Fertilizer and Gibberellic Acid on the Growth of *Tetrapleura tetraptera* (Schum and Thonn) Seedlings(Odoemena and Jaja, 2003).

The effect of growth media on the germination and early growth of *Tetrapleura tetraptera* (Shum and Thonn) was assessed at the Forestry Nursery Federal University of Agriculture Makurdi, Benue State, Nigeria by Odoemena and **Jaja** (2003). Two hundred viable seeds were immersed in 50% sulphuric acid for 15mins and later sown in five different media after pretreatment (Topsoil, sawdust, river sand, a mixture of topsoil and river sand and a mixture of river sand and sawdust).

To determine the suitable growth media, Statistical method

(Completely Randomized Design (CRD, Analysis of Variance (ANOVA), Duncan's Multiple Range Test (DMRT) were adopted for this experiment/data analysis on the experimental duration of 8 weeks at two weeks interval.

The result showed that germination percentage was significant as 5% level of probability ($p>0.05$) and the highest germination percentage of 80% was recorded in river sand + sawdust. The highest number of leaves was observed in topsoil (10.05), seedling height (7.88cm) in river sand and sawdust, girth (0.57cm) in topsoil and leaf length (4.71cm) in sawdust. This Effect of Different Growth Media on the Number of leaves, Seedling Height, Girth and Leaf length of *Tetrapleura tetraptera* Seedlings is as represented in Table 5.

Table 5: Effect of growth media on different parts of *Tetraphera tetratera* seedlings

Media	Variables No of leaves	Seedling Height	Girth	Leaf length
Sawdust	....	7.11±2.41b	0.21±0.06a	4.71±1.62c
River sand	8.21 ±0.89ab	4.96±2.55a	0.20±0.07a	4.07±1.45b
River sand and Sawdust	7.88 ± 0.43ab	7.88±2.05b	0.24±0.03a	4.56±1.32bc
Topsoil and River sand	7.78 ± 0.53ab	6.38±1.46ab	0.22±0.04a	4.14±1.59bc
Topsoil	10.05 ± 1.60b	6.98±2.79b	0.57±0.78b	3.14±1.82a
P-Value	0.007	<0.000	<0.000	<0.000

5.3 Effect of organic and inorganic manure mixture rates on the productivity of okra (*Abelmoschus esculentus*)(Jaja and Ibeawuch, 2015).

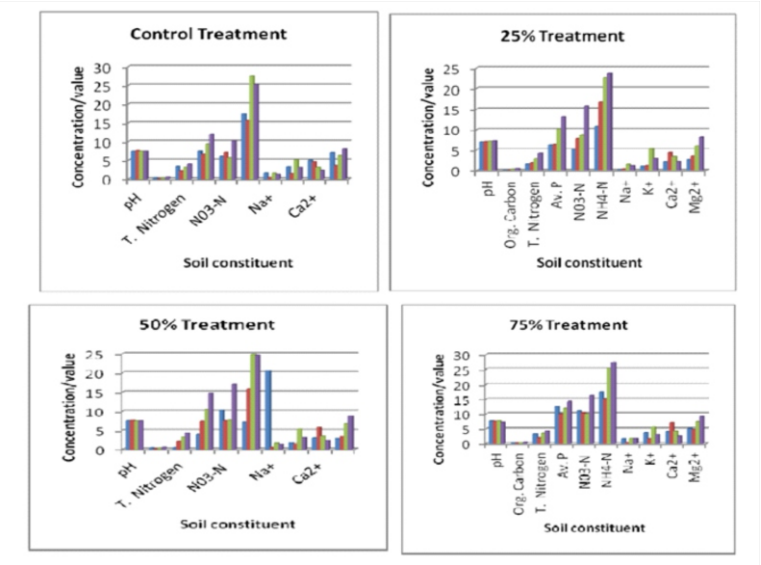
A study to investigate the effects of organic and inorganic manure mixture rates on the productivity of okra (*Abelmoschus esculentus*) in Owerri Imo State, Nigeria, was conducted at the Teaching and Research Farm of Federal University of Technology, Owerri. The study clearly indicated the effectiveness of poultry dung as promising organic manure as producing significantly higher fruit yield, leaf number, plant height and leaf area than other treatments (Jaja and Ibeawuch, 2015).

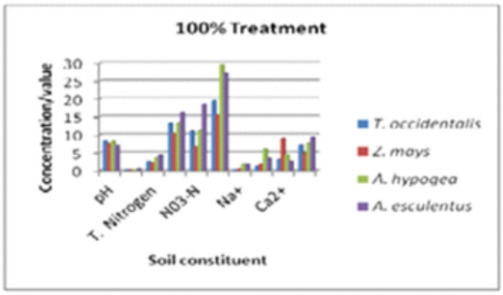
6.0 EFFECT OF POLLUTION ON PLANT PRODUCTIVITY AND QUALITY

6.1 Impact of Oilfield Wastewater on Soil Quality and Soils Planted with Various Crops(Jaja and Obire, 2015).

The effect of various concentrations (0%, 25%, 50%, 75% and 100%) of oilfield wastewater on soil quality and of soils planted with *Zea mays* (Maize) *Abelmoschus esculentus* (Okra) *Arachis hypogeal* (Groungnuts) and *Telfairia occidentalis* (Fluted pumpkin) commonly cultivated in the Niger Delta was investigated (**Jaja** and Obire, 2015). This was achieved by the determination of the physico-chemical constituents including heavy metals (zinc, lead, nickel, and cadmium) of the oilfield wastewater, of the experimental soil, of soils treated with oilfield wastewater and planted with these plants using standard methods of APHA and ASTM. Results of the physicochemical constituents of the oilfield wastewater showed, the pH was in the alkaline range of 8.3, high electrical conductivity, Turbidity and Total Dissolved solids above the acceptable limit by FEPA. The

