# EVALUATION OF THE ANTI-STRESS, ANTI-DEPRESSANT AND ANXIOLYTIC PROPERTIES OF PARQUETINA (*Parquetina nigrescens* Afzel.) AND FIG TREE (*Ficus capensis* Thunb.) LEAF EXTRACTS

**BY**

**AKINDUKO, AYOKUNMI ADEBUKOLA**

**(B. Sc. Ilorin, M. Tech. Akure)**

**(BCH/99/3717)**

**A THESIS IN THE DEPARTMENT OF BIOCHEMISTRY, SCHOOL OF LIFE SCIENCES SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN APPLIED BIOCHEMISTRY OF THE FEDERAL UNIVERSITY OF TECHNOLOGY AKURE, NIGERIA**

**SEPTEMBER, 2021**

## ABSTRACT

Depression and anxiety disorders are frequent psychiatric conditions identified as the most common stress-related mood disorders causing disability and premature death. The global socioeconomic burdens and suffering resulting from mood disorders are of tremendous impact and concern in society. Due to adverse effects of current antidepressant and anxiolytic drugs, a number of medicinal plants are being exploited as safer and more efficient alternatives. This research was therefore designed to evaluate the antidepressant and anxiolytic properties of leaf extracts of *Parquetina nigrescens* (PN) and *Ficus capensis* (FC), using two models: Pentylenetetrazol-induced anxiety and chronic Forced Swim Stress (FSS). Phytochemical evaluation, HPLC and GC-MS analyses, and *in vitro* antioxidant activity of hydro-ethanolic and aqueous leaf extracts of *Parquetina nigrescens* (PNET and PNAQ) and *Ficus capensis* (FCET and FCAQ) were evaluated by standard protocols. The sedative effect of the hydro-ethanolic extracts of the two plants in male Wistar rats was evaluated using the Diazepam sleeping time test. Anxiety was induced in male Wistar rats with a single dose of Pentylenetetrazol (20 mg/kg) intraperitoneally with or without post treatment with PNET or FCET (100, 150 and 250 mg/kg) or standard drugs, diazepam (1 mg/kg) or imipramine (30 mg/kg) for 14 consecutive days. The rats were subjected to behavioral test models of open field (OFT), elevated plus-maze (EPM) and forced swim (FST), on days 1 and 14, to evaluate the antidepressant and anxiolytic activity of the extracts. The antidepressant and anxiolytic effect of the extracts were also evaluated on chronic Forced Swim Stressed rats, which were subjected to 1 h swim stress daily for 7 days. Oxidative stress markers were determined in the hepatic and cerebral homogenates. Serotonin, cortisol and brain-derived neurotrophic factor levels were determined using Enzyme-Linked Immunosorbent assay kits. The dopamine level and acetylcholinesterase activity were also estimated. Hematological parameters, serum lipid profile, and liver function tests were determined. Phytochemical investigation revealed the presence of

tannins, flavonoids, saponins, alkaloids, cardiac glycosides, anthraquinones, and terpenoids. HPLC analyses revealed the presence of phytochemicals (alkaloids, terpenoids and phenolic compounds) with mood modulatory properties. Isoquercitrin and chlorogenic acid, were higher in *Parquetina nigrescens,* while gallic acid, caffeic acid, rutin and quercetin, were higher in *Ficus capensis*. The extracts demonstrated high antioxidant capacity and radical scavenging ability *in vitro.* The extracts possess sleep-inducing properties. The duration of sleep was significantly ($p$<0.001) increased by the extracts. The extracts demonstrated antidepressant and anxiolytic potentials in the FST, OPM and EPM, and also ameliorated the anxiogenic and depressant behaviors induced by PTZ and Forced swim stress on the animals. The extracts demonstrated anti-inflammatory, antilipidemic, hepatoprotective, and anti-oxidative potentials in the two models used in this study. The extracts also demonstrated neurotransmitter modulatory ability by ameliorating the PTZ-induced and FSS-induced neurochemical dysfunction shown by alterations in the neurotransmitter levels, cortisol and BDNF levels, in both models. The acetylcholinesterase inhibitory activity and cortisol levels were significantly ($p$<0.05) reduced by the extracts compared with the induced and stressed groups. Likewise, the BDNF level was significantly ($p$<0.05) increased by the extracts compared with the induced and stressed groups. The results of this study indicates *Parquetina nigrescens* and *Ficus capensis* as good alternatives or drug adjuvants in the management of mood disorders, depression-like mental ailments and stress-related disorders, as well as management of aging and other degenerative diseases associated with the brain.

# CHAPTER ONE

## 1.0 INTRODUCTION

The incidence of various psychiatric disorders, especially depression and anxiety, has been on the increase, and mental health disorders are regarded as one of the major causes of disability worldwide (Aluh *et al.,* 2020). Psychiatric disorders affect one in five people (Charlson *et al.,* 2019). According to a World Health report, about 450 million people suffer from a mental or behavioral disorder (Silva and Sobarzo-Sanchez, 2019). Stress is a major factor in the etiopathogenesis of depression, anxiety and a host of other diseases (Nicolaides *et al*., 2015). Stress can disturb the normal physiological and psychological functions of an individual. In medical parlance "stress" is defined as a perturbation of the body's homeostasis. Extreme stress conditions, are detrimental to human health but in moderation stress is normal and, in many cases, proves useful. However, stress is usually associated with negative conditions. Depression and anxiety are now psychiatric disorders of global concern. These mood disorders or their comorbidity remain two of the most debilitating psychiatric diseases that can compromise human welfare (Fajemiroye *et al*., 2014). According to the World Health Organization (WHO), depression is expected to constitute the largest source of global burden of disease by the year 2030 (Greenwood *et al*., 2018). Depression is whole body illness which involves not only mood or emotion but also the physical body and thought process. Depression is a state of low mood and aversion to activity that can affect a person's thoughts, behavior, feelings and sense of well-being (Rosenbaum *et al.,* 2016). The symptoms of depression are intense feelings of sadness, hopelessness, and despair, as well as the inability to experience pleasure in usual activities, changes in sleep patterns and appetite, loss of energy, and suicidal thoughts (Ingram, 2016).