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RIVERS STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, PORT HARCOURT

GOOD HEALTH IN HEALTHY GREEN PLANTS: The Plant Protectionist Approach

AN INAUGURAL LECTURE

By

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(PLANT SCIENCE AND BIOTECHNOLOGY)

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Inaugural Lecture

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To Chapel of Redemption where I belong my family, my people, the great people of God. The Redemption choir my unit. I remain ever indebted to you.

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And finally my Amiable Vice Chancellor who within a short period in the university put things right for the general good of the university. May God continue to bless and keep you for RSUST Port Harcourt.

And to everybody who found time to honour this invitation despite their busy schedules, may God bless you all.

AND IT CAME TO PASS

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My Departed Lecturers Prince U.U. Ebong, Prof. K.Zuofa, Prof. B.A. Okwakpam, Dr E.N.U. Okpon, etc may their soul continue to rest in peace.

My lecturers present here today Prof. Opuwaribo, Prof. T.A.T. Wahua, Prof. I.R Jack, Prof. M.V. Omubo-Pepple, Dr. J.A. Osakwe, Prof. T.T. Epidi, Dr. Douglas, Prof. G.C. Akani, etc may God bless you.

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I also acknowledge the Great Whales who were solidly behind me in their prayers for a fulfilled dream.

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I wish to remember my late mother who on her dying bed spoke a word which is always lingering in my mind since the tender age of 12 years when she died. She asked for my right hand and handed me over to my late father and she said “Look at our only daughter, borrow money and train her because I know she will not disappoint you. To my late parents Late Chief (Dr) M.N. Tasie and Late Mrs. Daisy Tasie I remain ever grateful because their wishes in my life came to pass.

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Chief Godwin Ogbugo my Principal please if you are here stand up for recognition, God bless you Sir.

GOOD HEALTH IN HEALTHY GREEN PLANTS: THE PLANT PROTECTIONIST APPROACH

The Vice Chancellor
Deputy Vice Chancellor
Registrar and other Principal Officers of the University
Members of the RSUST Governing Council here present
Distinguished Professors and members of Senate
Deans, Directors and Heads of Departments
Distinguished Academia and all other Staff
My Lord Spiritual and Temporal
Family members and Friends
Gentlemen of the Press
Great RSUST Students
Ladies and Gentlemen
Great whales

PREAMBLE

In 1983 when I was seeking for admission into the Federal University Jos in Plateau State, my intension was to study Law. I travelled by train to Jos with my Late Father Chief (Dr) Maxwell N.Tasie having passed JAMB and having obtained my five credits at one sitting in WAEC. However, something very strange happened when we got to the admission officer's office where my admission was to be confirmed. We left Port Harcourt with my personal file that contained all my credentials, but at the point where my WAEC result

was to be presented to the admission officer in Jos, my WAEC result suddenly disappeared from the file leaving me with only my JAMB slip bearing my name and my JAMB score. We searched through the file over and over to no avail. Disappointedly we left for the railway station because I wanted to study in Jos. On entering the train, while still weeping and being consoled by my Late Father, I opened the file again low and behold I saw my WAEC result at the front page of my file starring at me, that even made me cry the more. My Late father immediately screamed, Daisy your Late Mother does not want you to come to this place to school so wipe away your tears because this is strange and he reassured me that I must go to the university no matter what it was going to cost him. I immediately stopped crying and we came back home.

When we got home my Late Father told his brothers and sisters of what we encountered in Jos and everybody repeated the same statement m y Daddy made in Jos.

My Late Uncle Late Jonah Ekezie on hearing this, suggested that I should be taken to RSUST and read any other available course. My Late father took me to UST the next day and we met Rev. M.Y. Oguru who was the admission officer. He looked at my result and encouraged me to study Crop Science. Because I wanted to go to school I agreed and was admitted immediately. I told myself that I must excel in any field I choose to study and that spurred me to where I am today.

After my NYSC I searched for Job because I was already married with a kid my first Daughter Barr Chuku Princess as to support my late husband but nobody employed me. On a good Friday in 1992 I decided to go to my Department where I graduated from to look for

Recommendation

Vice Chancellor Sir, my observations in the several studies carried out clearly indicate the need for strong collaboration among the Plant Scientists, Micro biologists and the Food scientists in the protection of plants and hence ensuring that healthy green plants are grown and all the micro organisms responsible for their infection are tackled to enable the food scientist preserve and handle healthy green plants for the various recipes they produce for man.

Please join me to keep every green plant healthy as we generally maintain healthy living also.

Conclusion

The world population is increasing every day and there is the demand for consumption of healthy food that should be provided by healthy plants. Man is made up of what he eats and as such all hands must be on deck to protect the plants from anything that can cause economic damage on them. Human beings protect plant for their own needs especially for food and economic returns for better life. Plants by their nature try to defend themselves employing several defense mechanisms which may or may not be visible to man. However, it is the duty of man who feed on these plants to support them. I am hereby proposing that sign boards/posts and the promotions for plant protection other than the field and the laboratories should be placed side by side with human health clinics or hospitals. This is true because it shall not profit man nothing if all the human diseases with frightening names are cured and man dies of starvation due to lack of protection of plants from diseases and pest. So man needs to be healthy by consuming healthy green plants.

employment. On reaching there I saw my then head of Department Late Prof. K. Zuofa who screamed when he saw me Tasie where have you been, I answered Sir, no where I am job hunting. He said, Tasie follow me and I answered to where Sir? He said to the registrar PG office to pick a Master's form because you are too brilliant to waste your time. I replied I don't have money with me and he said pick the form and bring the money on Monday. And that was how I came to do my Masters and thereafter my Ph.D.

I am very grateful to God because he gave me the grace to work relentlessly with little or no supervision while combining my role as a mother, as a choir master, as a lecturer and as a mentor to anybody that comes around me which has led me to the pinnacle of my profession as a Professor of Plant Protection with interest in plant pathology/mycology.

The Lord has given me special grace to be a teacher to my students who always run to me for one academic problem or the other because they know that I will always listen to them and proffer solutions to their problems whenever it is in my power to do that. I try as much as possible to attend my lectures, give assignments, mark my assignments, test the students and examine them. I ensure that I always start my lectures from the first week of resumption so I can finish early and do my research. I attend my conferences not for fun but to present my research findings to the world. I return all the glory to God.

