A

TECHNICAL REPORT

ON

STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

UNDERTAKEN AT

DEPARTMENT OF PHARMACOLOGY, THERAPEUTICS AND TOXICOLOGY.

COLLEGE OF MEDICINE, UNIVERSITY OF LAGOS, IDI-ARABA, LAGOS.

SUBMITTED BY

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TO

THE DEPARTMENT OF BOTANY,

FACULTY OF SCIENCE, UNIVERSITY OF LAGOS,

AKOKA, YABA, LAGOS STATE

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR

THE AWARD OF BACHELOR OF SCIENCE DEGREE (B.Sc.)

IN BOTANY

SUPERVISOR: Dr. Kadiri A. B.

SEPTEMBER, 2021 – NOVEMBER, 2021

CERTIFICATION

This is to certify that **TORIOLA, ABIMBOLA DAVID** of the department of Botany, University of Lagos, with matriculation number **170803040**, carried out his **SIWES** at **DEPARTMENT OF PHARMACOLOGY, THERAPEUTICS AND TOXICOLOGY**, from September 27th, 2021 to November 19th, 2021 and that this technical report was written by him.

Dr. Kadiri A. B. ……

(Institution based supervisor) (Signature and Date)

DEDICATION

I dedicate this technical report to God my everything. Without him I wouldn't have been able to do this. Also, to my parents for their support in all ways and for believing in me, God will bless and keep you.

ACKNOWLEDGEMENT

First and foremost, I give thanks to God, for His great love towards me. He is the reason for my existence.

I am grateful to my lecturers and the entire staff of the department of Botany, University of Lagos, for their huge contribution in my education as a student of Botany. The theoretical and practical knowledge that they have imparted me in my first three years of studying Botany is invaluable and highly appreciated. I appreciate Dr. Kadiri who was my institution-based supervisor for his support in my progress.

I acknowledge my supervisors at Department of Pharmacology, Therapeutics and Toxicology, College of Medicine, University of Lagos: Mr. Fashina, Mr Chijioke, Mrs Ogoh and the I.T students. These individuals all ensured that I received adequate knowledge during the industrial training.

Finally, my appreciation goes to my parents Mr and Mrs Toriola and my siblings. Thank you for your prayers, love, care and support at all times.

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SUMMARY OF STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME

I carried out my Student Industrial Work Experience Scheme (SIWES) programme at the DEPARTMENT OF PHARMACOLOGY, THERAPEUTICS AND TOXICOLOGY. College of Medicine, University of Lagos, Idi-araba, Lagos. I worked at the laboratory where series of experiments and practicals were carried out such as medicinal plants dissection, plant extraction, plant collection and preparation of herbarium specimens of different plants.

My SIWES programme lasted for a period of eight weeks. In the Department of Pharmacology, I worked in the Toxicology laboratory on various experiments.

At the laboratory, I learnt how some leaf extracts of some plants possess anti-inflammatory activity in albino rats when injected in various routes such as orally, intravenously and intramuscular routes.

I learnt how to prepare 10% formalin which is used for anti-inflammatory test to induce pain and also how to prepare 10% alcohol.

I learnt about phytochemical analysis which helps in discovering the bioactive profile of plants that have medicinal and therapeutic importance.

I also collected different plants which possess anti-inflammatory properties (*Peperomia pellucida*) and treatment of diseases (*Tridax procumbens*).

I learnt about preparation of herbarium specimens of different plants. Also, practiced drying of leaves in an oven and also crushing and grinding of dried specimens.

The SIWES programme afforded me the opportunity to put in practice some of the things I had learnt in my first three years of studying Botany and gave me more insight into the branch of Botany I am.

CHAPTER ONE

INTRODUCTION TO SIWES

1.1 DEFINITION, NATURE, AND SCOPE

SIWES is a mandatory skill acquisition programme designed to expose students to the industrial workplace/environment in their course of study.

It is a cooperative industrial internship programme that involves institutions of higher learning, in collaboration with the Federal government of Nigeria, the Industrial Training Fund (ITF), the Nigerian Universities commission (NUC) and the National Board for Technical Education (NBTE) and the National Commission for Colleges of Education, Nigeria.

