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# ANTIMALARIAL ACTIVE COMPONENTS OF *CYMBOPOGON CITRATUS AND GONGRONEMA LATIFOLIUM* LEAF CRUDE EXTRACT

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## ABSTRACT

Malaria is a potential deadly tropical disease and the most important of infectious diseases in the tropics and sub-tropics. The search for new antimalarial drugs has been necessitated by *P. falciparum* resistance to virtually all antimalarial drugs. In this study, the phytochemical compositions of leaf of *G. latifolium* and *C. citratus* were analyzed using phytochemical analysis. The bioactive compounds in the extract were evaluated. The results of the phytochemical investigation of *G. latifolium* and *C. citratus* indicates the presence of Saponins, carbohydrates, Tannins, Phenols, Flavonoids, Alkaloids, Triterpenoids and Cardiac Glycosides. The results of the study also show that *G. latifolium* possess a moderate antimalarial activity. Therefore, the extracts possess promising antimalarial activities which can be exploited for malaria therapy, and also justifies the traditional use of the plants in malaria treatment. Further work is suggested to synthesis and characterizes the active principles from these plants.

## INTRODUCTION

Malaria parasite is an infectious tropical disease caused by the protozoan parasites, *Plasmodium falciparum, Plasmodium ovale, Plasmodium malariae and Plasmodium vivax.* The disease is widely spread in the tropical and subtropical regions of the world and is transmitted by the female anopheles mosquito. World Health Organization (2016) report opined that, there were 212 million new cases of malaria worldwide in 2015 (range 148–304 million).

It is estimated that African Region accounted for most global cases of malaria (90%), followed by the South-East Asia Region (7%) and the Eastern Mediterranean Region (2%)

with estimated 235,000-639,000 deaths in 2015, mostly among children under five years and pregnant women (WHO, 2016).

In Nigeria, malaria the public health challenges faced by rural and also urban dwellers. It accounts for 25 % of under-five mortality, 30 % of childhood and 11 % of maternal mortality. About 50 % of the Nigerian population will have at least one episode of malaria annually while children below the age of five (about 24 million) will have two to four attacks annually (WHO, 2016). The economic cost of malaria in Nigeria can be as high as 1.3 % of economic growth per annum. This is largely due to rising cost of treatment, loss of productivity and earning due to days lost from illness (WHO, 2016).

From decades, medicinal plants have been used as a source of medicine in virtually all cultures (Hoareau & Dasilva, 1999). In Africa, medicinal plants extract are still widely used in the treatment of many ailments including malaria and about 80 % of African population use traditional medicine for primary health care (WHO, 2002-2005). Several medicinal plants have been used in different part of the world for the treatment of malaria. For example, quinine extracted from the back of cinchona tree was used as an antimalarial agent as far back as 1632 (Amusan *et al.,* 1996). And this was later developed as antimalarial agents in form of primaquine, quinacrine, chloroquine and other quinine family of drugs (Duker-Eshun *et al.,* 2004).

There is increased and widespread resistance of the malarial parasites especially *P. falciparum* (the major etiological agent for human malaria) to the current standard malaria treatment drugs (WHO, 2016). However, there is urgent need for the development of new novel drugs for the treatment of malaria. This is couple with the fact that most medicinal plants currently used for the treatment of malaria have little scientific data to validate their claimed antimalarial activity (Hoareau & Dasilva, 1999). So, investigation of their antimalarial property is important in order to establish their efficacy as well as their potential as sources of new antimalarial drugs.

## MATERIALS AND METHODS

### COLLECTION OF EXPERIMENTAL PLANTS

Fresh leaves of *Cymbopogon citratus* and *G. latofolium* were obtained separately from the farm of the ACEPRD University of Jos. Collected plants were identified by a taxonomist at the Department of Botany and Biotechnology, University Jos.

**PREPARATION OF LEAVES FOR CRUDE EXTRACTION**

The preparation of the crude extract was carried out at the Department of Pharmacognosy and Ethnomedicine, Faculty of Pharmaceutical Sciences, Usmanu Danfodiyo University Sokoto. Collected leaves of the plants were washed off dirt and air dried under shade at room temperature. The dried leaves were made into powder using the laboratory grinder.

**CRUDE EXTRACTION OF THE COLLECTED LEAVES**

Using the maceration protocol described by Pandey & Tripathi (2014) 45.20g and 5.07g of *C. citratus* and *G. latifolium* of the powdered leaves respectively were extracted with 95% ethanol and distilled water.

**PHYTOCHEMICAL SCREENING OF THE CRUDE EXTRACT**

The phytochemical screening (qualitative determination) of the bioactive ingredients of the plant extracts were determined using standard conventional protocols described by Pandey & Tripathi (2014) for detecting the major components.

**STATISTICAL ANALYSIS**

Data are expressed as mean ± SEM. The student t-test was used to statistically analyze the data and values of $P \leq 0.05$ were considered significant.



**RESULTS**

**Phytochemical Analysis**

The experimental studies on phytochemical analysis and antiplasmodial testing started in 2019. The major aim was to scientifically verify the benefits of two Nigerian medicinal plants *Cymbopogon citratus* and *Gongronema latifolium* for it use by TMPs in malaria treatment by evaluating their efficacy against the *Plasmodium falciparum* parasite. The inventory of new medicinal plants helps in the development of new phytomedicines in malaria treatment.