I have been involved in many collaborative projects with my former lecturers, my colleagues and with my students the results of which are widely read on the net all across the globe. I try as much as possible to be original in what I do, not wanting to depend on others

or copy others because I have a name to protect. I have given several public lectures in my local government and even in the state on issues bordering on youths, women and on career development. I have been involved in field trials and experiment with Rivers State Agricultural Development Project at Rumuodomanya in Obio/Akpor LGA, Shell Pineapple Project at IITA and as a Resource person in the Rivers State Rehabilitation Project at Okehi Etche and several community development programs.

	F. oxysporum	
0	0±0.00	0±0.00
20	30±0.002	30±0.002
40	50±0.001	50±0.002
60	80±0.002	80±0.001
80	100±0.001	100±0.003
100	100±0.001	100±0.003
	B. cinerea	
0	0±0.00	0±0.00
20	30±0.002	30±0.001
40	50±0.001	50±0.002
60	80±0.002	80±0.002
80	100±0.002	100±0.001
100	100±0.001	100±0.001
	$\sum x=60$	$\sum x=60$

$\sum x$= mean inhibition of A. indica and A. vera of all the fungal isolates of C. esculenta.

Vice Chancellor Sir, one could at this juncture state with all humility that I have carried out several research works in mycology, plant pathology, ornamental plants, the use of bio pesticides, Agronomy and Environmental Studies in relation to plant protection and the findings and observations could only be attributed to the grace of God. Infact I return all the glory to Him and Him alone.

	G. candidum	
0	0±0.00	0±0.00
20	30±0.001	30±0.002
40	50±0.002	50±0.003
60	80±0.001	80±0.001
80	100±0.002	100±0.002
100	100±0.002	100±0.00
	N. crassa	
0	0±0.00	0±0.00
20	30±0.002	30±0.003
40	50±0.002	50±0.001
60	80±0.003	80±0.002
80	100±0.001	100±0.001
100	100±0.002	100±0.001

∑x=60 mean inhibition of A. *vera* extracts on all the fungal insolates of *x.sagititolia*

***Table 9: Inhibition of the cormel rot of Colocasia esculenta by crude extracts of* A.indica *and* A.vera**

Concentration of A. indica and A. vera	Fungal isolates	% inhibition	
	S. rolfsii	A. indica	A. vera
0		0±0.00	0±0.00
20		30±0.001	30±0.002
40		50±0.003	50±0.002
60		80±0.001	80±0.001
80		100±0.002	100±0.002
100		100±0.001	100±0.002

Introduction

I count it a great honour, privilege and opportunity to stand before you today to present this inaugural lecture. I return special thanks, adoration and praise to God Almighty for keeping me alive and in good health till this day and I return all the glory to him for His presence even in this gathering Amen. I will like to thank the Vice Chancellor, Prof. B.C. Didia, the Chairman of Inaugural lecture committee Professor I.K.E. Ekweozor and other members present here for giving me this privilege.

When I was asked to get ready for my Inaugural lecture by the committee Chairman, Prof. I.K.E. Ekweozor, which should reflect my contributions to knowledge in my discipline, I saw it as a great and challenging task which must be accomplished. I started searching for a suitable title that could be presented in a simple way and such manner that will enable my audience from diverse background and culture to understand and appreciate. It was at this point of praying for a formidable topic that I got the topic I will be speaking on, this afternoon.

"Good Health in Healthy Green Plants: The Plant Protectionist Approach"

Everybody wants to live a healthy life right from creation (Gen.1:1) and that is the reason why green plants which have been abundantly provided for man as food, medicinal herbs, recreational elements and as feed for animals should be maintained and nurtured for maximum utilization.

In this era of insecurity and inflation, people are more concerned about fighting themselves, killing and scrambling for the few available scarce resources and even blaming God for their predicament, but forget the terrorists that devastate the main source and resource that sustains life which are the green plants. Man has frequently neglected the green plants that provide food for him and his live stock. Have we forgotten that Green plants are sources for industrial raw materials? Oh no wonder the bible asks "if the foundation be destroyed what shall the righteous do?

Instead of fighting amongst ourselves, kidnaping and vandalization, we should deal with the terrorists of the green plants that keep us healthy.

The Lord Almighty in his incomprehensible wisdom made provision for food for man as soon as man was created. In Genesis 1:11 "And God said, let the land produce vegetation, seed – bearing plants and trees on the land that bear fruit with seed in it according to their various kinds. And it was so". After the creation of man God said I give you every seed – bearing plant on the face of the whole earth and every tree that has fruit with its seed in it. They will be yours for food (Gen.1:29). There was no discrimination amongst the tree size, fruit type or colour, leaf type or colour to be consumed quite unlike where certain animals and birds were discriminated against for consumption. Mr. Vice Chancellor Sir, with due respect to our medical doctors, pharmacists, vetenary doctors, animal Scientists, biotechnologists, microbiologists and other researchers, we the plant scientists are patiently waiting for the drugs, micro organisms and others that can replace food. We are waiting for alternative food outside plants and their products. It will indeed be a new dawn when drugs or injections or tablets will replace our daily food

a test for pathogenicity, the fungal isolates failed to germinate on the cormel thereby hindering infection. Several research works have been done on the biocidal properties of some plant leaf extracts such as Ocimum gratissimum and Azadiracta indica (Chuku et al, 2010) Chromolaena odorata (Chuku and Chuku, 2014) Zingiber officinale and Allium sativum (Chuku, 2014).

Table 8: Inhibition of cormel rot of **X.sagititfolia** *by the crude leaf extracts of* **A.indica and A.vera**

Concentration of A. indica and A. vera	Fungal isolates		% inhibition
	S. rolfsii	A. indica	A. vera
0		0±0.00	0±0.00
20		30±0.002	30±0.003
40		50±0.002	50±0.001
60		80±0.001	80±0.002
80		100±0.002	100±0.002
100		100±0.001	100±0.002
		A. Niger	
0		0±0.00	0±0.00
20		30±0.003	30±0.003
40		50±0.002	50±0.003
60		80±0.001	80±0.001
80		100±0.001	100±0.003
100		100±0.002	100±0.001
		A. cinerea	
0		0±0.00	0±0.00
20		30±0.003	30±0.002
40		50±0.001	50±0.001
60		80±0.003	80±0.002
80		100±0.002	100±0.001
100		100±0.001	100±0.003

Table 7: Mean number of insect pests of T.occidentalis *in treated and untreated plots*