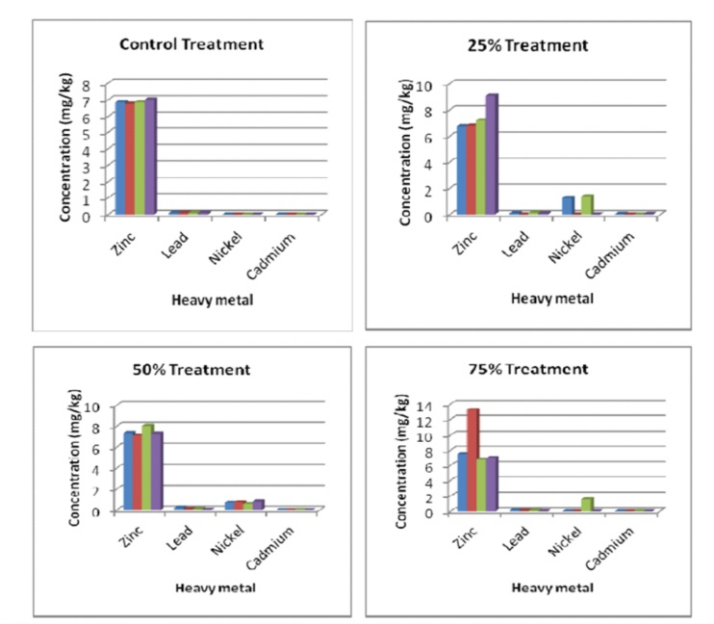
values of the heavy metals ranged from exhibited increases in Zinc content between the control and 25%. Except at 50% concentration, soils planted with A. hypogea had Nickel values of <0.001 and in control soils for all the plants. *T. occidentalis* and *A. hypogea* had same values of Cadmium in all the 50% treatment. Values of Cadmium were the same at 100% in all the soils. Zinc values for all the treatment were highest in *A. esculentus*. However, the control of all the plants except *Z. mays* had the highest values. The results are summarized in Figures 5 and 6. Absorption of total hydrocarbon and other hazardous constituents of the oilfield wastewater by the plants which serve as sources of food for humans pose a serious health hazard. The oilfield wastewater has been shown to have serious deleterious effect on soil and plants, leading to eco-toxicological and agro soil fertility problems that could create an artificial food scarcity.





Constituent of soils planted with different crops and traced with oilfield wastewater

Figure 5: Constituent of Soils Planted with Different Crops and Treated with Oilfield Wastewater



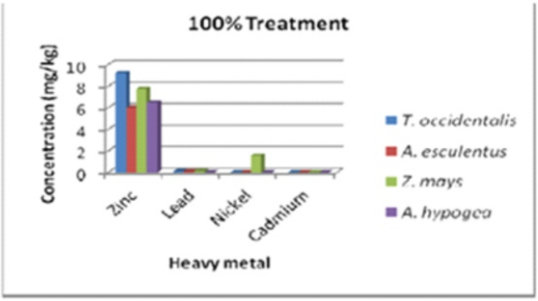


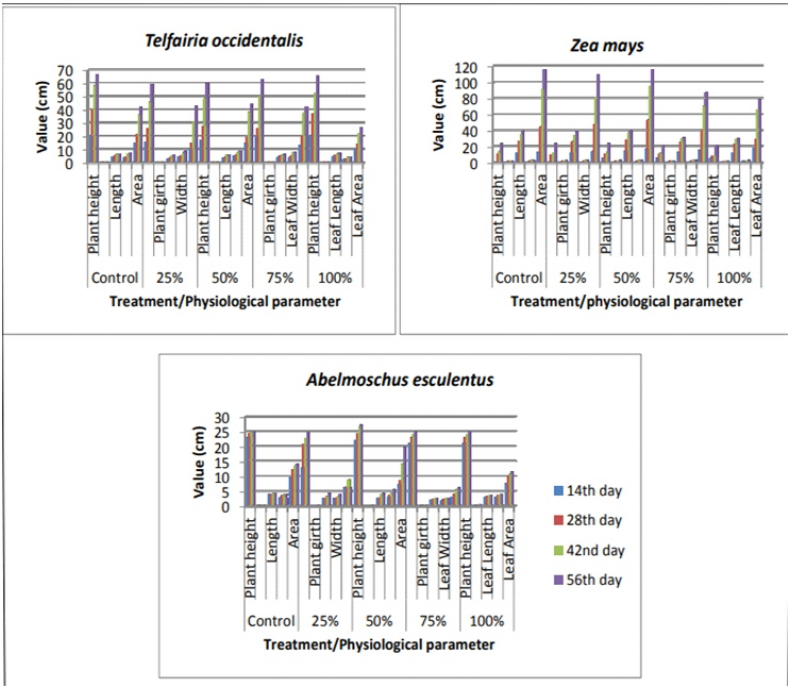
Figure 6: Heavy Metals in Soils Planted with Different Crops and Treated with Oilfield Wastewater

6.2 Phytotoxic Effect of Oilfield Wastewater on the Physiology and Chlorophyll Content of Some Crops (Jajaand Obire, 2015)

The phytotoxic effect of various concentrations (0%, 25%, 50%, 75% and 100%) of oilfield wastewater on the physiology of *Zea mays* (Maize), *Abelmoschus esculentus* (Okra), *Arachis hypogeal* (peanuts) and *Telfairia occidentalis* (Fluted pumpkin) commonly cultivated in the Niger Delta was investigated by **Jaja** and Obire (2015). This was achieved by the determination of the plant height and girth, leaf length, width and area, root density, chlorophyll content, crude fibre and total ash using standard standard methods. Results of the study showed that the girth and height of Z. mays were highest at 50% on the 56th day after planting (DAP). Generally, the leaf area was highest at 50% concentrations except at the 14th DAP. The control plants were consistently taller except at 50% for A. esculentus. Leaf

area was highest in the control at 14th DAP and at the 50% concentration at 56th DAP. Leaf width and area of *T. occidentalis* were highest at 50% concentration. Generally, the height and girth of *A. hypogea* were found to decrease with increasing concentration. The leaf length, width and area of *A. hypogea* had the highest value at 56th DAP in the control. Except at the 100% concentration, the leaf area was lower in the control than in all other treatment for *Telfairia occidentalis*. Except at the 50% concentration, the leaf area was higher in the control than in all other treatments for *Zea mays*. Generally, except at the 50% concentration, the leaf area was higher in the control than in all other treatment for *Abelmoschus esculentus*. There was a reduction in the size and number of leaves produced by *Arachis hypogea* which became less luxuriant with increasing concentration of oilfield wastewater. Generally, all the physiological parameters of the plant analyzed were higher in the control plants than in plants of the treated soils. The height and girth were found to decrease with increasing concentration of the oilfield wastewater except that there was an increase in girth at the 100% concentration. Statistical analysis using one way ANOVA showed that there was significant difference at $P = 0.05$ in the physiological characteristics of the various plants. Chlorophyll content was highest for *T. occidentalis* at the 75% concentration, in the control for *A. esculentus*, and at 50% for *Z.*

mays and *A. hypogea*. Fibre content and total ash for *Zea mays* was highest in control and at the 100% concentration respectively (Figures 7). Absorption of total hydrocarbon and other hazardous constituents of the oilfield wastewater by the plants which serve as sources of food for humans pose a serious health hazard. The oilfield wastewater has been shown to have serious deleterious effect on the physiology of the plants which will surely lead to agro production problems that could create an artificial food scarcity due to damage to crops and other vegetation.



