TETRADENIA RIPARIA HERBA

Definition

Tetradenia Riparia Herba consists of the fresh or dried leaf and smaller stems of *Tetradenia riparia* (Hochst.) Codd (Lamiaceae).

Synonyms

Iboza bainesii N. E. Br.
Iboza galpinii N. E. Br.
Iboza riparia (Hochst.) N. E. Br.
Moschosma riparium Hochst.

Vernacular names
Iboza, ibozane (Z), watersalie (A), ginger bush

Description [1]

Figure 1: Live plant (male flowers)

Macroscopical

Soft much-branched dioecious shrub or small tree 1-3m in height, with brittle, semi-succulent stems and sticky-aromatic foliage; **leaves** petiolate, ovate-oblong to round, 35-80 × 35-70mm, sparsely to densely glandular-pubescent on both surfaces, margin coarsely crenate to dentate, variable in size, shape and degree of hairiness; **flowers** (May-Aug) in large branched terminal panicles, the male flower-spikes longer than the female, small (corolla 3-3.5mm long), white to pale mauve.

Figure 2: line drawing (female flowers)

Microscopical

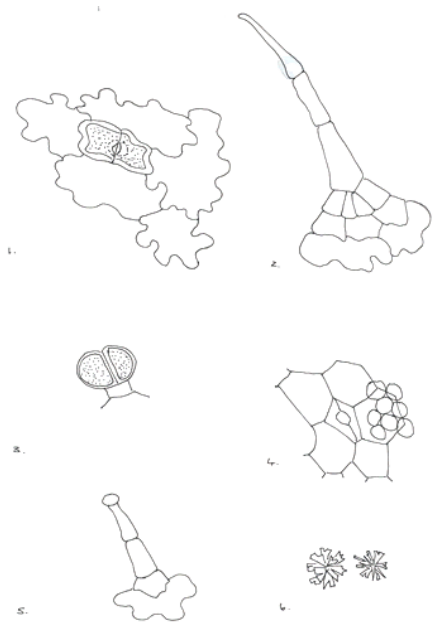

Figure 3: microscopical features

Characteristic features are: the cells of the lower leaf epidermis with sinuous walls and numerous anomocytic stomata (1); the polygonal cells of the upper leaf epidermis with occasional stomata and underlying

[1] Codd, L.E. (1985). The genus *Tetradenia*. Flora of Southern Africa **28(4)**: 113-116.

palisade layer (4); the numerous glandular hairs of leaf and stem, of two types: those with 2-3 celled stalk and unicellular head, up to 650µ in length, raised on papillae (5), particularly abundant on main leaf veins and those having a unicellular stalk and bicellular head up to 25µ in diameter, filled with yellow-brown contents (3); the uniseriate clothing hairs of both leaf surfaces, up to 800µ long, thin-walled, smooth, 2-3 cells long, with swollen base (2); the micro-rosettes of calcium oxalate, 10-12µ in diameter, in cells of the leaf palisade and mesophyll (6).

Crude drug

Best collected when required, as material blackens rapidly after harvesting and dries with great difficulty; odour pleasant, highly aromatic, texture soft, foliage extremely sticky and strongly scented, stems soft and semi-succulent.

Geographical distribution

Wooded hillsides and stream banks of coastal KwaZulu/Natal, Mpumalanga and the Northern Province of South Africa; also northern Namibia, Angola, Botswana and east tropical Africa.