Untreated Vegetable Plots		Aloe vera Treated vegetable plots	
Insect pests	**Mean number**	**Insects pests**	**Mean number**
Crematogaster	106	+	12
Acraea acerata	220	-	-
Acraea eponina	43	-	-
Dacrisia maculosa	60	-	-
Zonocerus variegates	73	-	-
Dysderscus superstitiousus	16	+	14
Podagrica spp	75	-	-
Aspidomorpha spp	220	-	-
Bemisia tabaci	103	+	10

Legend
+ = Insects Present
- = Insects Absent

vi. Cormel rots of two cocoyam varieties: Colocasia esculenta and Xanthosoma sagittifolia controlled with biocides

Mr. Vice Chancellor Sir, please permit me to summarize a similar work I carried out in 2013 where the cormel rots of two cocoyam varieties: Colocasia esculenta and Xanthosoma sagittifolia were controlled with biocides. Here different concentration of leaf extracts from Azadiracta indica (Neem) and Aloe vera babadense were incorporated into SDA in petri dishes and the fungal isolates introduced onto the SDA and monitored. It was observed that the leaf extracts of A. indica and Aloe vera inhibited the mycellal growth of all the fungal isolates at higher concentrations, an indication of their biocidal attributes. However, when healthy cormels were treated with the plant extracts and the fungal isolates inoculated as

requirements from cassava, yam, plantain, okra, vegetables, fruits and nuts etc.

The importance of a healthy green plant in human life cannot be over emphasized as no one can do without food. The Agriculturists including the plant protectionists are faced with the challenge of providing enough food that can sustain the ever increasing world human population.

A healthy green plant is likened to a precious gold as its benefits are overwhelming. It is indeed the back bone of human existence on the planet earth. Human beings grow green plants not just for food but fibre for clothing and shelter, raw materials for energy and ornamentals for the beautification of the environments. The earth is called a green planet because of the presence of the green plants. The following are the uses of the healthy green plants.

Food: The green plants occupies the first primary level and lead the chain as source of food and as such the main source of survival for every living thing. The green plant provides carbohydrate, protein, fats, oil, fruits, vegetables and other important nutritional attributes. Almost everything eaten is obtained from green plants and over 7,000 species are utilized as food for man. All the parts of a healthy green plant are useful to man: the leaves, stems and roots are good components of daily diets to man.

Shelter: The healthy green plants are important as shelter for man and animals, birds, monkeys, squirrels live on trees. The wood and timber are used for cooking and roofing of houses, building of furniture etc. doors, window, chairs, shelves, black boards, etc

Clothing: Healthy green plants are the largest providers of textiles and fabric materials. Gossypium spp, jute, sisal etc contribute to the production of yarn and thereby clothing.

Reduction of Gaseous Pollution: The healthy green plant makes the climate conducive by utilizing the carbondioxide produced from burning of fossil fuel wood for cooking, burning of tyres etc. which they convert to manufacture their own food during photosynthesis. There is always an increase in gaseous pollution from the release of CO_2, CO and SO_2 in the cities and towns due to increased automobiles and factories. These have caused the reduction of the healthy oxygen ratio of the atmosphere with corresponding increase in diseases of various types. The so much talked about depletion of the ozone layer and green house effect are not unrelated to these problems. Growing of healthy green plants on road-sides, parks and gardens will definitely minimize the effects of gaseous pollution. The oxygen we breathe is a by-product of photosynthetic activities of the green plant. It makes up a high percentage of the habitat and regulates water cycle through transpiration.

Medicine: The healthy green plants are great source of medicine even for life threatening diseases. The medicines from healthy green plants are safe due to their low propensity for side effects and their compatibility in humans. In the field of medicine, over a quarter of all drugs are from plant origin. The high level of awareness created in the use of medicinal herbs is a pointer to the fact that green plants are gaining recognition as sources of alternative medicine in contemporary times.

spot (10%) and Anthracnose disease (5%). Untreated plots also harbored very high number of insects totaling nine insects with high incidence while the treated *T. occidentalis* played host to only three insects with very low incidence as shown in the table below. The application of *Aloe vera* created an unfavourable condition for the diseases and insects pests due to the presence of Allicin a bitter gel or sap secreted by the plant. The use of Aloe vera leaf extract therefore favourably reduced the diseases and pest incidence of T.occidentalis. The implication of this research finding is that local vegetable farmer could use Aloe vera extracts as control measure against the prevailing diseases and pests of this potent crop.

Table 6: Diseases incidence of T.occidentalis in treated and untreated plots

S/No	Aloe vera Treated vegetable plot		Aloe vera Untreated vegetable plot	
	Disease	Incidence(%)	Disease	Incidence(%)
1	MVD	10	MVD	50
2	CLS	10	CLS	70
3	AD	5	AD	40

Legend

MVD = Mosaic Virus disease
CLS = Cercospora leaf spot
AD = Anthracnose disease

climate in well fertile soil (Purseglove, 1977). Mature leaves are ready for harvest one month after planting, (George 1989). The mature pods are also harvested, seeds extracted, boiled and eaten as snacks (Achinewhu, 1996). Diseases and pests are the major problems of this potent vegetable as they attack the plants from the seedling stage to maturity (Hill and Waller, 1999). The use of plant extracts is advocated for the control of plant diseases and pests because of their environmental friendliness, easily degradable and their harmless features to man (Chuku 2006, Chuku 2010, Chuku et al, 2006). To achieve the above objective, a piece of land measuring 10m x 10m was cleared and all the required agronomic practices were carried out ranging from land preparation, planting, watering, fertilizer application and weeding. Diseases and pests of *T. occidentalis w*ere assessed. To assess the effects of crude extracts of Aloe vera on diseases and insect pests incidence of T. occidentalis, the cultivated field was shared into two parts, with each part having a total of 50 plants. 10kg of *Aloe vera* leaves was harvested from a botanical garden and carried to the plant pathology laboratory. The leaf extract from *Aloe vera* was obtained and different concentrations prepared from the stock. These concentrations were applied on the leaves of *T. occidentalis* with a hand spray on weekly basis and labeled. The untreated plants served as control and the incidence of diseases and insect pests were recorded.