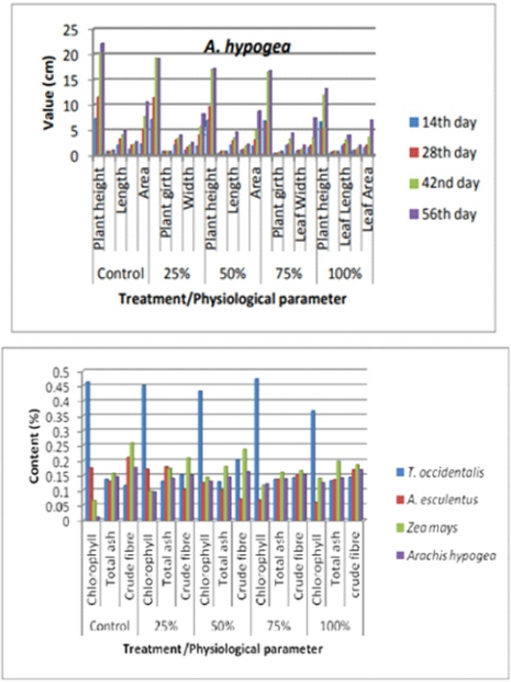


Figure 7. Physiological Parameters of Crops Treated with Concentrations of Oilfield Wastewater

6.3 Effect of Tillage Methods on the Growth and Yield of Egg Plant(Solanum marcrocarpan) (Ibeawuchi, I. I., Ihejirika,G. O., Egbuche, C.T., Jaja, E. T., 2015.

The experiments on the effects of different tillage method (Flat, Bed and Trench) on the yield of eggplant (*Solanum macrocarpon*) were conducted at the School of Agriculture and Agricultural Technology (SAAT) Training and Research farm, Federal University of Technology Owerri, (FUTO), Imo State

Nigeria by Ibeawuchi *et al*., (2015). The apices cutting technique helped to increase the number of branches per plant and the bed tillage method performed significantly better than the flat and trench methods in flower set, fruit set and development. However, tillage methods are location specific and vary with climate, soil type, and crop and management level.

Tillage can either enhance or destroy good soil tilth. It is true that bed preparation breaks up clods and loosens the topsoil, but the stirring action helps to stimulate the microbial breakdown of beneficial soil organic matter. However, seedbed preparation is very location specific and varies with climate, soil type, crop and management level. One has to be careful in over tilling the soil to avoid the negative consequences. The trench and flat however, has their own advantages and disadvantages and may overtime be more productive than an over tilled soil and bed tillage method had the advantage of releasing nutrients faster than the flat and trench tillage methods.

6.4 Response of *Zea Mays* to Oilfield Wastewater Treatment (Jaja and Nwauzoma, 2015)

Jaja and Nwauzoma (2015) conducted a study on the response of *Zea mays* to Oilfield Wastewater Treatment. This study was carried out to determine the impact of various concentrations (0%, 25%, 50%, 75% and 100%) of oilfield wastewater

treatment on the physiology of *Zea mays L* (maize) which is commonly cultivated in the Niger Delta. The Physiology of the plants such as plant height and girth, leaf length, width and area and root density were determined (Akonye and Nwauzoma,2003); chlorophyll content, crude fibre and total ash were also determined using AOAC (1984) method. The oilfield wastewater used in the study was proven to be a pollutant to the soil. The discharge of oilfield wastewater into the terrestrial environment has been shown to have serious deleterious effect on soil and plants. Absorption of total hydrocarbon and other hazardous constituents of the oilfield wastewater by the plants which serve as sources of food for humans pose a serious health hazard. The oilfield wastewater has been shown to have serious deleterious effect on soil and plants, leading to eco-toxicological and agro soil fertility problems that could create an artificial food scarcity.

7.0 PLANTS AND LIFE

7.1 HYDROPONIC FODDER PRODUCTION: A STUDY OF POTENTIAL LIVESTOCK FEED, GROWING MAIZE (Zea mays L.) IN NUTRIENT RICH SOLUTION (Ajoonu and Jaja, 2022).

The ever increasing demand for fresh and quality grasses/fodder for livestock feeding has been a very pressing concern to herders

and animal rearers and owing to climate change challenges and environmental degradation factors that do not encourage rapid growth of plant for agricultural use, it has become imperative for herders to sources alternative means to feed their animals. Hydroponic fodder production offers opportunity where herders can produce their own fodder locally for animal consumption without soil using nutrient rich solution (Plate 22). The production system for the fodder can be achieved in areas with very little or no rain fall as minimal water supply is needed and the setup can be arranged in very limited land space where maximum output and all year production of fodder can be achieved. The planting period of hydroponic fodder seeds to harvest takes up to 8 days duration to complete and a 2000g maize seed was used for the experiment. The maize (treatments) was planted in growth tray and replicated three times after been pre-soaked in the nutrient solution at different concentration percentages (0%, 10% and 20%) and arranged in a Completely Randomized Design on the growth tray rack giving a total of nine (9) sample size. Data collection began at the second day after soaking when the seeds started sprouting and data for agronomic traits and yield quality were analyzed for at harvest

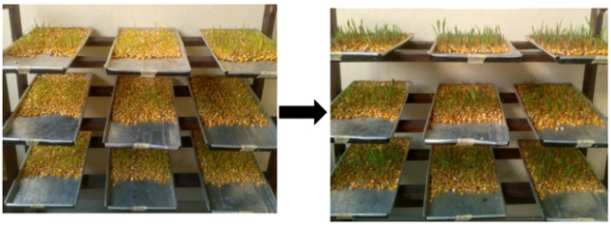


Plate 22: Setup for the Production Maize Fodder

7.2 Bioaccumulation of Petroleum Hydrocarbon in Plants (Jaja, 2018)

Bioaccumulation means an increase in the concentration of a chemical in a biological organism over time, compared to the chemical's concentration in the environment. Compounds accumulate in living things any time they are taken up and stored faster than they are broken down (metabolized) or excreted. Bioaccumulation can manifest in the discoloration of plants as shown by the *Telfairia occidentalis (Ugu)* planted in soil polluted with oilfield wastewater (Jaja, 2018) (Plate 23).

Plate 23: Shining leaves of Telfairia occidentalis indicating hydrocarbon absorption from soils polluted with oilfield wastewater (Jaja, 2018)

7.3 Hormonal Improvement of Crops (Uzoma-Wachukwu and Jaja, 2022)

Plants being the basic source of food for man and other animals, the effect of extinction on certain crops that are vital in supplying the body the required essential micro and macro nutrients has posed a challenge in science. In efforts to curb this prevailing challenge, researches on enhancement of growth of these affected crops, cutting across improving yield as well as limiting extinction rate with the use of plant growth regulators has been carried out in recent times.

Cucumeropsis mannii Naudi, locally known as Egwusi, Agwusi and commonly referred to as White-seed melon is a specie of melon native to tropical west, central and east Africa. It is cultivated for food as it is used complementarily with starch and grain diet of most Africans as well as its richness in oil which is a good source of natural antioxidants such as vitamin E and B-carotene. *Cucumeropsis mannii* is *faced* with the afore mentioned threat and as such, an experiment involving the use of plant growth regulators particularly; Cytokinin 9BAP) and Gibberellin (GA_3) was carried out at the screen house of the Department of plant science and biotechnology, applying procedures cited from Sanusi, 2019 as well as Al-Sahil.; 2016 and Pal *et al*., 2016.

