

Biological Activities and Chemical Constituents of Plants used for Herbal Medicine in Kenya

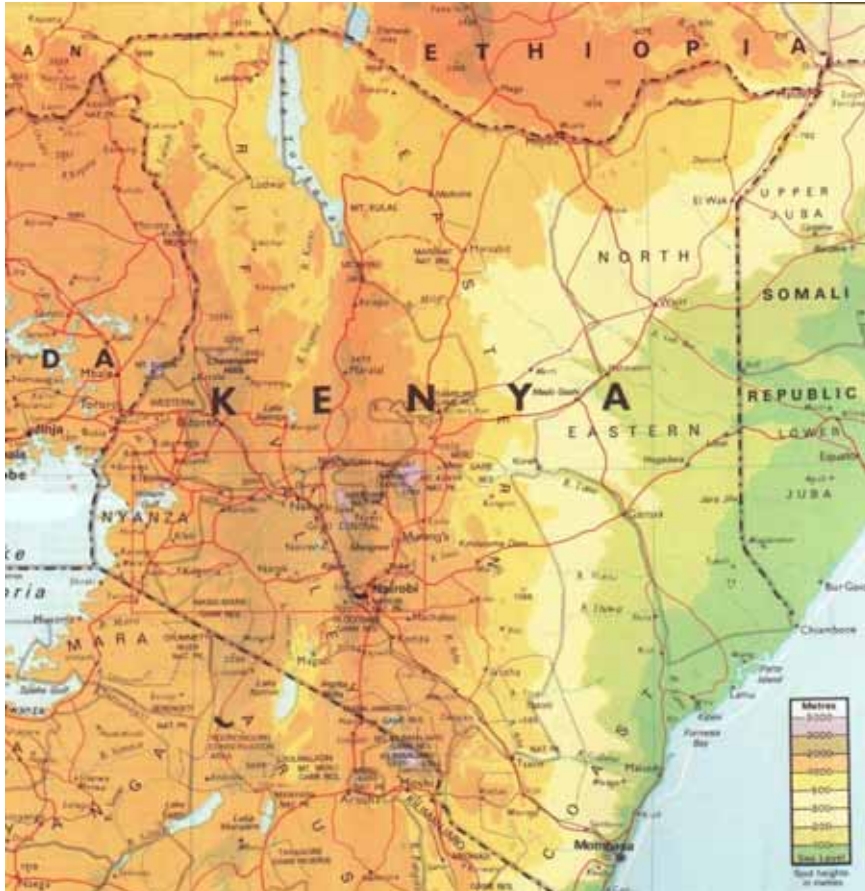
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Socio-economic and health status



- Population: 35 million
- >56 % live below poverty line
- Life expectancy 51 years
- Malaria, HIV/AIDS, TB, ARIs, Diarrhoea
- One conventional doctor to about 40,000 people
- One traditional doctor to about 500 people
- Accessibility, affordability of healthcare
- 80% Use TMs

Types of Herbal Medicine in Kenya



Gaps in Herbal Medicine

- Unvalidated claims on pharmacological activities
- Active constituents not known
- Little information for herbalists, doctors, patients, government departments
- Practices lack quality standards

Role of researchers

- Advancing scientific knowledge on natural products
- Strengthening herbal medicine practice
- Contributing to quality control of herbal medicines
- Rationalizing herbal medical practice
- Contributing to regulation of herbal medicines

Overview of work at UoN

Ethnomedical approach

- Biological activity
 - Pharmacological
 - Antimicrobial
 - Antimalarial
 - Antitheileria
 - Antitrypanosomal
 - Anthelmintic
 - Toxicological
- Isolation and characterization
 - Plant extracts
 - Essential oils
- Other
 - Information centre
 - Community participation
 - Regulatory support

Pharmacological effects

(Department of Pharmacology and Pharmacognosy)

Using isolated tissues or small animals

- Cardiovascular system
- Respiratory system
- Gastrointestinal system
- Uterus
- Ulcers
- Diuretic effects
- Antidiabetic effects

Mupal®



- Banana parts and spices
- Hyperacidity and ulcers
- Studies on mice show activity
- Case studies on patients show efficacy
- No observed adverse effect

Antimicrobial activity

(Pharmaceutical Chemistry Department)