Mr. Vice Chancellor Sir, it was observed that the control plots recorded very high incidence of the three prevalent diseases identified on the plant namely mosaic virus disease (50%) *Cercospora* leaf spot (70%) and Anthracnose disease (40%). However, the Aloe vera treated plots recorded low disease incidence as shown in mosaic virus disease (10%), Cercospora leaf

Source of vitamins: Fruits and vegetables are very essential in this regard as they provide these vital food nutrients to humans since the body cannot manufacture vitamins on its own for metabolism.

Sources of Raw materials for industries: Rubber and plastic are by-products from para rubber (Hevea brasiliensis). Others are car tyres, car seats, wearing materials etc.

Natural Pesticides: Healthy green plants are known to possess pesticidal properties which are bio degradable, environmentally friendly and unharmful to man. So many plants naturally release these phyto chemicals that repel pests from the environment.

Economic Contributions: Healthy green plants are contributors to national and international economy as many countries rely on plants as the main source of their revenue. Healthy green plants are used for production of food, cosmetics, drugs, cloths, honey, gum, tannines, perfumes, alkaloids, resins etc. These materials yield money and as such contribute to economic growth. Healthy green plants are linked with the environment as their presence influence rainfall, humidity and temperature. They help in the maintenance of the atmospheric chemistry (gaseous balance in the air), prevents soil erosion, maintain soil fertility, ecological balance and provide support for birds and animals. Healthy green plants are good source of essential oils used in perfumery, making beverages like wine, beer etc. other important items such as paper, bio-diesel, bio-manure, are obtained by the utilization of plant materials. However, green plants coexist in the same environment with many enemies that attack it in the wild and in the fields where they are deliberately cultivated. The green plants are attacked at all stages of their life

cycle during their storage, seedling stage, flowering, fruit and maturity stages. This challenge constitutes a great threat to their existence as these enemies do not only cause damage but can kill, consequently leading to quantity and quality losses which in turn affect both the consumers and producers.

Mr. Vice Chancellor Sir, Ladies and Gentlemen. I guess by now you all must have known the angle am coming from and why the topic "Good health in healthy green plants: The plant protectionist approach" was chosen for this inaugural lecture.

When is a person said to be in good health?

A person or an individual is said to be in good health when such a person is not sick. The popular saying that a healthy man is a wealthy man is true in the sense that it takes only a healthy man to make wealth. A sick man may not have the strength to make wealth even in the face of abundant resources. Maintaining a healthy living is therefore very important for maximum productivity. The fore-going not withstanding adequate consumption of fruits and vegetables are always encouraged for a healthy living. Most of humans' food consumption comes from their ability to consume healthy plants which in turn keeps us in good health. The consumption of healthy plants is therefore highly advocated as unhealthy plants will make us equally unhealthy when they are consumed.

From this research it was established that dipping cassava cuttings into 20 litres of water containing 300 grams of camphor for 10 minutes before cultivation will not only control millipede infestation but will also bring about increased sprouting of the cassava stem cuttings. The obvious advantage of this observation is that the local farmers can easily adapt it for improved cassava production.

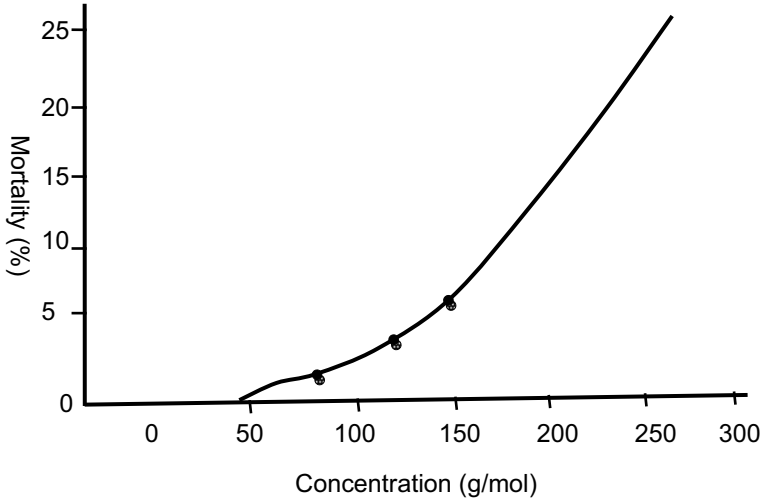

Figure 1. Mortality rate of millipede at different concentrations

v. Associated field diseases and insect pests of Telfairia occidentalis and control with crude extracts of Aloe vera

Mr. Vice Chancellor Sir, I also carried out a research on the "Associated field diseases and insect pests of *Telfairia occidentalis* and control with crude extracts of Aloe vera".

Telfairia occidentalis popularly known as *"fluted pumpkin"* is a *perennial* herb that is widely cultivated as garden and farm vegetable. It is native to West Africa and grows in humid tropical

again when the pest have disappeared. Infact farmers abandon their farm for about two months and return to start clearing again and fresh cassava stems are collected and replanted. This process of replanting of stems is time consuming and tedious.

In this study, as a way of tackling the problem, infested cassava stem cuttings and millipede samples were collected from infested farms and carried to the laboratory for mycological assessment to establish the fungi associated with millipede infested cassava cuttings. Having established that, camphor was purchased from the market and its pesticidal effects on millipede was also investigated. Seven concentrations of camphor 40g, 80g, 120, 160g, 200, 240g and 280g were prepared and labeled accordingly. The Lethal dosage of these concentrations was established by dipping five live millipedes into the various concentrations of camphor in conical flask.

Result showed that millipedes uncoiled and stretched out as an indication of death which occurred at the highest concentration.

At lower concentrations the time of death increased. However, cassava cuttings were tested for sprouting at different concentrations bearing in mind the established lethal dosage of 280g.

The stems were dipped into 20 liters of water with 300g concentration of camphor, for 10mins, 24hrs and 48hrs and planted in the millipede infested farms. However, all the cuttings sprouted with the highest sprouting found in plots with cuttings soaked for 10mins without any infestation by these millipedes which disappeared completely from the farms.

What are healthy green plants?