The effect of plant growth regulators implored was noted as

being impactful, as increase in growth with respect to various aspects such as plant height, number of leaves, leaf area was recorded on the use of Gibberellin (GA_3) while increase in fresh weigh, dry weight and chlorophyll content was recorded upon the use of Cytokinin (BAP) (Uzoma-Wachukwu and Jaja, 2022).

7.4 Effect of Nitrogen Fixation by Microorganisms (Nwankwo and Jaja, 2022)

In another study currently going on. The unflinching importance of Nitrogen especially to plants growth and development is tested and verified. Nitrogen fixing bacteria; *Nitrosomonas* and *Nitrobacter* were cultured and introduced to three weeks old seedlings of Soya beans and the Cowpea. These bacteria were inoculated into these leguminous plants planted in polytene bags via a broth media at different concentrations (0%, 25%, 50%, 75% and 100%). They were allowed for an extra week before undergoing Nitrogen Content Analysis using the Khedal Method. From the agronomic features, plants with higher concentration of inoculated media tend to do better in height and number of leaves. At the end of the Nitrogen content analysis the results followed a sequence of the higher the concentration of the inoculated microbes, the higher the amount of Nitrogen found on both the soil and plants. This also shows the extent to which the microbes, *Nitrosomonas* and *Nitrobacter* fix Nitrogen

in the soil and thus improving Nitrogen presence which ensures proper plant growth and development. This in the overall improves plants yields and food security for man and other users of plants.

7.5 Assessment of Selected Tomato (*Solanum lycopersicum* L.) Genotypes for Germination, Vegetative and Flowering Characteristics in a High Rainfall Region (Goodlife, Jaja, and Wilson, 2022)

This experiment was conducted in the Plant Science and Biotechnology, Department of Rivers State University, Port Harcourt, Rivers State, Nigeria to assess germination, seedling growth and establishment, vegetative and flowering characteristics of five tomato genotypes - NHTO 0201, NHTO 0294, B52, Thorgal F1 hybrid and Cameroun. Seeds of the five genotypes/ treatments replicated 6 times were sown in plastic containers with sandy-loam soil laid out in a CRD (Completely Randomized Design) and grown for five weeks before transplanting. Seedlings were transplanted into bags filled with 10kg of same soil, replicated 6 times and laid out in a CRD in the open field. Data collection included percentage germination, number of days for first and last seedlings to emerge, height of seedlings, number of seedling leaves and seedling vigour index (SVI). Others collected at 50% flowering were height of tomato plant, number of leaves/tomato plant, number of primary tomato

branches/plant, days to 50% flowering, flower clusters/plant and flowers/plant. Data were evaluated by ANOVA in a CRD at (P = 0.05) and means compared using LSD test at (P = 0.05). To estimate the relationships between parameters measured during germination and seedling growth and those for vegetative and flowering parameters, correlation analysis was utilized. Germination percentage and seedling characteristics did not differ significantly between genotypes. Significant correlations were found between germination% and SVI (r = 0.939*) and between days for first and last seedlings to emerge (r = 0.895*). There were significant differences in number of leaves/tomato plant and number of primary tomato branches/plant but flowering characteristics did not differ significantly. Highly significant correlations were found between height of plant and primary tomato branches/plant (r = 0.978**), and between flower clusters/plant and flowers/plant (r = 0.975**). Also, height of plant and days to 50% flowering (r = 0.889*) were significantly correlated (Goodlife *et al*., in press).

7.6 Yield Performance and Fruit Characteristics of Tomato (*Solanum lycopersicum* L.) Genotypes in a High Rainfall Region (Goodlife, Jaja, and Wilson, 2022)

This study was to evaluate adaptation in vegetative, phenological and yield traits of five tomato genotypes (F1

hybrid Thorgal, NHTO 0294, NHTO 0201, B52 and Cameroun) to conditions in a high rainfall region at the Botanical Garden of the Plant Science and Biotechnology Department of Rivers State University, Port Harcourt, Rivers State, Nigeria. Seeds of five genotypes were nursed separately in plastic containers measuring 950cubic cm for seven weeks and transplanted into 55 x 45 x 45 cm polythene bags containing 10kg sandy-loam soil at one plant per bag. The bags were set out in a Completely Randomized Design in an open field with six replicates. Watering and weeding were carried out when necessary. Collected data were height of plant, number of leaves/plant, number of branches/plant, number of flower clusters/plant, days to 50% flowering, days to 50% fruiting, and days to 50% ripening/maturity. Others included quantity of fruits/plant, fruit length, fruit diameter, fruit weight, fruit shape index and overall fruit yield. The results showed that differences were significant (P=0.05) for number of branches, fruit weight, number of fruits/plant and fruit diameter with B52 having the highest number of 8 branches and 9 fruits/plant while Cameroun and F1 Thorgal had the least number of 2 branches each. Cameroun had the least number of one fruit/plant. The F1 hybrid Thorgal had the largest fruit diameter (4.4 cm) and highest fruit weight (66.9g). Other parameters studied (plant height, number of leaves, number of flower clusters, days to 50% flowering,

fruiting, and maturity) did not differ significantly among tomato genotypes. The F1 Thorgal genotype is recommended for tomato production in Port Harcourt being well adapted and producing fruits almost three times bigger than fruits of other tomato genotypes.

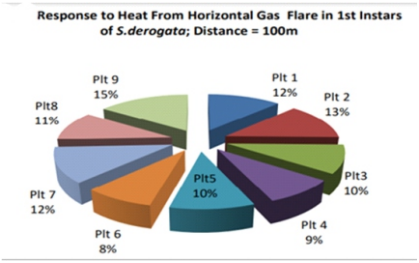
Effect of Different Rates of Liming Materials on the Production of Groundnut (*Arachis hypogeae*) In Owerri Southeastern Nigeria (Jaja and Ibeawuchi, 2015)

This work evaluated liming effects on the production of groundnut. The field work was laid out in randomized complete block design (RCBD). Three lime materials (Calcium oxide, wood ash and palm bunch ash) were used at three rates (2,4,6tons ha- 1) and the control (Otonha-1) to give a total of 10 treatments. The treatments were replicated three times. Plant growth parameters collected at 2,4 and 8 week after planting includes% emergence at 2WAP; leaf area, plant height and number of leaves per stand at 4 and 8 WAP. Pod yield parameters per hectare. Data collected were subjected to statistical analysis of (ANOVA). Results of the analysis showed significant difference at 5% probability level except for number of leaves at 4WAP which manifested at 8WAP. Soils of Owerri are acidic in nature and this could be as a result of parent materials, land use and climate. However, results of the post planting physiochemical analysis were promising at it

showed considerable improvement in the soli system and the effective distribution and uptake of nutrient is an indication of the response of the crop due to liming. Highest performance of the crop was obtained from treated with 2 tons ha-1 of wood ash followed by palm bunch ash at 4tons ha -1. The least performance was obtained from the control experiment.