Plant	<i>Staphylococcus aureus</i>	<i>Bacillus pumilus</i>	<i>Escherichia coli</i>	<i>Candida albicans</i>	<i>Aspergillus niger</i>
<i>Conyza sumatrensis</i>	-	+++	+++	ND	ND
<i>Combretum fragrans</i>	++	++	+++	+++	ND
<i>Carrisa edulis</i>	+	+++	+++	+++	ND
<i>Sida cuneifolia</i>	++	+++	+++	+	ND
<i>Lanea stuhlmanii</i>	++	++	+	+++	ND
<i>Rhoicissus revoilif</i>	+	+	+	++	ND
<i>Plumbago zeylanica</i>	-	++	-	+++	ND
<i>Girardinia diversifolia</i>	++	++	++	+++	++

Antimicrobial activity

(Pharmaceutical Chemistry Department)

Plant	<i>Staphylococcus aureus</i>	<i>Bacillus pumilus</i>
<i>Fuerstia africana</i>	+	+
<i>Blumea perrotetiana</i>	++	+
<i>Cassia mimosoides</i>	+++	+
<i>Physalis peruviana</i>	+	+
<i>Sphilanthes mauritiana</i>	+	+
<i>Lantana trifolia</i>	+++	+
<i>Alectra sessiflora</i>	++	+
Standards: Chloramphenicol, Nystatin + : 0-14 mm ++: 14.1 – 18 mm +++: 18.1 – 27 mm		

Antimalarial activity

(Pharmaceutical Chemistry Department)

Plant	Extract/Isolate	IC ₅₀ (µg/ml)
<i>Ajuga remota</i> (aerial parts)	Ajugarin I Ergosterol-5,8-endoperoxide	23 (CQS) 8.8 (CQS)
<i>Toddalia asiatica</i> (roots)	Methanol extract Coumarin derivative	2.2 (CQS) 16.2 (CQS)
<i>Toddalia asiatica</i> (roots)	Methanol extract Coumarin derivative	1.8 (MDR) 8.8 (MDR)
Plant A (Ongoing work)	Methanol extract Isolate	25.1 (CQR) 25.1 (CQR)
Plant A (Ongoing work)	Methanol extract Isolate	8.9 (MDR) 0.39 (CQS)
CQS –Chloroquine sensitive (D6) <i>Plasmodium falciparum</i> CQR - Chloroquine resistant (W2) <i>Plasmodium falciparum</i> MDR – Multidrug resistant (V1/S) <i>Plasmodium falciparum</i>		

Erythrina abyssinica

(Chemistry Department)



Extract/Isolate	IC ₅₀
Stem bark	7.9 µg/ml (CQS)
Root bark	0.6 µg/ml (CQS)
Abyssinin III	5.8 µM (CQS)
Sigmoidine A	5.8 µM(CQS)
Stem bark	5.3 µg/ml (CQR)
Root bark	0.5 µg/ml (CQR)
Abyssinin III	5.2 µM (CQR)
Sigmoidine A	5.9 µM (CQR)

Erythrina sacleuxii

(Chemistry Department)



Extract/Isolate	IC ₅₀
Stem bark	3.8 µg/ml (CQS)
Root bark	2.2 µg/ml (CQS)
5'-Prenylpratensein	6.3 µM (CQS)
Erysubin F	4.5 µM(CQS)
Stem bark	6.3 µg/ml (CQR)
Root bark	1.3 µg/ml (CQR)
5'-Prenylpratensein	8.7 µM (CQR)
Erysubin F	8.9 µM (CQR)

Antitrypanosomal activity

(Pharmaceutical Chemistry Department,
Veterinary Microbiology, Parasitology and Pathology Department and ILRI)

Plant	Activity	Plant	Activity
Plant B (On-going)	++++	<i>Olea europea spp africana</i>	++
Plant C (On-going)	+++	<i>Olinia rochetiana</i>	++
Plant D (On-going)	++++	<i>Prunus africana</i>	++
Plant E (On-going)	+++	<i>Rhamnus prinoides</i>	+
<i>Clerodendron myricoides</i>	++	<i>Aloe spp</i>	+
+++++: LD ₅₀ <10 µg/ml +++: LD ₅₀ 10.1-100 µg/ml ++: LD ₅₀ 100.1-500 µg/ml +: LD ₅₀ 500.1-1000 µg/ml against TB ILTAT 1.1. Standard drug = Berenil (LD ₅₀ = 0.31)			