Healthy green plants are plants that are free from diseases and pests. It is interesting to know that just like man, that green plants also have enemies that pretend to be friends. The major enemies to the health of green plants are bacteria, fungi, nematodes, viruses and the parasitic flowering plants that reproduce, feed and invade plants in diverse ways causing diseases. About 85% of all plant diseases both in the store and field are caused by fungi an indication that fungal diseases are much more than those caused by other pathogens. The pathogens affect all the plant parts with symptoms ranging from mild to very severe epidemic resulting in total crop failures. The shortage in food supply that is leaving almost 800 million people in the world hungry or with inadequate food supply is due mainly to damages caused by these natural enemies of green plants (Onuegbu, 2002, strange and Scott, 2005). A good knowledge of the features, growth and development of these enemies of green plants is important to their effective management. The population of pathogens vary with time, space and genetic makeup as such total eradication of a particular disease causing organism is usually not very easy. However, they can be managed to a level that does not cause economic injury. The menace of diseases and infections are severe in the developing countries as most of them lie within the tropics where the weather conditions favour their growth and development.

Fungi: Fungi are nucleated, spore bearing, achlorophyllous Eukaryotic thalophytes. They are filamentous, branched somatic structures containing cellulose, chitin or both. They reproduce asexually and/or sexually by means of spores. They are diverse in nature and abundant in terrestrial, marine and other ecosystem.

Fungi dominate their environment because of their ability to survive where other organisms cannot. Examples are in the refrigerators, crude oil, respiratory tracks of man and animals etc. They are heterotrophs and obtain their food from other sources as either saprophytes or parasites. (Alexopolous et al, 1996). The parasitic fungi are those that derive their food from living plants and are of paramount interest in plant health.

Spores are the main dispersal mechanism of fungi and can remain dormant until germination conditions become favourable. Many fungi are plant pathogens and are the ones responsible for certain unhealthy conditions in plants causing diseases that lead to high yield loss and reflect on food security as they cause hunger and starvation to man. Some symptoms of fungal infections include leaf spots, leaf curl, gall, rots, wilt, canker, stem and root rots.

A few fungi also affect animals including humans causing diseases like ring worm and athlete's foot. Some others produce mycotoxins that are dangerous to human e.g. aflatoxins produced by Aspergillus flavus and Aspergillus parasiticus in groundnuts associated with cancer in humans.

However, some fungi are useful to humans, yeasts in baking and brewing, some antibiotics are products of metabolic activities of fungi e.g. streptomycin and penicillin. Fungi are spread by wind, water, soil, animals, man, equipment and through plant materials. They enter through natural openings such as stomata, hydathodes, nectathodes, lenticels and through wounds from pruning, hail, thunderstorm and other mechanical damage. They also secrete enzymes that break down the cuticle which is the outer protective covering of plants. The plates 1A and 1B below show the structure

insect pest. The advantage of intercropping have been highlighted in crop production and protection. Willey, (1979) also stated that yields of crops increased by unit area when cassava was intercropped with cowpea. Maize grain yield was reported to have increased when intercropped with other crops (Okpara et al. 1995).

Table 5: Mean thrips populations in various mixtures of crops

Crop combination	**Mean thrips population in maize**	**Mean grain yield of maize per plot**
Maize + Yam	5.0a	125.5c
Maize + Cassava	5.4b	228.2ab
Maize + Cowpea	5.1a	220.5b
Maize alone	7.8c	229.8a

In a column means followed by the same letters are not significantly different from each other at 5% level.

iv. Control of millipede in cassava infested farm and the enhancement of the sprouting of cassava cuttings using camphor

Cassava is one of the most important staple food in the Niger Delta which provides carbohydrate for the masses. The potential of this crop has not been fully harnessed because of its production, which is still limited to peasant farmers (Arinze 2005, Onuegbu 2002).

Vice Chancellor Sir, in the year 2008, I also carried out another ground breaking research on the control of millipedes using camphor on millipede infested cassava farms in Rivers State. The outbreak of millipedes infestation of cassava cuttings has often led to total crop failure, hunger and starvation as farmers waste their scarce resources to cultivate their cassava plants over and over

iii. Reduction of the thrips infestation of maize intercropped with other crops

Maize is one of the most important cereals in the world ranking 3rd after wheat and rice belonging to the family Poaceae (Onuegbu, 2002, Chuku 2007). It serves as food for man and feed for livestock. However, it is prone to several insect infestations among which are the thrips. Thrips are flower pests which feed on inflorescences of flowers where they feed on pollen grains thereby hampering pollination (Okwakpam, 1978), it was reported in Oregon that 16% of the seeds of Emerald bent grass was destroyed by *Anaphothrips obscures* (Kam, 1972). In Sri-Lanka *Frankiniella schultzei* infested flower while *Thrips palmi* and *Megalurothrips usitatas* fed on both foliage and flowers, *Scirtothrips dorsalis* fed strickly on foliage of cowpea (Wijeratne, 1996). Work done by Singh and Taylor (1994), Wein and Rosingh (1989) and Singh *et al*., 1990, have shown that early feeding damage on developing flower buds can cause a total crop failure. However, intercropping has been identified as one of the most viable cropping systems that helps in controlling the prevalence of diseases and pests in the field as well as improved agricultural productivity in terms of increased yields (Enyi, 1973, Egharevba, 1979, Ezulike et al, 1993, Chuku and Ugoji, 2011, Chuku et al, 2003).

This insect has a wide host range from cereals to legumes and even vegetables. The study was therefore carried out to assess the effects of inter cropping maize (Zea mays) with other crops on thrips infestation and crop yield. It was observed that the number of thrips on intercropped plots reduced drastically with more grain yields as against the high thrips population recorded in the control plots. An indication that intercropping is a better option for the control of this

of a fungus (Rhizopus stolonifer) as seen under the microscope and a fungi infected rice plant.