It is designed to expose and prepare students of universities and other tertiary institutions for the industrial work situation they are likely to meet after graduation. The scheme exposes students of tertiary institutions to industry-based skills necessary for a smooth transition from the classroom to the world of work, affording them the opportunity to be familiarized and exposed to the needed experience in handling machinery and equipment which are usually not available in the educational institutions.

Participation in SIWES has become a necessary precondition for the award of diploma and degree certificates in specific disciplines in most institutions of higher learning in the country; in accordance to the education policy of the government i.e., it forms part of the approved minimum academic standards in these institutions.

1.2 HISTORY OF SIWES

SIWES was initiated in1973 by the Industrial Training Fund (ITF) to solve the problem of lack of adequate practical skills preparatory for employment in industries by Nigerian graduates of tertiary institutions.

It is a tripartite programme involving the students, the tertiary institutions (universities, polytechnics and colleges of education) and the industry. It is funded by the Federal government and jointly coordinated by the Industrial Training Fund, National Universities Commission (NUC), National Board for Technical Education (NBTE) and National Commission for Colleges of Education (NCCE).

It is an effort which was created in order to bridge the existing gap between the theory taught in the classroom and practice of science, engineering and other professional educational programmes in the Nigerian tertiary institutions.

OBJECTIVES OF SIWES

Specific objectives of the Federal government in its gazette of 1978 are as follows

- To expose students to work methods and techniques of handling equipment and machinery that may not be available in their universities.
- To enhance students' contact for later and thus make the transition from the university to the world of work easier.
- To enlist and strengthen employers in the process of preparing university graduates for employment in industries.
- To provide students with an opportunity/opportunities to apply their educational knowledge in real work situations thereby bridging the gap between theory and practice.
- Prepare students for a business career by merging their analytical power with self- reliance (information and guidelines from SIWES 2002)

RELEVANCE OF SIWES

Alabi 2009 asserts that the programme affords students the following opportunities

- To blend or relate theoretical knowledge acquired in the classroom with the practical application of the knowledge which is a realistic way of determining the relevance of theory to practice
- To develop and enhance personal attributes such as critical thinking, creativity, initiative, resourcefulness, leadership, time management, presentation skills and interpersonal skills
- To enhance students' contact with potential employers while on training.
- SIWES is a key factor on enhancing the efficiency and expertise of the workforce.

1.3 BRIEF HISTORY OF COLLEGE OF MEDICINE, UNIVERSITY OF LAGOS

The College of Medicine was conceived by the founding fathers as a Medical School which is an autonomous entity within the University of Lagos. It was founded to produce highly trained medical manpower to provide specialized medical services and to conduct research into health-related problems. In October 1962, the first batch of 28 medical students were admitted into the College and they received their first lectures on October 3, 1962.

Over the past 50 years, successive leadership of the College had worked tirelessly towards the realization of the lofty goals of making the Medical School the foremost College of Medicine located in the University of first Choice and the Nations pride. The College has grown remarkably.

1.3.1 RESEARCH AND COLLABORATION

The college is involved in research including research on HIV/AIDS, malaria, MDR Tuberculosis, Lassa fever and so on. It has a Central Research Laboratory (CRC) that serves as a research hub. It also has a research ethics committee which approves all research.

It has ongoing collaborations with WHO/TDR, CDC, Hospital for Tropical Diseases [HTD], Australia Army Malaria Institute, Foundation for Innovative New Diagnostics (FIND), Geneva,

Family Health International (FHI), Harvard/APINS and Volkswagen Stifung Foundation, Germany on issues relating to malaria, HIV/AIDS, Lassa fever, Tuberculosis and so on.

1.4 STRUCTURAL ORGANISATION OF COLLEGE OF MEDICINE, UNIVERSITY OF LAGOS

The college of medicine now has three faculties: Basic Medical Sciences, Clinical Sciences and Dental Sciences. The Faculty of Dental Sciences is today the center of Excellence for Dentistry in Nigeria. The College consists of 32 departments with a student population of almost 2000 students and a staff strength of 1,850. The College has to date produced over 6,000 graduates in disciplines of Medicine, Dentistry, Microbiology, Physiotherapy, Physiology, Radiography and Pharmacology where I had my industrial attachment.

