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Prophylactic Antimalarial Agents from Ochna kibbiensis Leaf Isolation and Characterization

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Introduction

The parasites that cause malaria are deadly and spread to humans through the bites of female Anopheles mosquitoes that have the disease. The World Malaria Report estimates that there will be 241 million cases of malaria in 2020 with an estimated mortality of 627,000, up from 227 million cases in 2019 and an increase of over 69,000 deaths caused by disruptions during the COVID-19 pandemic and a recent change in WHO's methodology for calculating malaria mortality. Over half of all malaria deaths globally occurred in four African nations: Nigeria (31.9%), the Democratic Republic of the Congo (13.2%), the United Republic of Tanzania (4.1%) and Mozambique (3.8%). In Africa, 80% of malaria deaths were in children under the age of five. Annually, an estimated 50 million tourists travel to regions where malaria is endemic, while 30,000 cases of malaria are reported in industrialised nations that are not malaria-endemic. The United Kingdom, France, Italy and Germany account for over 70% of imported malaria fatalities in Europe, which is still a major public health concern. Malaria can be avoided with a vaccine, personal precautions and chemotherapy. Despite the rumours of fresh evidence, the development of a malaria vaccine is not imminent. Although it is a useful technique, personal defense is frequently insufficient to prevent malaria, hence the main line of defense is still chemoprophylaxis [1].

Description

It is crucial to perform toxicity tests in order to assess the potential negative side effects of these products because a significant portion (>80%) of the world's population frequently uses medicinal plants as remedies without knowing how toxic they are. Due to their reputation as safe alternatives to conventional medications with few to no side effects, the usage of these natural remedies has surged. Therefore, an acute toxicity test was performed on OK to determine its median lethal dose (LD50), and the results showed that the plant is generally acceptable and safe [2].

Significant (p 0.05) activity was seen in the methanol leaf extract of OK and its fractions, which was equivalent to pyrimethamine in the prophylaxis experiment. The dichloromethane fraction of DFL was shown to have the strongest antimalarial activity in comparison to the other extracts and fractions investigated. DFL displayed a very significant preventive antimalarial effect against. Saturation at the active sites, the action of other endogenous chemicals in the body, or activity on other bodily organs of the experimental animals may all be factors in a fall in the preventive effectiveness of MLE and HFL of OK at the middle dose (250 mg/kg). Furthermore, as this study amply demonstrated, increasing the dose of BFL will result in a reduction in the preventive effect.

The extracts of OK may have cytotoxic effects on the parasites directly or indirectly by limiting their ability to multiply. They may also work by altering the erythrocyte membrane characteristics to stop parasite invasion. Pyrimethamine works by impeding the dihydrofolate reductase in plasmodia, which then prevents the biosynthesis of purines and pyrimidines, which are necessary for DNA synthesis and cell division. This results in a failure of nuclear division at the time of schizont formation in erythrocytes and the liver. Prophylactic antimalarial often function by either preventing the emergence of asexual blood stages of the parasite or by reducing the initial growth of malaria parasites in the liver (casual action) [3].

Using Lorke's approach, the median lethal dosage (LD50) of MLE of OK, its n-hexane, dichloromethane, ethylacetate, and n-butane fractions was calculated. Two phases of the investigation were separated. In the first phase, nine mice were split into three groups of three mice each. The extract and fraction were given separately to Groups 1, 2, and 3 at doses of 10, 100, and 1000 mg/kg. Each treatment group received therapy, which was administered intraperitoneally, based on the findings of the first phase [4,5].

Conclusion

Based on the LD50 values discovered, it was determined that leaves were generally safe, and the plant has shown considerable antimalarial activity with preventive effects at the graded doses used in this investigation. Additionally, Stigmasterol and -Sitosterol were combined and extracted. These substances had positive in silico pharmacokinetic profiles and good binding affinities against *P. falciparum* lactate dehydrogenase. As a result, these chemicals may have contributed to the observed effect in part.

Utilising silica gel 60 GF254 precoated aluminium sheets, Thin-Layer Chromatography (TLC) was performed. LOBA Cheme silica gel (60-200 mesh) was used for the column chromatography. Spraying 10% H2SO4 on TLC plates and then heating them for 10 minutes at 105 °C allowed for the visualisation of the spots. On electro thermal melting point equipment, the melting point was determined. Using a residual solvent as the internal standard, NMR data were collected using a Bruker AVANCE spectrometer (600 MHz). Antimalarial drugs have been developed as agents for dual indications (treatment and prophylaxis). There are at least three prophylaxis strategies of administration that have been utilized; the most common strategy is the administration of casual or suppressive drugs at efficacious prophylaxis doses throughout the period of exposure to malaria which must be continuous, a post-exposure part regime which is required to prevent subsequent relapse and an alternative approach called ‘fire and forget’ prophylaxis, or ‘pre-exposure prophylaxis’, in which travelers are given a single dose or short course regime of a long half-life drug at a treatment dose that will protect them throughout the duration of exposure. However, this approach is currently unproven in clinical practice and no drug for malaria prevention is adequate and effective in all respects. Thus, there is a need to search and develop new prophylactic antimalarial drugs.

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