Leaf-Rolling: A Response Of larval Instars of *Sylepta derogata* [*Lepidoptera: Pyralidae*] to Horizontal Gas Flare at Owaza, Rivers State, Nigeria (Jaja and Ogbalu, 2015)

In a work by **Jaja** and Ogbalu (2015) six larval instars of *Sylepta derogata*, a major pest of Okra (*Abelmoschus esculentus*) were sampled in Okra traditional Farms located near a gas-flared station at Owaza in March 2015. Measurements of distances from the horizontal gas flare point to the traditional okra farms were recorded as 100, 150, 200, 250, 300, 350 and 400m where the last Okra Farm was located at a temperature range of 38-48^{O}C. Control plots were located at Oyigbo, a non-flare source. Samples were taken from okra plants in search of rolled leaves. The results are shown in Figures 8.



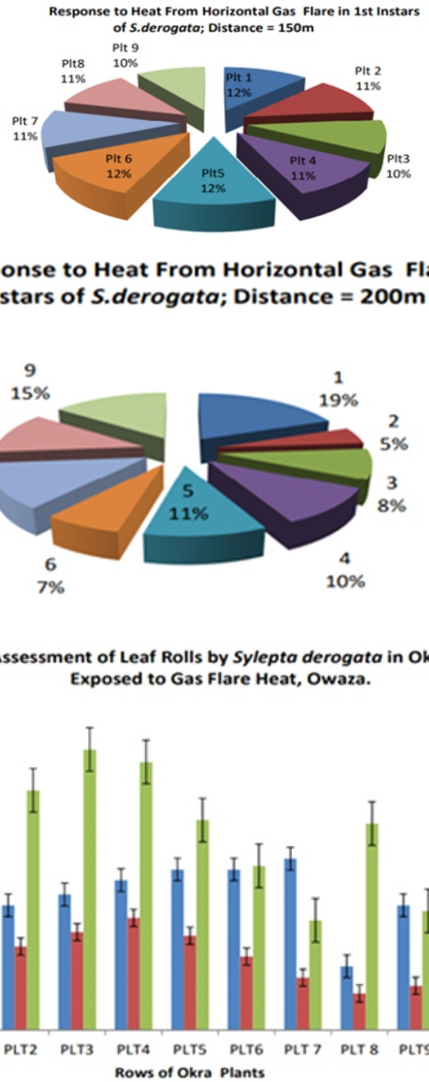


Figure 8: Plant Response to Heat from Horizontal Gas Flare

Effect of Tillage Methods and Spacing on the Productivity of Waterleaf(Ibeawuchi, Ihejirika, Egbuche and Jaja)

An experiment was carried out by *Jaja et al.,* 2018 at the teaching and research farm of Federal University of Technology, Owerri, Nigeria to determine the effect of tillage methods and spacing on the productivity of waterleaf. The treatments consist of three tillage methods (flat, Mound and bed) and three spacing (25x25cm, 30x30cm and 40x40cm). The experiment was a 3x3 factorial arrangement laid out in a randomized complete block design (RCBD) and replicated three times. The results of the experiment indicate improved growth of leaves 40x40cm spacing at 4 and 6WAP. Tillage method using beds and flats produced better and higher yield than mound. However, the waterleaf propagated with 25x25cm spacing produced highest yield (0.6kg/plot) 3000kg ha-1 while 40x40cm spacing gave lowest yield (0.323kg/plot) 1610kg-1. From this experiment, the 25x25cm plant spacing is recommended to farmers for waterleaf planting because it maintained soil water because of the close spacing thus improving soil fertility. Farmers are advised to practice this method of vegetable farming which helps to maintain soil fertility for sustainability of vegetable crop production in their area.

IMPACT OF SPENT CRUDE OIL ON SEEDLING GROWTH OF MAISE

***(Zea mays L.)*(Douglas and Jaja, 2022)**

Study on the impact of spent crude oil on seedling growth of maize (*Zea mays* L.) was carried in the department of plant science and biotechnology, Rivers State University Douglas and **Jaja** (2022). Three spent crude oil treatment levels (0.5, 0.7 and 1.0L) as well as the control 0.0L we used for the cultivation at OBA super ii maize variety plant for four weeks. The completely randomized design (CRD) was adopted where 8kg of soil per planting bag were established for various treatment and their replicates. Plant height, leaf length and leaf with were estimated using centimeter rule. Treatment assessment at week two after planting showed highest plant height (33.9cm) plant leaves (5), leaf length (38cm) and leaf width (2.5cm) for the control (0.0L). although 1.0L treatment recorded lowest values for plant height (2.2cm), leaf length (8cm) and leaf width (0.7cm) treatment 0.5,0.7 and 0.1L recorded same number of leaves (3). Week three assessment revealed the highest plant height (41cm), number of leaves (8) and leave length (62.2) and leaf width (4.4cm) for control treatment. However, lowest values at height (2.0cm), number of leaves (2) and leave length (5cm) were observed for 1.0L treatment. Meanwhile, treatments 0.7 and 1.0 recorded equal leaf width (1.0cm). Assessment at week from

after planting showed highest plant height plant (50.3cm), number of leaves (11), leaf length (83.1cm) and leaf width (6.2cm) for control treatment. While treatment 1.0 L recorded lowest value of height (2cm) and leaf length (52cm). Equal values of number of leaves (2) and leaf width (1.0cm) were observed for both 0.7 and 1.0 L treatments. The research showed that spent crude oil can still be harmful to plant and polluted site should not be used for maize cultivation.

8.0 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The role of plants as enablers of growth of human societies has been demonstrated in this lecture. From geological times when fossilisation of plants was part of the process leading to the meeting the energy needs of modern man, driving industrial processes and economic development. Plants provide food and medicines as well as social and psychological ambience for sustenance of life. Global population increase and industrial development have resulted in increased demand for natural resources and environmental pollution. Plant Science provides tools not only for identifying and monitoring environmental change but also for remediation (phytoremediation).

8.2 Recommendations

- As the availability of land and water resources is rapidly declining, there is need to increase the productivity of remaining natural resources, including energy while at the same time observing nutritional and environmental needs of man. Therefore, there is need for government and corporate organizations to fund further research into food production systems that are socially acceptable, environmentally sustainable and economically viable.
- Plants are veritable enablers to the energy transition

aspirations from fossil fuels to renewable energy to tackle climate change. Biomass (plant material) is a renewable energy source because it can be generated within a short time frame. Through the process of photosynthesis, plants capture the sun's energy. When the plants are burnt, they release the sun's energy they contain.

