**Zanthoxylum zanthoxyloides**

General description

**Scientific Name**

*Zanthoxylum zanthoxyloides* (Lam.) Zepern. & Timler

**Vernacular Names**

- rapeko (Moore)
- Guene gui deg (Wolof)
- Wo, Gozo ngua (Bambara)
- Barkeley, Bulabarkele (Peuhl)
- Fasahuari (Hausa)
- Dori (Toucouleur)
- wouho (Djoula)

**Synonyms**

*Fagara zanthoxyloides* Lam, *Zanthoxylum senegalense* DC..

**Family**

Rubiaceae

**Botanical Description (Nacoulma, 1996; Arbonier, 2004)**

Shrub or small tree, spiny and more or less scandent, up to 6–8(–12) m tall, with straight, often short bole and rounded and quite dense crown; bark grey to beige, rough, with fine vertical fissures, often with woody prickle-bearing protuberances; slash yellow, odorous, orange-mottled beneath; stems glabrous, grey, with solitary prickles. **Leaves** alternate, glabrous, imparipinnately compound with 5–7(–11) opposite or alternate leaflets, up to 12(–20) cm long; petiole 2–5 cm long, glabrous, spiny beneath with recurved prickles; stipules absent; petiolules 2–5 mm long; leaflets obovate to elliptical, 5–10 cm × 2–4 cm, base cuneate to rounded, apex obtuse or rounded, sometimes apiculate or notched, with many glandular dots, smelling of pepper and lemon when crushed, rigidly papery, pinnately veined with 10–14 pairs of lateral veins, barely prominent, fusing near the margin. **Inflorescence** a lax terminal or axillary panicle 5–25 cm long, with short branches. **Flowers** unisexual, regular, 5-merous, white or greenish, sessile; corolla barely open; male flowers with stamens slightly
exserted; female flower with superior ovary, 1-celled, style short, lateral. **Fruit** an ovoid follicle, 5–6 mm in diameter, brown, with glandular dots, dehiscent, 1-seeded. Seed black to bluish, shiny, long persistent in the fruit.

**Plant Part Used**
Throughout West Africa the aromatic roots, stem bark and leaves are commonly used in traditional medicine.

**Possible Alternative Source Species**
In vitro propagation of *Zanthoxylum anthozyloides* Lam., an endangered African medicinal plant was proven (Etsè et al. 2011).

**Ethnobotanical information**

**Major Ethnopharmacological Uses**
They are considered antiseptic, analgesic and diaphoretic. Root or stem bark macerations, decoctions or infusions are widely taken to treat malaria, fever, sickle cell anaemia, tuberculosis, paralysis, oedema and general body weakness. They are also widely taken to treat intestinal problems, including colic, dysentery, intestinal worms, gonorrhoea and
urethritis, but also as an emmenagogue, stimulant and to treat pain during childbirth, migraine and neuralgia. The roots are externally applied to ulcers, swellings, haemorrhoids, abscesses, snake bites, yaws, wounds leprosy and syphilitic sores as well as rheumatic and arthritic pain and hernia (Nacoulma, 1996).

The roots and stem bark give a warm, pungent and benumbing effect on the palate when chewed, and are widely used in the treatment of sore gums, toothache and dental caries. A decoction of the roots is used as a mouthwash and against a sore throat.

In Côte d’Ivoire sap from the pulped bark is applied as eye drops to treat eye infections, notably conjunctivitis with pus. In Ghana root and stem bark powder is taken to treat whooping cough (Arbonnier, 2004).

In southern Nigeria a decoction of the stem bark and roots is taken to treat cancer. Pulped stem bark and root bark is thrown in the water to stupefy fish.

In West Africa, it is planted as a hedge, as the thorns make it impenetrable. Sheep browse the leaves. The wood is used for manufacturing of torches. The timber is yellow, very hard and termite-resistant and used for building purposes, including poles and posts. It also makes good firewood. The roots, young shoots and twigs are commonly used as chew-sticks. The bark or young branches contain much resin, which makes them suitable for ceremonial torches. The spines are thrown into fire to give off a scented smoke. The leaves, which smell like citronella, and the seeds, which taste strongly of cinnamon or pepper, are commonly used to season food. From the seeds, necklaces are made. Z. zanthoxyloides also has numerous magico-religious uses, including protection against spirits. It also serves as fetish plant (Arbonnier, 2004).

Chemical constituents

Fruits:

✓ α-pinene, trans-β-ocimene, citronellol, citronellyl acetate, the α-terpinolene, the α-phellandrene, geraniol, limonene and the β-myrcene (Ngassoum et al. 2003).

✓ acridone alkaloids, namely, 3-hydroxy-1,5,6-trimethoxy-9-acridone; 1,6-dihydroxy-3-methoxy-9-acridone; 3,4,5,7-tetrahydroxy-1-methoxy-10-methyl-9-acridone; 4-methoxyxanthacridone; 4-hydroxyxanthacridone; 4-hydroxyxanthacridone oxide. The known acridones which have been characterized are, helebelicine A; 1-hydroxy-3-methoxy-10-methyl-9-acridone; 1,3-dihydroxy-4-methoxy-10-methyl-9-acridone and tegerrardin A (Wouatsa et al. 2013).
citronellol (29.9%), geraniol (11.5%), citronellyl acetate (5.5%), limonene (5.5%) and citronellal (4.6%), (E)-β-ocimene (29.4%), myrcene (28.6%), limonene (13.6%) and α-pinen (8.1%), respectively (Fogang et al. 2012).