VISION

"The vision of the College of Medicine is to be a Centre of global distinction in medical training, research, clinical services as well as character and service to humanity".

MISSION STATEMENT

To create a conducive environment for Learning, Research and Development of skills that

promote human health and prevent illness.

1.5 GENERAL SAFETY PRECAUTIONS

There are several guiding principles which must be observed to ensure proper functioning and efficiency of activities in the lab as well as safe guarding the person who works within it. They include:

1. Clean laboratory coat must be worn at all times within the lab and must be properly buttoned.
2. Protective hand gloves must be worn at appropriate times most especially when handling samples. They should be changed often and properly discarded immediately after completion of sample processing.
3. Covered shoes are to be worn at all times within the laboratory area to avoid spilling of chemical reagents, physical contact with broken bottles and other laboratory reagents on bare skin.

4. Shoe covers should be worn at appropriate times at the right places, removed and discarded at appropriate times.
5. There should be no smoking, eating, or drinking within the lab and in other food processing areas.
6. There should be no unnecessary chatting and talking should be kept to the barest minimum.
7. All long or flowing hair should be neatly packed up and hair net should be worn at all times.
8. Nose mask should be worn to prevent accidental inhalation.
9. The laboratory environment especially work surfaces must be thoroughly cleaned before and after working.

CHAPTER TWO

ANTI-INFLAMMATORY ACTIVITY OF LEAF EXTRACTS

2.1 WHAT ARE PLANTS EXTRACTS

Plant extract refers to a product that is formed through an extraction and separation process where plants are used as raw materials. There are also small amounts of liquid or oily plant extract products. According to process and intrinsic quality, plant extracts can be divided into simple extracts, quantitative extracts, standardized extracts, and purified extracts. Based on the product form, they are classified into solid extracts, liquid extracts, and soft extracts.

2.2 EXPERIENT ON ANTI-INFLAMMATORY PROPERTY OF LEAF EXTRACTS IN ALBINO RATS

Inflammation: This is a response of vascular tissues to harmful stimuli. It is a response of living tissues to injuries that leads to increase of plasmatic fluid and blood cells.

2.2.1 At the toxicology laboratory, experiment on the anti-inflammatory property of leaf extract of *Mitragyna stipulosa* was carried out.

MATERIALS

Plant leaves were collected in Kajola Oju Irin village Ondo state August 2015. It was collected by Professor Dr. Olowokudejo, a forestry expert of the department of Botany, Unilag, Akoka, Nigeria.

CLASSIFICATION OF LEAF COLLECTED

Kingdom: Plantae

Division; Magnoliophyta

Class: Magnoliopsida

Family: Rubiaceae

Genus: *Mitragyna*

Species: *stipulosa*

PREPARATION OF EXTRACT

Leaves were air dried for 7 days and pulverized. The powered crude drug(500g) was macerated with 70%ethanol and 30%distilled water for 72 hours.

Extract was filtered through a funnel covered with cotton wool and poured into a beaker. Filtrate was evaporated to dryness in an oven to prevent decomposition of natural metabolites.

METHOD

Doses of 50mg/kg, 100mg/kg and 200mg/kg leaf extract each was given via oral route to the animals

APPARATUS

Weighing balance

Vernier caliper

Distilled water

Reagent bottles

Cages

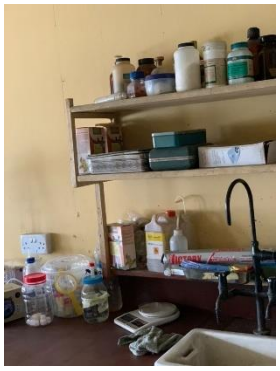
Sample bottles

CHEMICALS/ DRUGS

Carrageenan

Normal saline

Ethanol

A)  B)  C)  D) 

A) Weighing balance B) Reagent bottles C) Box cage D) Y maze cage.