Antitheilerial activity

(Pharmaceutical Chemistry Department,
Veterinary Microbiology, Parasitology and Pathology Department and ILRI)

- *Theileria parva*
- More than 20 plants screened
- One plant showed high activity.
- Other biological activities of the plant include antimalarial and antitrypanosomal

Anthelmintic activity

(Pharmaceutical Chemistry Department and
Veterinary Microbiology, Parasitology and Pathology Department)

Plant	Activity	Plant	Activity
<i>Albizia anthelmintica</i>	++	<i>Bridelia micrantha</i>	-
<i>Combretum molle</i>	+	<i>Croton megalocarpus</i>	-
<i>Dombeya rotundifolia</i>	+	<i>Rapanea melanophloes</i>	-
<i>Vernonia lasiopus</i>	-	<i>Microglossa pyrifolia</i>	-
<i>Physalis peruviana</i>	+	++: LD ₅₀ 100.1-500 µg/ml +: LD ₅₀ 500.1-1000 µg/ml in Egg Hatch Assay	

Toxicological effects

(Pharmaceutical Chemistry Department and
Veterinary Microbiology, Parasitology and Pathology Department)

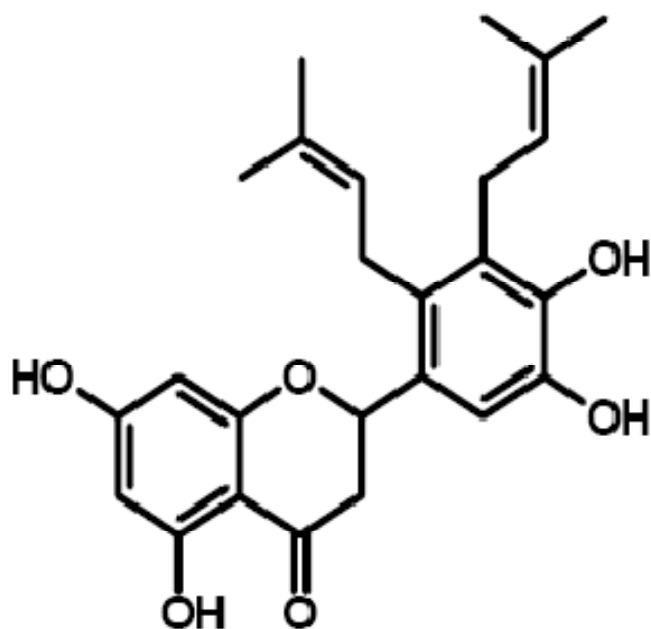
Albizia anthelmintica

- Isolated tissues – bronchoconstrictor
- Gross pathology on mice
 - haemorrhage on lungs
 - congested liver
 - scanty fluid in thoracic cavity
 - pulmonary oedema and froth in trachea
 - empty stomach distended with gas
- Animal dies in jerking movements

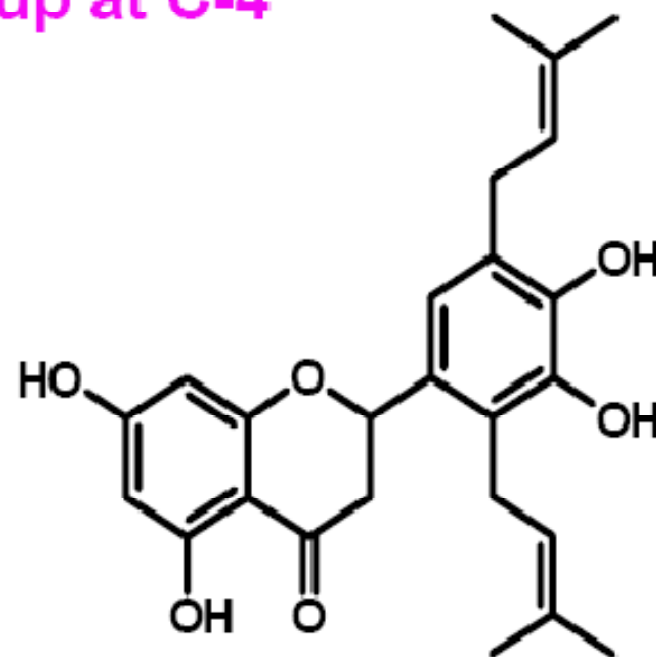
Phytochemistry

(Chemistry Department)

