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**PHYTOCHEMICAL COMPOSITION, *IN VITRO* ANTIMICROBIAL
ACTIVITY, AND CYTOTOXICITY OF ESSENTIAL OILS OF *Ocimum
gratissimum*, *Ocimum kilimandscharicum* AND *Lippia javanica*.**

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*Phytochemical composition,
in vitro antimicrobial*



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DECLARATION

I, Samoei Chemutai Judith, declare that the work presented in this thesis is my original work and has not been submitted for a degree or any other award in any other university or any other institution

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ABSTRACT

Antimicrobial resistance to available conventional drugs because of their misuse in treatment and the evolution of multidrug-resistant organisms has been increasingly reported around the world and is one of the leading causes of infectious disease treatment failure, increased health care costs, and human deaths. Plants, especially those with secondary metabolites, may be used to reduce this problem. Science is taking this new direction in manufacturing pharmaceutical drugs for the cure of various microbial infections. This study focused on plants such as *O. gratissimum*, *O. kilimandscharicum*, and *L. javanica* to determine the chemical composition, antimicrobial effectiveness, and cytotoxicity of plants essential oils. The aerial parts of the three plants were cut into small pieces and then hydro distilled using modified Clevenger to obtain essential oils. The phytochemical constituents were assayed by means of GC-MS. The antimicrobial effectiveness of the essential oils was tested against eight pathogenic microorganisms such as *Candida albicans* (ATCC 90018), *Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922), *Candida albicans* (ATCC 90030), *Candida parapsilosis* (ATCC 90018), and clinically isolated species of *Candida albicans*, *Candida lusitanae*, and *Trichophyton mentagrophytes*. The standard *in vitro* assay methods were used, and they included agar disc diffusion and broth micro-dilution with chloramphenicol and fluconazole as positive controls. The essential oils were screened for *in vitro* cytotoxicity against MDCK cell lines, using the MTT assay with eight different concentrations (3.9–500 mg/ml). Measurements were performed, and the concentration required for a 50% inhibition of viability (IC_{50}) was determined graphically. Data were processed with one-way ANOVA and calculated as the mean and standard error of the mean. In general, *O. kilimandscharicum* essential oil had the highest inhibitory activities, producing the largest inhibition zones in fungal and bacterial pathogens. The largest inhibition zone (32.000 ± 0.000 mm) was obtained by *O. kilimandscharicum* essential oil against *C. albicans* ATCC 90030, and this could be due to a wide range of phytochemicals. *Candida lusitanae* clinical isolate and *C. albicans* ATCC 90030 were the most sensitive fungi to the essential oils. *Escherichia coli* ATCC 25922 was the most sensitive bacterium to the essential oils. Antimicrobial properties of chloramphenicol and fluconazole were significantly greater in comparison to plant essential oils ($p < 0.05$), while 5 % DMSO was inactive against all the tested microorganisms. Minimum bactericidal concentration (MBC) and minimum fungicidal concentrations values were greater than minimum inhibitory concentration (MIC) values. The essential oils of *O. kilimandscharicum* against *C. albicans* (ATCC 90018) and *O. gratissimum* against *C. parapsilosis* (ATCC 90018) had the same MIC and MFC values of 5.21 ± 2.26 and 500 ± 0.00 mg/ml, respectively. The essential oils' antimicrobial activity was found to be lower than the reference drugs chloramphenicol and fluconazole. In the MTT assay, *L. javanica* ($IC_{50} = 0.0198$ mg/ml) was considered to be moderately toxic because it recorded a CV below 50%, while *O. kilimandscharicum* and *O. gratissimum* are considered to be safe because they recorded a CV that was above 50%. They had IC_{50} s of 8.0505 mg/ml and 2.2267 mg/ml, respectively. These essential oils had low toxicity against MDCK cells (CV above 50%), suggesting they could be safe as antimicrobials. The results provide support for the use of essential oils to treat microbial infections and could be used as pharmaceuticals.