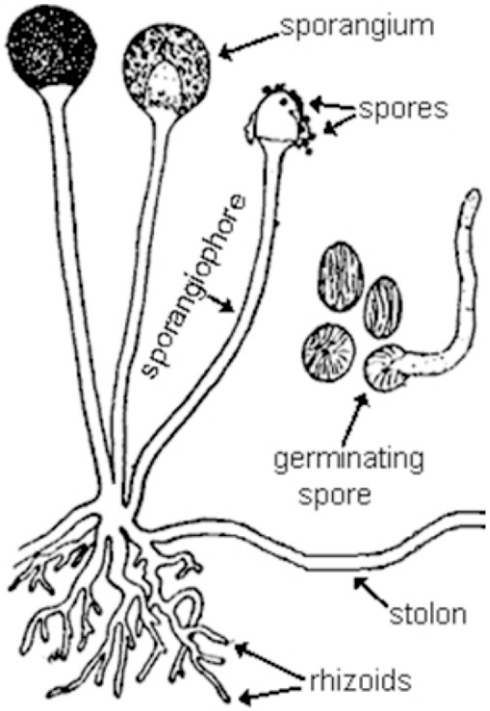

Plate 1A: Fungus **(Rhizopus stolonifer)**

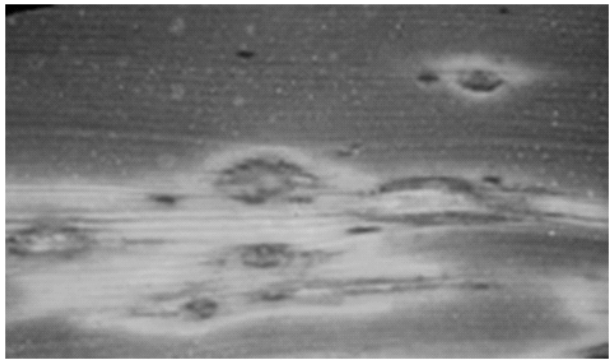

Plate 1B: Rice blast disease caused by **Helminthosporus spp**

Bacteria: Bacteria are single-celled organisms, that do not posses nucleus but reproduce by binary fission and so they multiply and mutate rapidly. They function either as parasite or saprophytes. They can infect all plant parts and can enter the plant through natural opening and can move from one plant cell to another just like fungi in water, soil, plant materials. However, bacterial pathogens are more dependent upon water an indication that they thrive better in a wet condition. Bacteria move between plant cells and secrete substances that degrade plant cell wall in order to utilize the cell content. Some produce enzymes that break down plant tissue thereby causing soft rot or water soaking. Like the fungi, bacteria cause symptoms such as leaf blight and spots, gall, cankers, wilts and stem rots. Plates 2A is a bacterial cell and 2B is an example of disease caused by bacteria.

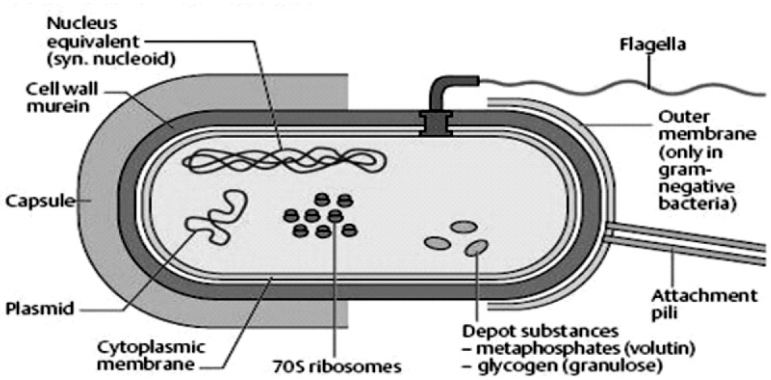

Plate 2A: Structural representation of a bacterium cell

Table 4: Stagnant flooded water analysis and its composition

Chemical Analysis	Expression
pH	4.92
Iron	0.25mg\L
Acidity (Total)	42.50mg\L
Alkalinity (Total)	30.0mg\L
Hardness as in CaC03	26mg\L
Calcium	1.3%
Chloride	2.8mg\L
Magnesium	0.06%
Nitrogen (NH+)	0.35%
Nitrogen (N03)	0.42%
Nitrogen (Total)	0.77%
Phosphorus (P+)	0.01%
Potassium(K+)	2.05%
Sodium (Na+)	0.5%
Total Dissolved Solids (T DS)	80.0mg\L
Total Suspended Solids (TSS)	43.5\L
Sulphate (S042)	25.4mg\L
Dissolved Oxygen (D0)	11.6mg\L
Biochemical Oxygen Demand (BOD)	0.56mg
Chemical Oxygen Demand (COD)	3.35mg

Effect of mangrove wood ash and stagnant flooded water on the shelf life of pawpaw (Carica Papaya)

It was observed that the samples treated with the mixture (slurry) from stagnant flooded water which has been reported to be rich in calcium, potassium and other essential element and mangrove wood ash remained intact for about 14 days without ripening and spoilage while the untreated samples ripened within three (3) days and started decaying from the fifth day. The physico – chemical compositions of stagnant flooded water and mangrove wood ash were measured and found to contain elements such as calcium phosphorus, potassium, sodium, sulphate, chloride and other essential elements that must have conferred a histological defense against pathogens on the cell walls of the treated pawpaw sample hence the improved shelf life observed. This finding is very important as it would help pawpaw vendors to delay ripening of the pawpaw fruits and at the same time reduce the contamination of the fruits from micro organisms. It will enable pawpaw vendors to make more money by selling their fruits at piece meal instead of the rush to dispose off all the fruits with little accruable income.

Table 3: Physico-Chemical Composition of Treated and Untreated Pawpaw fruits

	% Moisture	% Ash	%Lipid	% Carbo-hydrate	%Protein	%Fiber	Mean
Treated (Red) Pawpaw	86.95	0.13	0.07	9.05	0.83	0.06	16.18a
Untreated (Red) pawpaw	87.67	0.5	0.05	9.05	0.89	0.05	16.37a
Treated (Yellow) Pawpaw	88.69	0.14	0.06	8.25	0.74	0.07	16.33a
Untreated (Yellow) pawpaw	89.76	0.5	0.05	9.00	0.85	0.05	16.70a

Means with same letters in a column are not significantly different (P=0.05)
(LSD = 0.87)

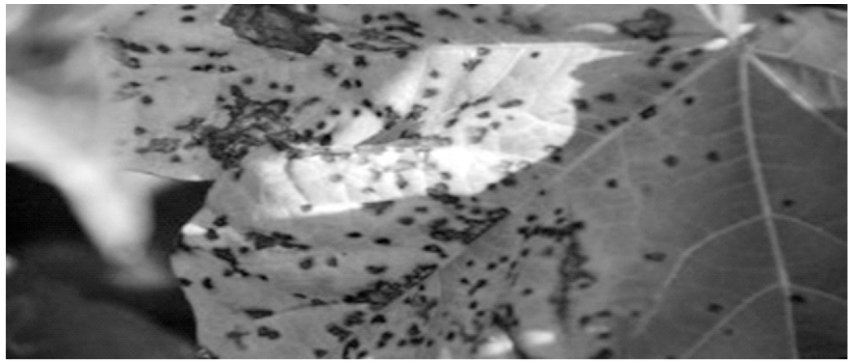

Plate 2B: Cotton leaf blight disease caused by **Xanthomonas campestris p.v. malvacearum**

Nematodes: Nematodes or Eel worms are microscopic round worms that live in the soil, water and plant materials. They have a spear-like stylet mouth part, require free water to move about and reproduce by egg. They spread in water, infected plant materials, soils and in some cases insects. Nematodes cause a variety of symptoms including stunting, yellowing and wilting of plant parts. Infected plants develop strange knot-like growth on their roots. Nematodes live parasitically and saprophytically e.g. root-knot nematodes on tomatoes (Meloidogyne spp.).