Flavanones with two prenyl groups in ring-B
and phenolic group at C-4'



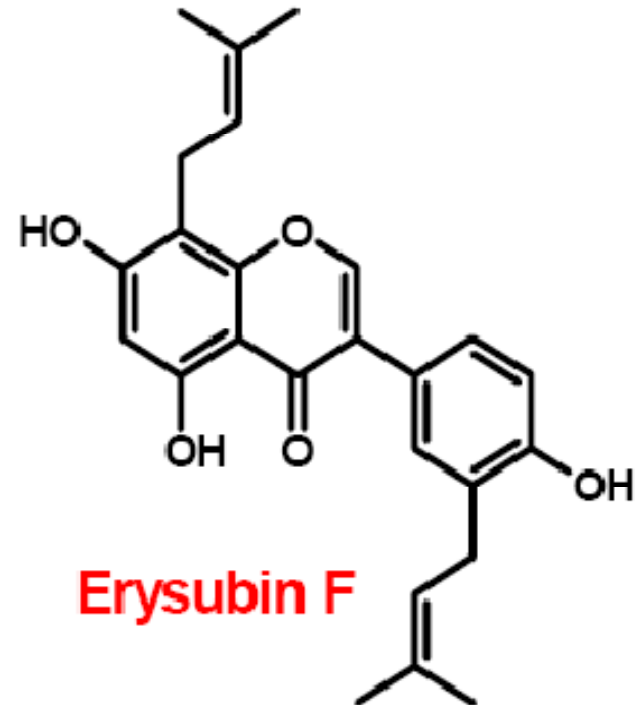
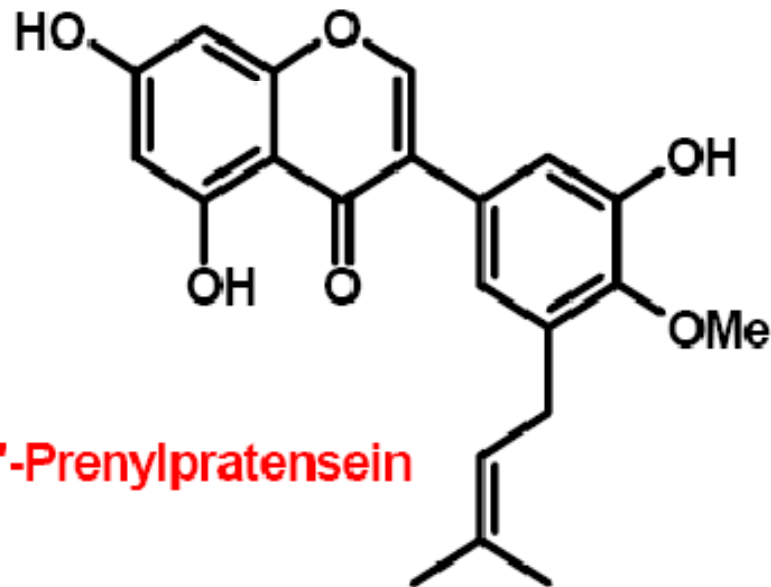
(+)-Abyssinin III



(+)-Sigmoidine A

Phytochemistry

(Chemistry Department)



Essential oils

(DOPC and DOPP, School of Pharmacy)

Family	Species
Apiaceae	<i>Heteromorpha trifoliata, Anethum gravealens, Coriandrum sativum</i>
Asteraceae (Compositae)	<i>Artemisia afra, Brachylaena hutchinsii, Microglossa pyrrhopappa</i>
Burceraceae	<i>Boswellia neglecta, Commiphora myrrha, C. holtziana</i>
Eurphobiaceae	<i>Croton sylvaticus, Synadenium compactum</i>
Graminea (Poaceae)	<i>Cymbopogon citratus, C. nardus, C. afronardus</i>
Labiatae	<i>Ocimum basilicum, O. gratissimum, O. kilimandscharicum, Plectrantus marruboides</i>
Myrtaceae	<i>Eucalyptus citriodora, E. globulus</i>
Papilionaceae	<i>Rynchosia minima</i>
Rutaceae	<i>Clausena anisata</i>
Verbenaceae	<i>Lippia carviadora. L. grandifolia, L. somalensis, L. wilmsii</i>
Zingiberaceae	<i>Zingiber officinalis</i>