The phytochemical screening of these medicinal plants showed the presence of saponins, carbohydrates, tannins, phenols, flavonoids, alkaloids, triterpenoids and cardiac glycosides in the extracts of *Gongronema latifolium* (Table 1).

## Yield of Extracts

Yield of extracts of *Cymbopogon citratus* and *Gongronema latifolium* are presented in Table 2 and it shows crude extract and solvent extraction of experimental plants. Water solvent yielded more of extracts than ethanol in both plants.

**Table 1**

The Major Phytochemicals Presents in the Extract of the selected Plants

| Plant species | Extract | %Yield | Major Phytochemical Constituents | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | SAP | CAB | TAN | PHE | FLA | ALK | TRI | CAG |
| *Cymbopogon citratus* | Et | 4.77 | +++ | + | - | +++ | +++ | ++ | ++ | ++ |
| | Wt | 12.22 | +++ | +++ | +++ | +++ | +++ | - | ++ | +++ |
| *Gongronema latifolium* | Et | 10.98 | - | + | - | +++ | +++ | +++ | +++ | ++ |
| | Wt | 24.72 | +++ | +++ | ++ | +++ | +++ | +++ | - | +++ |

**Key:** Percentage yield is calculated from the formula, %yield = Weight of crude extract (g)/Weight of the sample powder (g) x 100%
Negative, -
Mild positive, ++
Positive, +++
Highly positive, +++

SAP=SAPONINS, CAB=CARBOHYDRATE, TAN=TANNINS, PHE=PHENOL, FLA=FLAVONOIDS, ALK=ALKALOIDS, TRI=TRITERPENOIDS, CAG=CARDIAC GLYCOSIDES
Et= Ethanol
Wt= Water

**Table 2**

Yield of Extracts of *Cymbopogon citratus* and *Gongronema latifolium*

| Plant | Solvent | Weight of plant (g) | Weight of solvent (g) | Yield (%) |
|---|---|---|---|---|
| *Cymbopogon citratus* | Aqueous | 23.0 | 2.81 | 12.22 |
| | Ethanol | 22.0 | 1.05 | 4.77 |
| *Gongronema latifolium* | Aqueous | 26.5 | 6.55 | 24.72 |
| | Ethanol | 26.5 | 2.90 | 10.98 |

**Key:** Percentage yield is calculated from the formula, %yield = Weight of crude extract (g)/Weight of the sample powder (g) x 100%

**DISCUSSION**

Phytomedicinal plant is any plant in which, one or more of its organs, contains substances that can be used for therapeutic purpose of which are precursors for the synthesis of useful drugs. The crude extracts or purified form of plant has been used as medicines and cosmetics (Sofowora, 1993). The medicinal value of these plants lies in bioactive phytochemical constituents that produce definite physiological action on the human body (Akinmoladun *et al.,* 2007).

In this present study of *Cymbopogon citratus and Gongronema latofolium*, the phytochemical investigation indicates the presence of Saponins, carbohydrates, Tannins, Phenols, Flavonoids, Alkaloids, Triterpenoids and Cardiac Glycosides. This is in agreement with the work done by (Abbas *et al.,* 2017), (Ekpo and Ekanemesang, 2016) in Sokoto and Calabar respectively. These classes of compounds especially alkaloids and saponins, are known to have curative activity against several pathogens (Usman *et al.,* 2009).

The presence of alkaloids in *C. citratus and G. latofolium*, extract in this study shows the potential of the extract to have an analgesic, anti-inflammatory and adaptogenic effects, which help the host (man and animal) to develop resistance against disease and endurance against stress (Gupta, 1994).

Saponins are steroid or triterpenoid glycosides characterized by their bitter or astringent taste, foaming properties and their haemolytic effect on red blood cells. Saponins possess both beneficial (cholesterol-lowering) and deleterious (cytotoxic permeabilization of the intestine) properties and also exhibit structure dependent biological activities (Osagie and Eka, 1998). Saponins cause a reduction of blood cholesterol by preventing its reabsorption (Prohp and Onoagbe, 2012).

Flavonoids are compounds with a widespread occurrence in the plant kingdom which have also been detected in *Artemisia* species*.* They are reported to have exhibited significant *in vitro* antimalarial activity against *P. falciparum*.

With the developments of resistance of *Plasmodium* species to most antimalarial drugs has led to the development of new phytomedicinal drugs for the treatment of malaria. *Cymbopogon citratus* and *Gongronema latifolium* are two such plants which are traditionally used for the treatment of malaria in Nigeria, but for which there are no scientific proof of their efficacies. The results of the present study revealed that *C. citratus* and *G. latifolium* exhibited moderate antimalarial activity against *P. falciparum* isolates *in vitro*. Similarly, Abbas *et al.,* (2017) reported that the two plants have been traditionally claimed to relieve fever and cure malaria. This study provides a scientific evidence for the claims.



**CONCLUSION**

The results of this study have shown that *Cymbopogon citratus and Gongronema latofolium*, the phytochemical investigation indicates the presence of Saponins, carbohydrates, Tannins, Phenols, Flavonoids, Alkaloids, Triterpenoids and Cardiac Glycosides. This result justifies the use of medicinal plants the treatment of malaria. Further work is suggested to synthesis and characterizes the active principles from these plants.

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