ANALYSIS

Swiss albino mice were randomly distributed into groups and housed 5 per cage for a week before experiment. They were fed the standard rodent Peller diet and tap water. They did not receive food for 12 hours before the experiment.

Group 1: Saline(10ml/kg)

Group 2: Extract (50mg/kg)

Group 3: Extract (100mg/kg)

Group 4: Extract (200mg/kg)

Group 5: Aspirin 10mg/kg

All were administered orally with the use of an injection. Thirty minutes later, edema was induced by injection of carrageenan(0.1ml) into the right paw. The paw was measured with a vernier caliper. The paw was measured before injection of carrageenan.

PHYTOCHEMICAL SCREENING

TEST	INFERENCE
PHENOL	+
TERPENOIDS	-
SAPONINS	+
FLAVINOIDS	+
STEROIDS	-
ALKALOIDS	-
ANTHRAQUINONE	+
TANNIN	+
PHLOBATANIN	-

EFFECT OF LEAF EXTRACT

GROUP	DOSE	0hrs(mm)	1hr(mm)	2hrs(mm)	3hrs(mm)
CONTROL		1.77	3.90	3.99	3.95
EXTRACT	50	1.83	2.96	2.25	2.20
EXTRACT	100	1.86	3.50	3.30	3.25
EXTRACT	200	1.82	3.25	3.28	3.05
ASPIRIN	10	1.84	3,25	3.01	2.40

RESULT

Extract produced significant anti-inflammatory activity. The effect was more than that of the control group. Phytochemical analysis showed leaf extract had flavonoids, phenols, tannins, saponins, and anthraquinones.

CONCLUSION

Leaf extract of *Mitragyna stipulosa* was found to possess anti-inflammatory activity in carrageenan induced edema.

CHAPTER THREE

PHYTOCHEMICAL ANALYSIS

3.1 WHAT ARE PHYTOCHEMICAL ANALYSIS

This is the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds.

3.2 PHYTOCHEMICAL ANALYSIS OF GARLIC

The phytochemical screening of the Garlic for various phytochemical constituents was conducted using laboratory method.

3.2.1 PREPARATION OF EXTRACTS

The collected bulbs were washed with distilled water, air dried for two weeks and grounded into fine powder using sterile pestle and mortar under laboratory condition. Fifty (50) grams of the powder was mixed with 500ml of Distilled water and ethanol in a sterile conical flask separately and stand for 3 days with intermittent shaking. The mixtures were filtered using filter paper and concentrated in water bath at 70 °C for 3 hours. Each extract was kept in a sterile container and refrigerated at 4 °C for further experiment

3.2.2 QUALITATIVE PHYTOCHEMICAL SCREENING OF GARLIC

The qualitative phytochemical screening of *Allium sativum* aqueous and ethanol extracts indicated the presence of Alkaloid, terpenoids, flavonoids, steroid, phenol, Anthraquinones, saponin, tannin and glycoside.

3.2.3 QUANTITATIVE PHYTOCHEMICAL SCREENING OF GARLIC

The qualitative phytochemical screening of *Allium sativum* extracts shows that quantitatively, Alkaloid was found to be the abundant constituent making about 7.2 %, followed by Tannin and saponin constituting 4.8 % and 4.3 % respectively.

The results of the above study suggested that several phytochemicals are present in *Allium sativum* bulb extracts. Phytochemicals give plants their colour, flavour, smell and are part of a plant`s natural defense system and protect them against herbivorous insects and vertebrates, fungi, pathogens, and parasites. The phytochemicals saponin, flavonoid, tannin, reducing sugar, steroid, and terpenoid were present in *Allium sativum* extracts according to this study. The phytochemical content of the extract of *A. sativum* revealed that the Alkaloids was found to be the most abundant phytochemical (7.2 %) followed by tannin (4.8 %), saponin (4.3 %) and flavonoids (2.18 %). Based on the finding of this study, terpenoid is present in the both the extracts.

3.3 MEDICINAL AND THERAPEUTIC IMPORTANCE OF BIOACTIVE PROFILE IN GARLIC

1. **Terpenoids** have been found to be useful in the prevention and therapy of several diseases, including cancer. Terpenoids are also known to possess antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, anti-inflammatory and immunomodulatory properties.