**Roots bark:** Burkinabines A, B and C (Ouattara et al. 2004)

![Chemical structures of Burkinabines A, B and C](image)

**Quality control**

**Identification**

**Organoleptic Properties**

All bodies emit a very aromatic smell peppery lemony

**Macroscopic Characteristics**

Solubility (MeOH: 4.30-7.65%) cf Aline

Moisture Content (2.22-3.40%)

Total ash Roots: 3.96 -8.06%
**Pharmacological properties**

**Pharmacodynamic Properties**

- **In Vitro Experiments**

  **Antimicrobial activity**
  The antibacterial and antifungal activities of fruit essential oil; leave and roots bark were demonstrated (Anne et al. 2013, Misra et al. 2013, Ngane et al. 2000,).

  **Antiparasitic activity**
  Roots extracts were found to be significantly active against the intracellular form of *Leishmania majo* parasite (Maximin et al. 2007); while leaves extract has presented lowest anthelminthic activities on *Ascaris lumbricoides* (Barnabas et al. 2011). The non polar fractions from crude alkaloid was displayed a good antiplasmodial (W2) with a IC$_{50}$ ranging 1.91 to 4.32 μg/ml (Gansane et al. 2010). The reverse-phase high-pressure liquid chromatography (RP-HPLC)-semipurified, and RP-HPLC-purified root extracts inhibit the growth of *P. falciparum* (3D7) in vitro, with 50% inhibitory concentrations (IC$_{50}$s) of 4.90, 1.00, and 0.13g/ml, respectively (Kassim et al. 2005).

  **Antioxidant activity**
  Stem extract demonstrated the DPPH radicals scavenging and chelating iron and reduced generation of reactive oxygen species in isolated mitochondria in the presence or absence of hydrogen peroxide (Adekunle et al. 2012).

**Markers and Quantitative Methods**

- **Adulterants and Adulterations**
- *Fagara zanthoxyloides* Lam;
- *Zanthoxylum senegalense*

- **Standard Preparations**: decoction, maceration

**TLC / HPLC / GC**

Root Bark acetone extract
A: 365 nm, B: Anisaldehyde under UV 365nm, C: Anisaldehyde

**Pharmacological properties**

- **Pharmacodynamic Properties**
  - **In Vitro Experiments**
  - **Antimicrobial activity**
  - **Antiparasitic activity**
  - **Antioxidant activity**

**Markers and Quantitative Methods**

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The oils were also tested for antiproliferative, antimicrobial and antioxidant activities by MTT assay, agar disc diffusion method, and DPPH, ABTS and β-carotene–linoleic acid assay, respectively (Fogang et al. 2012).

**In Vivo Experiments**
Fresh leaves and stem bark extracts (200mg/kg bw and 500mg/kg bw, p.o) caused significant reduction in the concentrations of serum total cholesterol, triacylglycerol and LDL-cholesterol, with a significant increase in HDL-cholesterol concentration in rats administered (Oyewole et al. 2012). Leaves extract though exhibits antidiabetic and hypolipidaemic effects, in alloxan induced diabetic rats (Aloke et al. 2012).

The ethanolic root bark extract (150mg/kg to 500 mg/kg, p.o.) has gastroprotective effect in Sprague-Dawley rats working possibly via antimuscarinic or antihistaminic mechanism(Boye et al. 2012). The leaves powder (3.2 g/kg to 4.8 g/kg p.o.) demonstrated a moderate antihelmintic effect (Azando et al. 2011).
Leaves extract exhibited antidiabetic and hypolipidaemic effects Aloke et al 2012. The hypotensive of root bark extract was evaluated (Zahoui et al. 2010). The extract reduced vasodilatation and decreased capillary permeability in inflammation (Prempeh, et al. 2009).

**Clinical Studies: none**
**Pharmacokinetic Properties: none**

**Safety data**
**Ethnic Use Safety Data**
Root bark and leaves extract have been used for many years with no side effects.
**Preclinical Safety Data: none**
**Single Dose Toxicity: none**
**Repeated Dose Toxicity**
The LD50 of the methanolic root extract was found to be 5.0 g/Kg body weight within 95 % confidence limits, with congestion and focal necrosis of the liver and renal tubules in mice (Ogwal-okeng et al. 2003). Toxicological Evaluation of Methanolic Stem Bark extract suggests that the margin of safety of the extract is high at a dose of 1.5 mg/kg bw in Wistar rats (Nwozo et al. 2011).
Mutagenic Potential: none
Carcinogenicity; none
Sensitizing Potential: none
Clinical Safety Data: none

**Key (proposed) usage**

Therapeutic Indications: malaria, drepanocytose, headache; stomachache  
Dosage Method and Duration of Administration: until healing  
Contraindications Special Warnings and Precautions for Use:none  
Effects on Ability to Drive and Use Machines: none  
Interactions: none  
Pregnancy and Lactation : none  
Adverse Effects: Vomiting  
Overdose: Vomiting  
Evaluation of Efficacy: antimalarial pharmocolgical proven(Gansane et al. 2010).

**Trade information**

Volume of production in the country: lack of information  
Volume of domestic consumption: lack of information  
Volume of export : lack of information  
Average price : lack of information  
Nature of plant material: everytime  
Conservation status: vulnerable  
Nature of plant products: lack of information  
Processing and Storage: leaves, root bark, dry in shade or sun, store in plastic

**References**


Ouattara, B. et al., 2004. LC/MS/NMR analysis of isomeric divanilloylquinic acids from the root bark of Fagara zanthoxyloides Lam. Phytochemistry, 65(8), pp.1145–51.

Oyewole, o.i., adebayo, a.. & ogunsakin, s.., 2012. the international journal of biotechnology effects of crude extract of ageratum conyzoides , moringa oleifera and zanthoxylum