Research efforts should be directed towards developing biofuel crops adaptable to our local environment targeting yields of crops as biomass sources that can be achieved on a sustainable basis with minimal energy inputs for crop production including cultivation, planting, nutrient production and application, harvesting and transport.

ACKNOWLEDGEMENTS

"All glory must be to the Lord, for He is worthy of our praise." No man on Earth should give glory to himself for; All glory must be to the Lord." My Vice Chancellor Sir, and this Esteemed Audience, with my whole heart, soul and body, I worship and thank the Almighty God for being God in my life. He is, has been and will ever be my fountain of sustenance.

On the 29th of May 2015, His Excellency, the Governor of Rivers State, Chief (Barr.) Nyesom Ezebunwo Wike in his maiden speech as Governor of Rivers State made a profound statement in which he "restored all the rights and privileges of Rivers State University striking lecturers." This singular, monumental action formed the basis for the suspension of the 3-years old strike and my subsequent and progressive elevation to the position of a **Professor of Plant Physiology -** the pinnacle of my career. My Governor, Mr. Quality Project, the man whose word is His bond, I salute you God bless you and your family Your Excellency.

My sincere gratitude goes to our Vice Chancellor, my brother, the award winning and specially blessed Prof. Nlerum S. Okogbule FCIAbr, DSSRS who has always lent me his ears and was not short in praises of the fact that my team and I were able to get full accreditation for the Department of Plant Science and

Biotechnology at our very first outing.

To the Deputy Vice Chancellor, Prof. V. B. Omubo-Pepple and Prof. N. S. Okoroma, the immediate past DVC (Admin), I am grateful for your support and encouragement at all times. The Registrar, Dr. Sydney Enyindah who always has my back. My name for him was **"Onyeudo"** even before he was officially given the title. So you see, I saw and spoke into his future. Your milk of kindness in this University will not go unrewarded. The Librarian, Prof. J. N. Igwela, who believes in me, and will always celebrate me. The Acting Bursar, Mr. James Ebere, Acting Director of Works, Arc. H. Onu, and Mr James Ebere Acting Chief Security Officer I thank you for always making me feel good even when you do not oblige me.

Mr. Vice Chancellor Sir, may I acknowledge and appreciate in a special way the Chairman and members of the 13th University Governing Council to which I belong. The leadership and comradeship has been very impactful. I pray the relationship goes on even after our tenure. To the Grand Commander, the leader, Chairman, Hon. Justice (Dr.) Iche Ndu, DSSRS, you are exceptional. Barr. (Drs.) Akani and Amadi; Hon. (Mrs.) I. Aguma; Rev. (Dr.) J. Omaegbu; Profs. Ojule, J. Ezekiel-Hart, Dr. D. Cookey-Gam, Dr. K. Ordu; Prof. I. Zeb-Opibi, Prof. R. Amadi, and Lady P. Berezi, I salute you all.

Vice Chancellor Sir, writing out my appreciation is a herculean

task. I have found favours and love all around across all cadre of this great University and society at large. I am grateful to Prof. G. O. M. Tasie, Chairman of the 9th Governing council of this university who took me under his wings at the death of the husband of my youth.

I only got thus far because I stood on the shoulders of giants who had been there before me. Dr. N. A. Ndegwe (Late) introduced me to the field of Plant Physiology, Prof. F. A. Onofeghara fanned the embers and research did the rest. My gratitude goes to Prof. T. G. Sokari who influenced my transfer to the Department of Applied and Environmental Biology. Prof. Okwakpam (Late), Dr. Okpon (Late), Prof. T. J. T. Princewill and Prof. O. Obire were teachers and mentors I met during the early days of my job trajectory.

At this juncture, I must bring to the fore those angels who formed a wall around me in my years of travail. Prof. Monsi was the first hit and he bore it like the great man he is .Sir, I cannot payback what you have lost but God can. Prof. Wami who will make out time regularly to pray with me, thank you sir. Emeritus Prof. Steve Odie-Owei for your godly counsel, I appreciate you. Prof. M. Ahiakwo, your question in senate shook the table, God bless you. Emeritus Prof. A. Ahiauzu (Late) your managerial speech stemmed the tide and brought the realization that the plot to cancel the degree was an effort in futility, I thank you.

Emeritus Prof. S. C. Achinewhu was the "Oga" who prayed, gave bible passages, made proclamations which eventually came to pass. He worked the talk, thank you sir. Dr. Elsie Banigo and Prof. Adata. A. Hart, your protectiveness was not in vain, it ended in praise. May you never lack help in your time of need. Prof. O. Obire, your care, love and tears did not go unnoticed thank you,

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REFERENCES

Ajayi C. & Ajakaiye, D. (1981). The origin and peculiarities of the Nigerian Benue Trough: another looks from recent gravity data obtained from the Middle Benue. *Tectonophysics*. *80*: 285–303

Akonye, L. A. & Nwauzoma, B. (2003). Growth measurement in Plants. *In*: *Research Techniques in Biological and Chemical Science*. Springfield Publishers Ltd Owerri Nigeria, 147-155

Arakelova, V. (2014). The Onion and the Mandrake: Plants in Yezidi Folk Beliefs. *Journal of Persianate Studies*. *7*: 149 -- 156

Bennett, B. C. (2007). *Doctrine of Signatures:* An Explan ation of Medicinal Plant Discovery or Dissemination of Knowledge? *Economic Botany. 61(3):* 246–255.

Bennett, R. (2014). *The gift of healing herbs: Plant medicine and home remedies for a vibrantly healthy life.* Berkeley, CA: North Atlantic Books.

Bennett, R. (2014). *The gift of healing herbs: Plant medicine and home remedies for a vibrantly healthy life.* Berkeley, CA: North Atlantic Books.

Borokini, T. I. (2015). *Okoubaka aubrevillei* Pelleg & Norman: A Synthesis of Existing Knowledge for Research and Conservation in West and Central Africa. *Journal of Biology and Life Science*. *6 (1)*: 67-95

Carter, J. D., Barber, W., Tait, E. A. & Jones, G. P. (1963). The Geology of Parts of Adamawa, Bauchi and Borno Provinces in Northeastern Nigeria. *Bulletin Geological Survey Nigeria. 30*: 1 – 108.

Chang C. & Chen, P. (2005). Human response to window views and indoor plants in the workplace. *Hort*. *Science*. *40*:

1354–9.

Coleman, C. K. & Mattson, R. H. (1995). Influences of foliage plants of human stress during thermal biofeedback training. *Hort. Technology. 5*: 137–40.

David, T.S., Henriques, M. O., Kurz-Besson, C., Nunes, J., Valente, F., Vaz, M., Pereira, J. S., Siegwolf, R., Chaves, M. M., Gazarini, L.C. & David, J. S. (2007). "Water-use strategies in two co-occurring Mediterranean evergreen oaks: surviving the summer drought". *Tree Physiology. 27 (6)*: 793–803.