Plates 3A, 3B and 3C show a typical nematode and nematode infested plant.

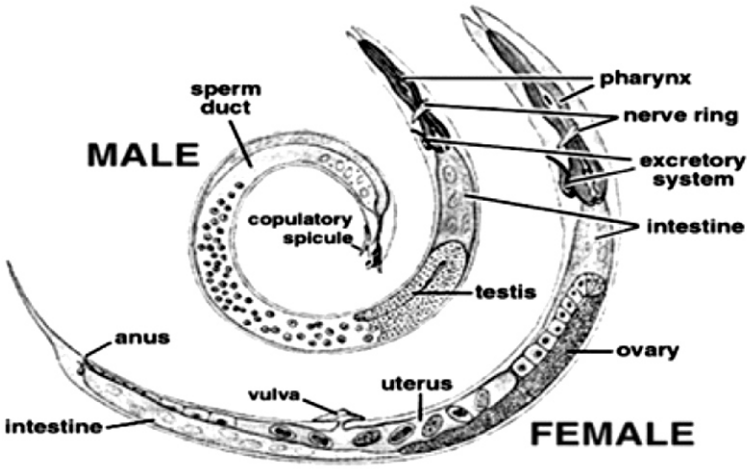

Plate 3A: Structural representation of a
Female and male nematode

Plate 3B: Tomato root knot disease caused by
Meloidogyne incognita acrita

A major breakthrough came when the study eventually succeeded in preserving the shelf life of the powdered seeds of this potent crop/plant for a period of six months with ascorbic acid. The viscosity of the powdered seed was stabilized without any loss in colour, flavour or ordour, meaning that ogbono would not lose its taste and flavour. This work was published in Agric Science digest 22(3) 191 – 193 in INDIA.

ii. Preservation of the shelf life of pawpaw (Carica papaya) using mangrove wood ash and stagnant flooded water

Pawpaw *(Carica papaya)* is a very important fruit which is believed to have originated from South Mexico and Costa Rica and widely cultivated. The pulpy fruit which is consumed as salad, pawpaw drink is known to be rich in essential nutrients for man. Unfortunately, it is one of the most perishable fruits as evidenced in most of our local markets where they are dumped into waste bins especially during the flush seasons (Chuku and Onuegbu 2007). Any approach that could preserve the half ripen fruits for at least 7 days will be well applauded.

Our study showed that mangrove wood ash and stagnant flooded water were used to inhibit ripening in pawpaw (Carica papaya). Here a simple but scientific approach was employed. Pawpaw fruits of half ripen stage were harvested from a botanical garden. Mangrove wood ash was obtained from a wood vendor. Stagnant flooded water was collected from a flood plain. A known quantity of the mangrove wood ash was mixed with a known volume of the stagnant flooded water to form a slurry. The slurry mixture was smeared on the half ripen pawpaw fruit and monitored for ripening, as well as spoilage along side the unsmeared samples.

Table 1: Effect of Ascorbic acid on the growth of the seed-borne fungi of **Irvingia gabonensis**

Fungus	Ascorbic			
	0	200	400	600
Aspergillus flavus	0.84	0.57	0.43	0.19
Aspergillus tamari	0.86	0.72	0.52	0.30
Rhizopus stoloniler	1.45	1.17	1.02	1.01
Aspergillus niger	0.64	0.52	0.42	0.25
Penicllium italicum	0.79	0.46	0.30	0.23

The figures against each fungus represent the mycelia dry weight.
By ANOVA, the data are significantly different at 5% level of probability (F=3.22)

Table 2: Effect of Ascorbic acid on the storage stability of the powdered seeds of **Irvingia gabonensis**

Duration of storage (days)	Ascorbic acid (mg/6g seed)	Peroxide value (%)	Free fatty acid (%)	Fat content (%)	Co -efficient of viscosity (%)
30	0	6.4	9.4	7.5	698.8
	200	4.2	7.6	8.0	865.0
	400	2.8	5.8	8.5	931.2
	600	2.3	4.8	8.8	1091.7
90	0	6.6	9.7	10.0	588.3
	200	5.3	7.9	9.0	728.2
	400	4.9	6.5	8.5	783.9
	600	3.7	5.6	9.5	919.0
180 days	0	6.8	9.8	10.5	48.8
	200	5.5	6.8	8.5	613.0
	400	5.0	6.5	8.0	659.9
	600	4.6	6.4	9.6	773.6
	LSD (0.05)	1.75	1.03	1.55	13.62

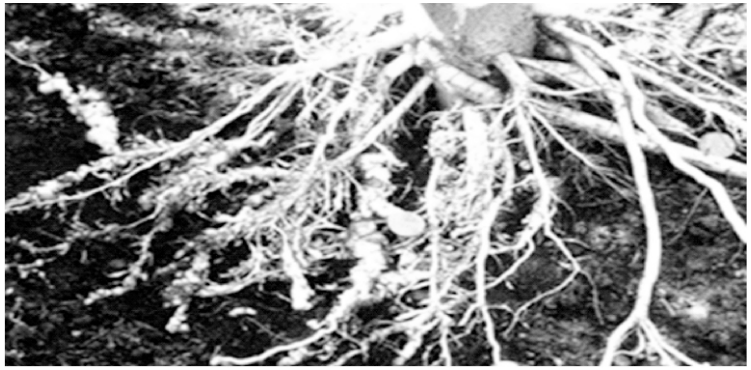

Plate 3C: Okra root knot disease caused by **Meloidogyne spp**

Viruses: Viruses are crystalline particles composed of nucleic acid (RNA or DNA) and protein. They are obligate parasites that cannot survive outside their host.