2. **Flavonoids** are also present in the extracts as a potent water-soluble antioxidant and free radical scavenger, which prevent oxidative cell damage and also have strong anticancer activity. It also helps in managing diabetes induced oxidative stress.
   Steroids are important in pharmacy as they possess compounds like sex hormones and can be used for drug production.

3. **Tannin and saponin** are present in the extract. Saponins protect against hypercholesterolemia and antibiotics properties. In addition, it has been found that saponins have antitumor, antioxidant and anti-mutagenic activities and can lower the risk of human cancers by inhibiting the growth of cancer cells.

In conclusion, the presence of the phytochemicals has authenticated its usefulness by traditional herbalists in ethno medicine and potentials in drug formulation and development. In addition to that, the presence of nutrients proves why *A. sativum* bulb can be used as food supplement.

CHAPTER FOUR

4.1 ROUTES OF ADMINISTRATION OF DRUGS

Route of administration of drugs in pharmacology and toxicology is the path by which a drug, fluid is taken into the body. It was introduced in 1914.

4.2 DIFFERENT TYPES OF ROUTES OF ADMINISTRATION OF DRUGS

- **Intramuscularly (IM):** Drugs are administered in body muscles, including deltoid, dorsogluteal, ventrogluteal, rectus femoris, or vastus lateralis muscles. Although the dorsogluteal site, or the buttock's upper outer quadrant, is a common site chosen traditionally for intramuscular injections by healthcare professionals, it poses a potential risk of injury to the superior gluteal artery and sciatic nerve. On the other hand, the ventrogluteal site, or the anterior gluteal site, targets the gluteus medius muscle and avoids these potential complications.
- **Intravenously (IV):** is the most common parental route of medication administration and has the benefit of bypassing the first-pass metabolism by the liver. Given their superficial location on the skin, peripheral veins provide easy access to the circulatory system and are often utilized in the parenteral administration of medications. The upper extremity is usually the preferred site for intravenous medication as it has a lower incidence of thrombophlebitis and thrombosis than the lower limbs. The median basilic or cephalic veins of the arm or the metacarpal veins on the hand's dorsum are commonly used. In the lower extremity, the dorsal venous plexus of the foot can be used.
- **Orally:** Oral administration of drugs is a convenient, cost-effective, and most commonly used medication administration route. The primary site of drug absorption is usually the small intestine, and the bioavailability of the medication is influenced by the amount of drug absorbed across the intestinal epithelium. The first-pass effect is an important consideration for orally administered medications. It refers to the drug metabolism whereby the drug concentration is significantly diminished before it reaches the systemic circulation, often due to the metabolism at the liver.
- **Subcutaneously (SC):** Drugs are administered to the layer of skin referred to as cutis, just below the dermis and epidermis layers. Subcutaneous tissue has few blood vessels; therefore, the medications injected undergo absorption at a slow, sustained rate. Subcutaneous medication can be administered to various sites, including the upper arm's outer area, abdomen avoiding a 2-inch circle around the navel, the front of the thigh, upper back, or the upper area of the buttock behind the hip bone.
- **Intraperitoneally (IP):** Drugs are administered through the abdominal region.

Other routes of drug administration are through inhalation or vaginal routes.

CHAPTER FIVE

CONCLUSION

The SIWES programme which lasted for a period of eight (8) weeks afforded me the opportunity to understand better the theoretical principles I had learnt in my first three years of studying Botany, by putting them to practice.

At the department of Pharmacology, Therapeutics and Toxicology, I was exposed to the diverse ways the knowledge of Botany can be employed in the aspect of medicinal and therapeutic uses of leaf extracts of various plants.

I learnt how to prepare herbarium specimens, know about various routes of drug administration. I also learnt how to prepare formalin and alcohol.

I was able to make use of botanical laboratory apparatus that broadened my knowledge of the field.

Conclusively, the SIWES programme was educative and enriching. I look forward to practicing all that I had learnt in my fourth year and as a graduate in the nearest future.