Dravigne A., Waliczek, T. M., Lineberger R. D. & Zajicek JM (2000). The effect of live plants and window views of green spaces on employee perceptions of job satisfaction. *Hort Sci. 43*:183–7.

Fjeld, T (2000). The effect of interior planting on health and discomfort among workers and school children. *Hort Technology. 10*: 46–52.

Hendry, G. A. F. & Jones, T. G. (1980). Haems and chlorophylls: comparison of function and formation. *Journal of Medical Genetics. 17*: 1-14

Hoballah, M. E. F. & Turlings, T. C. (2001). Experimental evidence that plants under caterpillar attack may benefit from attracting parasitoids. *Evol. Ecol. Res. 3*: 583–593.

Ibeawuchi I. I., Ihejirika G. O.1, Egbuche C. T, &**Jaja E. T** (2015). Effect of Crude Oil Pollution on the Carbohydrate Content of Oryza Sativa at Different Stages of Growth. *Agriculture, Forestry and Fisheries. 4*: 86-89

Jaja, E. T. & Barber, L. I. (2017). Organic and inorganic fertilizers in food production system in Nigeria. *Journal of Biology, Agriculture and Healthcare. 7(18)*:51 – 55.

Jaja, E. T. & I.I. Ibeawuchi (2015), Effect of Different Rates of

Liming Materials on the Production of Groundnut (Arachis Hypogeae) In Owerri Southeastern Nigeria. *Journal of Biology, Agriculture and* Healthcare. *5 (18)*: 164 – 169.

Jaja, E. T.& Nwauzoma, A. B (2015). Response of *Zea mays* to Oilfield Wastewater Treatment. *Journal of Natural Sciences Research*. *5(18)*: 157 – 162.

Jaja, E. T. & Obire, O (2015), Impact of oilfield wastewater on soil quality and soils planted with various crops. *Current studies in comparative education, science and technology*. *2 (2)*: 179-196.

Jaja, E. T. & Obire, O. (2015), Phytotoxic effect of oilfield wastewater on the physiology and chlorophyll content of some crops. *Current studies in comparative education, science and technology*. *2 (2)*: 198 - 212.

Jaja, E. T. & Ogbalu, O. K. (2018). Leaf-Rolling: A Response Of larval Instars of *Sylepta Derogata* [*Lepidoptera: Pyralidae]* to Horizontal Gas Flare at Owaza, Rivers State, Nigeria. *Journal of Biology, Agriculture and Healthcare*.8 *(4)*: 36 – 42.

Jaja, E. T., Nwankwo, N. E. & Dimkpa, S. O. N. (2018)Effect of Tillage Methods and Spacing on the Productivity of Waterleaf. *Journal of Natural Sciences Research*. *8 (4)*: 10 - 14

Jaja, E.T. & Ibeawuch, I. I. (2015). Effect of Organic and Inorganic Manure Mixture Rates On the Productivity of Okra. *Int. Journal of Agric. and Rural Dev. 18 (1)*: 2085 - 2091

Kelepertsis, A. E. & Andrulakis, I. (1983). Geobotany-biogeochemistry for mineral exploration of sulphide deposits in northern Greece - Heavy metal accumulation by *Rumex acetosella* L. and *Minuartia verna* (L.) Hiern.

J. Geochem. Expl. 18: 267 – 274.

Lohr, V. I., Pearson-mims, C. H. & Goodwin, G. K. (1996). Interior plants may improve worker productivity and reduce stress in a windowless environment. *Journal of Environmental Horticulture Article*. *14(2)*: 97–100.

Min-sun Lee, J. L., Bum-Jin, P. & Yoshifumi, M. (2015). Interaction with indoor plants may reduce psychological and physiological stress by suppressing autonomic nervous system activity in young adults: a randomized crossover study. *Journal of Physiological Anthropology*. *34(1)*:21

Obaje, N. G., Ligouis, B. & Abba, S. I. (1994). Petrographic Composition and Depositional Environments of Cretaceous Coals and Coal Measures in the Middle Benue Trough of Nigeria. *International Journal Coal Geology*. *26*: 233 – 260.

Odoemena, C. S. I. &**Jaja E. T**. (2003). Effect of NPK fertilizer and gibberellic acid on the growth of Teterpleura tetraptera (Schum and Thonn) Seedings. *Journal of Tropical Biosciences*. *3*: 78-83

Onofeghare,F.A. (1985)Botany in Human Affairs Inaugural Lectures 1985-80 Series No 3,University of Port Harcourt

Orem, W. H. & Finkelman, R. B. (2003). Coal Formation and Geochemistry. *Treatise on Geochemistry*. *7*: 191–222

Pearce, J. M. S. (2008)."The Doctrine of Signatures". *European Neurology. 60(1): 51–52.*

Shukla, R., Sharma, S. B., Puri, D., Prabhu, K. M. & Murthy, P. S. (2000). Medicinal Plants for Treatment of Diabetes Mellitus. *Indian Journal of Clinical Biochemistry*. *15*:169-177

Simard, S. W., Perry, D. A., Jones, M. D., Myrold, D. D., Durall,

D. M. & Molina, R., (1997). "Net Transfer of Carbon between Tree Species with Shared Ecto- mycorrhizal Fungi," *Nature*.*388*: 579 – 582.

Sumarmin, R., Yuniarti, E., Araucana, A. & Huda, N. K. (?). Influence of combination of bean sprouts extracts and trisquail yolk on quality frozen semen of Holstein Friesian bull. *Journal of Physics*: *Conf. Series*. *1116*: 1 - 8.

Suparmi, S., Nur Anna, C. S., Alvenia, M. E., Galuh, D. U., Iqrommatul, L. & Heavin, R. S. (2016). Anti-anemia Effect of Chlorophyll from Katuk (*Sauropus androgynus*) Leaves on Female Mice Induced Sodium Nitrite. *Pharmacognosy Journal*. *8(4)*: 375 - 379.

Tang, S., Wilke, B. M. & Huang, C. (1999). The uptake of copper by plants dominantly growing on copper mining spoils along the Yangtze River, the People's Republic of China. *Plant and Soil*. 209 (2): 225 – 232.

Taylor, T. N., Taylor, E., & Krings, M. (2009). *Paleobotany: The Biology and Evolution of Fossil Plants*, 2nd Edition, Elsevier, Amsterdam,

Waliczek, T. M., Zajicek, J. M. & Lineberger, R. D. (2005). The influence of gardening activities on consumer perceptions of life satisfaction. *HortScience*. *40*:1360 - 1365

Wohlleben, P. (2015). *The Hidden Life of Trees: What they feel, how they communicate*. Greystone Books Ltd. Vancouver, Canada: 272pp.

Wolverton, B. C., Johnson, A., & Bounds, K. (1989). Interior landscape plants for indoor air pollution abatement-final report NASA, Stennis Space Center Houston, USA.

