CHARACTERIZATION OF ELEMENTAL DENSITIES OF SELECTED HERBAL HAEMATINICS AND ANTIACIDS USED IN THE MASAI REGION OF KENYA.

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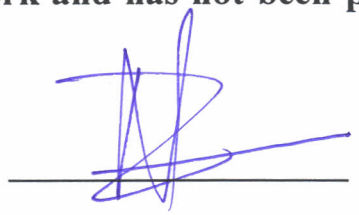
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.



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ABSTRACT

The study was carried out to determine the concentrations of the elements in the medicinal samples used for treating anemia and acidity. Also determined was the amount of the elements "bio-available" at the human para physiological conditions in the gastro-intestinal tract. Phytochemical profiles of some of the medicinal plant species were also carried out. An exploration of some aspects of toxicity was incorporated in this study.

Ten species of medicinal herb samples were obtained from Narok, ten from Kajiado central and ten from Kajiado North. Five samples were bought from herbal clinics and ten samples from town centers (medicine hawkers). Corresponding ten (10) conventional drugs from pharmaceutical producers were purchased from chemists in Nairobi city. The total number of samples analyzed were 79 (n=79).

The plant species and the medicinal samples screened contained varying phyto-chemicals; among them were alkaloids that are essential in combating various disease maladies. They were observed in in *Ormocarpum tricocapum Euphorbia hirta, Strychnos henningsi, Asystasia gengitica, and Dombeya kirki*; Flavonoids were observed in *Euphorbia hirta, Senna dydymomtrya, and Urtica massaica*. Another group which was observed were quinines in *Senna siguena*, *Senna dydymomtrya and Warbugia ugadensis.* Some toxic products like cardiac glycosides and those that interact negatively with essential trace elements like the tannins were observed in *Rhoicissus trindetata*, Senna *siguena*, *Asystasia gengitica*, *Urtica massaica Acacia nilotica*, *and Vigna ungulata.*

All plant extracts showed no adverse effects during toxicity tests on mice and rats at doses ten times higher/above those usually administered to humans by the traditional doctors. However some

extracts of the plants showed antimicrobial activity. These were; *urtica massaica, Zathoxylum chalybeum, Senna dydymomtrya and Warbugia ugadensis. Also* extracts of *Zanthoxylum chalybeum and Warbugia ugadensis* exhibited antifungal activities.

The results of EDXRF characterization show high-density profiles for major elements' densities of the medicinal samples used for anti-acidity. The values of major element densities for commercial medicines range from 4413 ± *485* µg/g in *Relcer to 190001*± *1025* µg/g in *Actal* while the concentration in herbal medicines were; 95292 ± *24 6* µg/g in SHIN, 91029 ± *12455* µg/g in NMN (sample from market) 85237.5 ± *1475* µg/g in *Hypoestasis forskali*, 83783 ± *2510* µg/g in *Senna singuena*, 75581 ± *2345* µg/g in *Carissa edulis* and 24592 ± *4589* µg/g in NMN1 a medicinal sample from the market. The trace elements density for these medicinal samples varied as 9511 ± *895* µg/g in KMK8 (herbal medicine obtained from the market) and 8510±*235*µg/g in *Vigna ungulculaia* and 468± *10* µg/g in *NMN9 (*sample from the market).

Major element density profiles for commercial haematinics ranged from 5959± *985* µg/g in *FESS* to 123748 ± *456* µg/g in *AAIN* and their trace elements density averaged about 209774.2 ± *1245* µg/. The trace element densities for herbal haematinics ranged from, 680 ± *72* µg/g in NMN1, 5619± *235* µg/g in KLBK to 9099 ± *784* µg/g in ADK

The *in vitro* accessible elements' percentages ranged from 0.5 % for Pb in *Zathoxylum chalybeu* to 30 % for K in *Acacia nilotica* with a mean of 10%. The percentage soluble trace elements ranged from 10.8 to 22.9%. Citric acid content in the samples ranged from 51.3 ± 10 µg/g in *Strichnos heningsii* to 199.2 ± 22 µg/g in *Physalis sativa*. Phenolic compounds varied widely in the analyzed species. Total phenolics ranged from 2.51 ± 0.02 in *Strichnos henninsii* to 48.4 ± 5 in *Rhoicissus tridentata*, catechols concentrations ranged from 1.38 ± 0.02 in *Strichnos henningsii* to 14.51±4 in

Rhoicissus tridentata and resorcinols from 1.04 ± 0.01 in *Strichnos henningsii* to 16.8 ± 2 in *Physalis sativa* mg catechin equivalents/g sample. Galloyls were found in lower amounts ranging from 0.1 ± 0.001 in *Strichnos henningsii* to 26.3± 4 mg tannic acid equivalents/g in *Acacia nilotica*. *Rhoicissus tridentata* showed the highest amount of total phenolics as well as phenolic groups and *Strichnos henningsii* contained the least. The phytate content ranged from 1.38 ± 0.02 in *Strichnos henningsii* to 15.0 ± 1.6 mg/g in *Acacia nilotica* sample.

The plant materials used for anemic conditions including Adenia *gummifera, Rhoisicus tridenata, Urtica maasica, Physalis sativa, Zanthoxylum chalybeum, Acacia nilotica* were established as attractive candidates for commercialization. Attractive attributes include, among others, the high concentrations of trace elements and/or other essential ingredients suitable for anemic conditions remedy. They also contain other compounds that boost the trace element absorption/bioavailability. Notable examples include the presence of vitamin C in *Acacia nilotica* and *Urtica massaica*, citric acid in *Physalis sativa* and *Zanthoxylum chalybeum* which are iron absorption boosters. The presence of active phytochemicals like flavonoids in *Zanthoxylum chalybeum* would be indicative of disease remedial potential. This medicinal plant potential for treatment of malaria accompanied with anemia symptoms should be further investigated. These species should be investigated for possible utilization in the therapeutic industry.