UNIVERSITY OF NAIROBI

PHYTOCHEMICAL INVESTIGATION OF *ERYTHRINA SACLEUXII* FOR ANTIMICROBIAL PRINCIPLES

BY

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DECLARATION

I declare that this thesis is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.

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ABSTRACT

The ever increasing problem of antibiotic resistance around the world has led to a pressing need to develop new therapeutic agents. Secondary metabolites of higher plants have a potential of providing a new source of antimicrobial agents with possibly novel mechanisms of action. This has inspired many scientific researchers and pharmaceutical companies to prospect for new biologically active compounds from natural products. *Erythrina* species have been reported to produce many secondary metabolites, some of which produce antimicrobial principles against pathogenic fungi and bacteria. Hence in this study *Erythrina sacleuxii* has been investigated for antimicrobial principles.

The air-dried and ground root wood, root bark and stem bark of *Erythrina sacleuxii* were separately extracted with CH_2Cl_2-MeOH (1:1) by cold percolation. All the crude extracts showed antimicrobial activity against *Staphylococcus aureus* while the root bark extract also showed antifungal activity against *Candida albicans.*

The crude extracts were subjected to chromatographic separation which led to isolation of a steroid [stigmasterol (**150**)], a flavanone [abyssinone V 4'-*O*-methyl ether (**35**)], six isoflavones [erysubin F (**73**), 7-demethylrobustigenin (**76**), 3'-prenylbiochanin A (**77**), genistein (**89**), daidzein (1**51**) and parvisoflavone (1**52**)] and two pterocarpans [erythrabyssin II (**107**) and shinpterocarpin (**123**)]. The structures of these compounds were elucidated by a combination of spectroscopic methods including ^{1}H and ^{13}C NMR, H,H-COSY, HSQC, HMBC, NOESY, LCMS, EIMS, OR and CD. Among the isolated compounds, compound **152** is being reported for the first time in the genus *Erythrina*.

Compounds **77**, **89** and **151** showed antimicrobial activity against *Staphylococcus aureus*, **107** and **152** were active against *Staphylococcus aureus* and *Shigella* species while **123** was active against *Staphylococcus aureus*, *Shigella* species and *Candida albicans.* Compound **123** was the most active with a MIC value of 24.3 µg/disc against *S. aureus*, and could serve as a lead compound for discovery of new antimicrobial agents.

Hydrogenation of compound **35** was carried out to give tetrahydroabyssinone V 4'-*O*-methyl ether (**153**). The antimicrobial activity of both **35** and **153** was tested, but no activity was observed for both up to a concentration of 164 µg/disc. Nitration and mannich base reaction of compound **123** gave 8-nitroshinpterocarpin (**154**) and 8-(*N,N*-dimethylaminomethyl)shinpterocarpin (**155**). Reaction of compound **77** with hydrazine hydrate gave 3-(2,6-dihydroxyphenyl)-4-(4-methoxy-3-

prenylphenyl)-1*H*-pyrazole (**156**). Compound **155** exhibited good antimicrobial activity with MIC values of 45 90, 45 and 22.5 µg/disc against *S. aureus*, *A. flavus*, *A. niger* and *C. neoformans* respectively. However, nitration of shipterocarpin drastically reduced its activity. The pyrazole derivative (**156**) was also not active against the tested microorganisms. Compounds **154**, **155** and **156** are being reported for the first time.