CITATION

Professor Emylia Tamunodiari Jaja was born Emylia Atemie Jaja (name change due to marriage) to the family of Senibo Dick Mietamuno Jaja, Nigeria's first Philatelist and Dame Melrose Dick Mietamuno Jaja (Nee Peterside), first female Counsellor in Opobo. She was born 4th child and third girl in a family of seven children (5 girls and 2boys). Her father, a strict disciplinarian and firm believer in the girl-child did not bow to the pressure of acquiring male children at all cost. He maintained that, "his girls will be his boys."

Professor Emylia was born in Nsukka, Eastern Nigeria (today's Enugu State). She started her primary school education in Methodist Primary school, Ogui, Enugu and later, due to the regular civil service transfers, completed primary education in Surulere Baptist School, Surulere, Lagos.

For her secondary education, Professor Jaja attended the St. Catherine's Girls' Secondary School, Nkwerre and Mary Knoll College, Okuku Ogoja, She obtained her West African School Certificate from Mary Knoll College, Okuku, Ogoja with Grade One. She also attended the Federal School of Arts and Science, Sokoto for her A' Levels, which she passed with merit.

Prof. Emylia T. Jaja obtained a BSc. (Botany) degree with a Second Class Honours, Upper Division from the University of Nigeria, Nsukka in the year 1980, and an MSc (Plant Physiology) from the University of Port Harcourt in the year 1992. Prof. Emylia Jaja bagged her doctoral degree (PhD) in Environmental Plant Physiology in the year 2010 from the Rivers State University of Science and Technology, Nkpolu-Oroworukwo, Port Harcourt, Rivers State (now Rivers State University).

In 2015, she was promoted to the rank of a Reader and a FULL

PROFESSOR OF PLANT PHYSIOLOGY in 2018. By this, she became the **First Professor of Plant Physiology in Rivers State University of Science and Technology**. Professor Emylia Tamunodiari Jaja, today stands celebrated as the **First Female Professor of Opobo Town Extraction**. *He anointed my head and gave me laughter at the end of it all.*

Professor Emylia Tamunodiari Jaja has over seventy (70) publications in reputable national and international journals and conference proceedings. She has also attended and presented papers in both international and national conferences.

She is a member of several professional bodies namely:

1. Botanical Society of Nigeria (BOSON)
2. Science Association of Nigeria (SAN)
3. Nigeria Society for Plant Protection (NSPP)
4. Nigeria Institute of Food Science and Technology (NIFST)
5. International Society of Comparative Education and Science Technology, Nigeria (ISCEST)
6. Mycological Society of Nigeria (MYCOSON)
7. Organic Agriculture Project in Tertiary Institutions in Nigeria (OAPTIN)

Prof. Emylia Jaja is a Fellow, African Academics Network (AAN)

Professor Emylia also was and is a reviewer to many journals which include;

1. FUAAB Journals
2. Net Journal of Agricultural Science Research Journal (ART)
3. International Invention Journal of Agricultural and Soil Science (IIJAS), just to mention but a few.

Prof. Emylia Jaja is also an Editor of the International Journal of

Microbiology and Applied Sciences (IJMAAS).
Prof. Emylia has served as an examiner of undergraduate and postgraduate students to some universities. She has also been an external assessor for promotion to professoral cadre in some universities.
She has held various positions of authority in her formative and adult years with outstanding recommendations, awards and prizes. Within and outside the University, she has held various positions, and has been chairman and member of committees, some of which are;

- Niger Delta *Biologia*, Launching Committee 1996 (member)
- Departmental Examinations Officer 1998-2000
- Student Registration Officer and Advisor 2000-2010
- Staff School Management Board 2001-200 (member)
- Faculty Disciplinary Committee 2000-2004 (member)
- Hall Warden 2002-2004
- Health Management Board 2006-2010 (member)
- Examination Monitoring Committee

2006-2007

- Departmental Accreditation Committee 2009-2012
- First Associate Dean, Students Affairs 2015-2018
- Head of Department 2018-2022
- Ad-hoc Committee on Orientation of Fresh Students 2005
- Vice Chancellor's Committee on Destruction of University Property 2005-2006
- University Car Refurbishing Loan 2006-2007
- Tiship Committee 2015-2018
- Investigative Panel (Medical Laboratory) 2016
- University Canteens/Food Vendors Committee 2016-2017
- Departmental CCE Coordinator 2004-2012
- Rivers State University 5-year Strategic Plan 2019
- Chairman, Board of Survey 2019-Date

- ASUU Secretary (first to serve two terms in RSUST) 1999-2003
- ASUU (First and only female to date) Chairman (RSUST) 2005-2010
- ASUU Owerri Zonal Coordinator 2010-2014 (First and only female zonal coordinator till date)
- ASUU National Welfare Officer 2014-2018
- Public Lecture Committee, National Education Summit (November) 2014 (member)
- Federal Government of Nigeria NEEDS Assessment Committee 2012 (member)
- Committee for Restructuring of University of Abuja 2018 (member)
- Rivers State Local Government Election Tribunal 2021 (member)
- Opobo Water Management Team 2021-Date
- Opobo Infrastructure Committee 2022-Date

- Chairman, Graceland International School (PTA) 2019-Date
- Member 13th Gorverning Council 2020 to date
- Chairman, Church Board, Living Faith Church 2022-Date (Winners Chapel) Mile 3. Port Harcourt.

She believes in hard work and follows up tasks to a desired logical conclusion. Little wonder in 2022, as the head of the Department of Plant Science and Biotechnology, she piloted the department to attain the NUC Full Accreditation Status of the programme at its very first outing.

Summarising Prof. Emylia is a committed and firm believer in the rules, regulations, ethics and principles of ASUU, which earned her various positions in over 20 committees in the University , Nigeria's tertiary education space, Rivers State , Opobo Local Government, Opobo town and the Church of Jesus Christ.

Prof Emylia met and married her soulmate, Late Engr. Dienye Tamnodiari Jaja (Opobo first registered Engineer) in her undergraduate days. They lived happily married until death parted them. He left his "madam" physically but he is ever close. They are blessed with two wonderful children, Lolia and Dienye.

Prof Emylia, is a firm believer in Christ and the power of His resurrection. She is a mentor to many, a quiet philanthropist with a motto of never withholding good and never bearing grudges. Prof Emylia, serves and is still serving her community, Opobo

Town in various capacities.

Mr. Vice Chancellor, ladies and gentlemen, I present to you an Astute Academic, A Plant Physiologist par excellence,a lady of proven integrity, a team player, The Lady of many Firsts : First female Professor (Opobo town), first Associate Dean (Student Affairs), first female Chairman (ASUU,RSU) ,first female Zonal coordinator (ASUU Owerri Zone), a quiet phillantropist, a mentor and a mother and above all lover and servant of Jesus Christ Professor Emylia Tamunodiari Jaja.