Essential oils

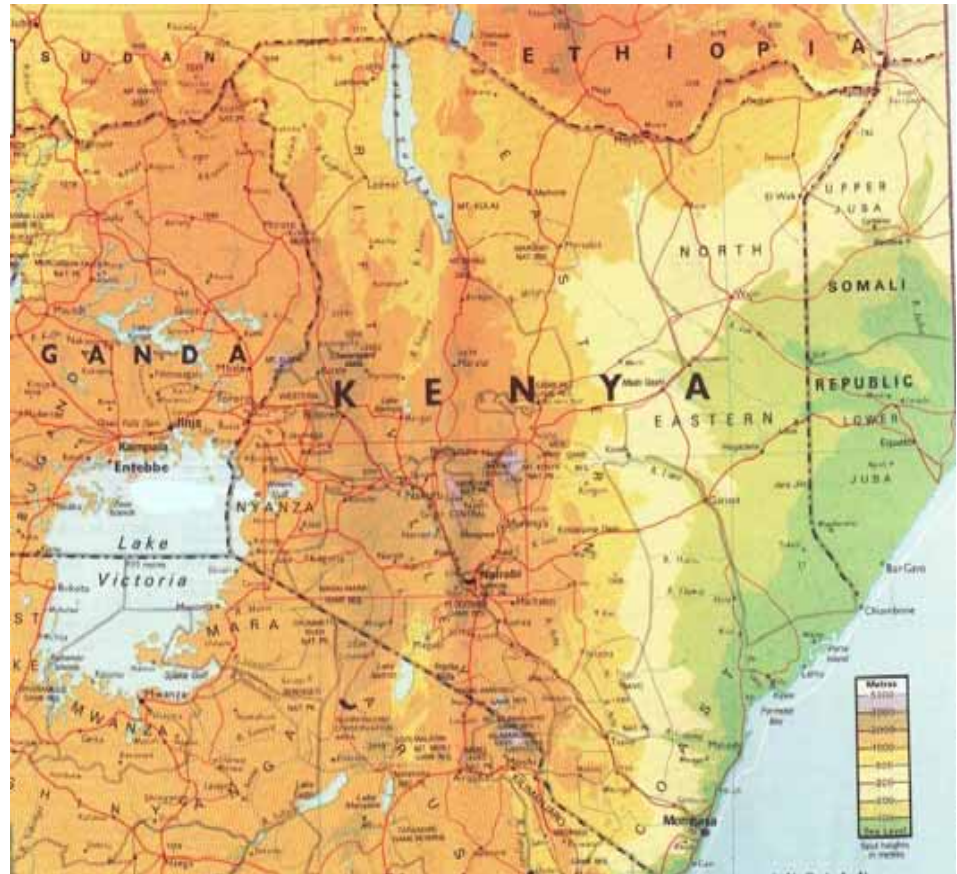
- Chemical constituents of essential oils
- Biological activities
 - Antibacterial, antifungal
 - Anti-free radical
 - Antimycotoxicogenic
 - Mosquito repellent
 - Maize weevil repellent

Information centre

- Herbalists
 - Information
 - Verification certificate for registration
- Patients, doctors, researchers
 - Information

Community support

- Good Working Relationship
Maasai in Narok,
Thika, Kirinyaga, Embu,
Vihiga, Kakamega
Yatta
- Product verification
- Education
- Associations and groups
- Conservation
- Basic tools



Naturub®

Essential oils in suitable base

Demonstrated mosquito repellent activity in laboratory

UoN-ICIPE partnership

Donated to community in Kakamega forest



Regulatory support

Technical support of the MRA and Ministries

- Developing and drafting a bill on Traditional medicines
- Developing guidelines for evaluation of herbal medicines
- Technical expertise in evaluating products requiring market authorization

GIBEX

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