The virus particles are small and can only be seen with an electron microscope and are found in all plant parts. The virus particles are transmitted from plant to plant by vectors through a wound. The vector is typically an insect, nematode or human. Insects and nematodes spread viruses between plants as they feed on them. The feeding injury creates the necessary wound. A plant virus is usually spread by only one kind of insect vector. Aphids, leaf hoppers, and thrips are examples of virus vectors, but not all aphids, leaf hoppers or thrips spread virus. Humans may spread plant viruses as they work in the garden. Mechanical abrasion from infected hands may be all that is needed. Viruses over winter in infected perennial plants or over wintering insects. A small portion of viruses can be transmitted through seeds, whole others are transmitted through vegetative propagators. Diseases associated with viruses include mottling, spots and mosaic like patterns,

crinkling, and other malformations on leaves and fruits, and may stunt plants. Viruses are systemic, infected plants must be rouged or discarded. Examples are ground nut rosette, rice, yellow mottle virus.

Plates 4A and 4B show the structure of the virus as seen under the electron microscope and the characteristic cassava mosaic virus disease on cassava plant.

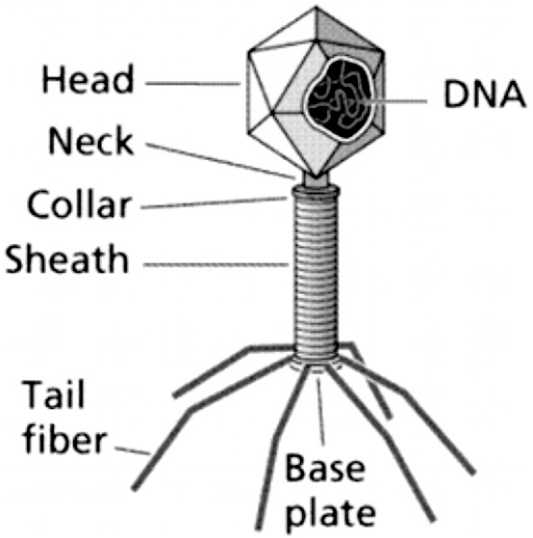

Plate 4A: Structural representation of a virus

foofoo is highly cherished and made the plant popular all through the tropics. (Okafor and Okolo, 1974, Okafor, 1980, Chuku, 2002). The cotyledon are highly perishable and lose their viscosity easily, they are prone to fungal attacks with low shelf life. All these observations prompted me to carry out a research work on this potent crop.

In 2002, I carried out a research work on the fungal flora of the seeds of Irvingia gabonensis (Ogbono). The result showed that these fungi greatly reduced the viscosity or the drawability of the seeds which is the most cherished property of this plant. This observation was of a great concern and there was therefore the need to seek for solution, which led me to start the search for what could be used to stabilize the viscosity of Ogbono as well as inhibit the growth of the fungi: 200mg, 400mg and 600mg of ascorbic acid were prepared and transferred onto petri dishes containing Saboraud Dextrose Agar (SDA), the various fungi were inoculated into the petri dishes in triplicate and incubated for 7 days. Similarly ascorbic acid was added to 2g, 4g, 6g, 8g and 10g of powered seed of I. gabonensis and assessment on the viscosity was done on a monthly basis for 6 months.

vegetables and realized that so many diseases and pests contended with his crops which he must control and protect these plants to avoid yield loses. This was how the whole ideas about plant protection came to be.

MY CONTRIBUTIONS IN THE FIELD OF PLANT PROTECTION

The Vice Chancellor Sir, permit me to state at this juncture that my contributions in this chosen field are enormous. As a burdened scientist, I have carried out several researches ranging from the protection of cultivated crops to plants growing in the wild and to harvested plant produce in the store. I have added values to agricultural produce by preserving their shelf life thereby making these produce available even outside their flush seasons. As a plant protectionist, I have tried as much as possible to cut across every area in plant protection with special interest in plant pathology, mycology and entonomlogy and carried out outstanding researches which I presented locally and internationally. Some of my researches are as follow.

i. Preservation of the shelf life of Irvingia gabonensis using ascorbic acid

Irvingia gabonensis var gabonenesis (Aubry – Lecomte) Bail belongs to the family of irvingiaceae. It is grown in various parts of West Africa (Okafor 1994, 1975a, 1975b). This crop which is said to have originated from the casamance regions of Senegal to Zaire, Angola and Uganda is widely grown all through Africa. It is an important crop because of its cotyledons which are used as food condiment for soup thickening. The slimy attribute of the cotyledons which makes for easy swallowing of rough textured foods like garri and

Plate 4B: Cassava mosaic disease transmitted by the white flies **(Bemisia tabacii)**

THE PARASITIC ANGIOSPERM

More than 2500 species of higher plants are known to live parasitically on other plants (Singh and Emechebe, 1999, Onuegbu, 2002). Parasitic plants produce flowers and reproduce by seeds like other plants. Parasitic plants differ from the other angiosperm because of their inability to produce their own chlorophyll or produce only a small amount of chlorophyll. They obtain their food nourishment from a chlorophyll-producing plant in order to survive. Parasitic plants are spread in various ways including animals, wind and through explosive mechanism. Plants infested by parasitic plants appear wilted, stunted, distorted and chlorotic (Singh and Emechebe, 1991). Some examples of parasitic plants are striga hermonthica, S. asiathica, S. gesnoiriodes on cowpea, Alectra vegelli on cowpea or ground nuts.

Plates 5A, 5B and 5C showing parasitc mistletoe and maize infested with striga.

Plate 5A: **Mistletoe (A parasitic angiosperm)**

Plate 5B: Infestation of maize by **Striga spp**

Plate 5C: **Striga infested Maize farm**

Plant protection: Plant protection is therefore the branch of Agronomy that deals with the nurturing of plants in the field to ensure that diseases and pests do not hinder the performance and productivity of the plants. The plant protectionist is charged with the responsibility of monitoring, forcasting, preventing, controlling and eradicating any disease organism or pest that will influence the general well being of the plant either in the field and in the store. The field of plant protection is the mother body governing several areas such as mycology, entomology, pathology, virology, nematology, bacteriology, acarology and other related disciplines.

The early man was a gatherer of wood and fruits. History has it that any where he went, he harvested from the wild ate and discarded the seeds without consciously taking care of them. He realized that as the years went by, the discarded fruits and vegetables grew and yielded many more fruits and vegetables for him, to harvest. But with civilization, he decided to consciously cultivate these fruits and