Figure 4: distribution map

Quality standards

Identity tests

Thin layer chromatography on silica gel using as solvent a mixture of toluene:diethyl ether:1.75M acetic acid (1:1:1). Reference compound cineole (0,1% in chloroform). Method according to Appendix 2a.
R_f values of major compounds: 0, 36 (grey); cineole:0,79 (light blue)

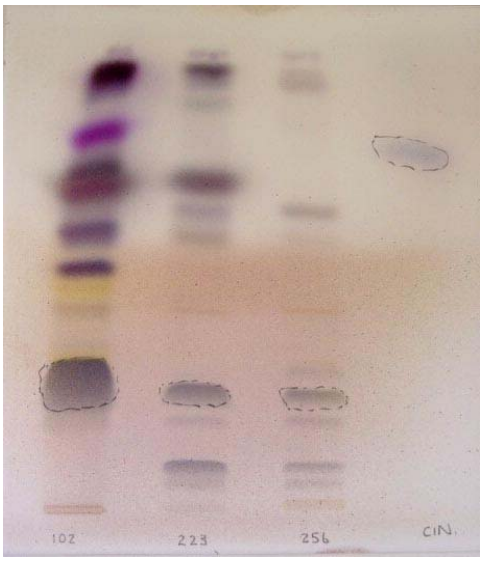

Figure 5: TLC plate

HPLC on C_{18} column, method according to Appendix 2b.

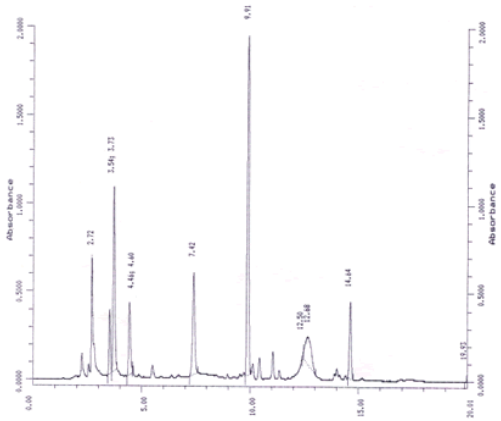

Figure 6: HPLC spectrum

Major compounds:
Methanol extract:
Retention times (mins): 3.54; 3.73; 7.42; 9.91
Ethanol (70%) soluble extractive value: not less than 2.0% (range: 1.96-2.29%), determined using fresh material (15.0g) extracted with 200ml 70% ethanol, of which 50ml aliquots were taken (method according to the BHP 1996).

Purity tests

Assay

Not yet available

Major chemical constituents

1. diterpenes e.g. ibozol [2], 7 α-hydroxyroyleanone, 8 (14), 15-sandaracopimaradiene-7α,18-diol [3]
2. α-pyrones e.g. umuravumbolide [4, 5], tetradenolide [6],
3. essential oil (1.9%) of which the main components are: α-terpineol (22.6%), fenchone (13.6%), β-fenchyl alcohol (10.7%), β-caryophyllene (7.9%) and perillyl alcohol (6.0%) [7].
4. phytosterols

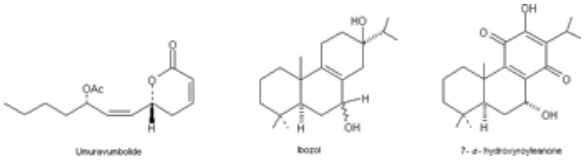

Figure 7: chemical constituents

Dosage forms

An aqueous infusion or decoction is taken orally.

Medicinal uses

Used throughout its range as a traditional remedy for cough, respiratory problems, stomach ache, diarrhoea, dropsy, *angina pectoris*, fever, malaria and dengue fever, yaws, headache, toothache and as an antiseptic. [GR1]

Pharmacology/bioactivity

Moderate antimalarial activity of the leaf essential oil against two strains of *Plasmodium falciparum* has been reported [7].

The diterpene diol 8 (14), 15-sandaracopimaradiene-7α,18-diol has been shown to possess papaverine-like antispasmodic activity on methacholine, histamine and barium chloride-induced contractions of guinea pig ileum as well as on noradrenaline-induced contractions of rabbit aorta [3].

Leaf extracts (80% ethanol), tested for antimicrobial and antiviral activity, inhibited the growth of *Staphylococcus aureus, Candida albicans*, *Mycobacterium smegmatis, Microsporum canis, Trichophyton mentagrophytes* and *Bacillus subtilis.*

No antiviral activity against Coxsackie virus, poliovirus (unspecified), measles virus and Semliki-Forest virus was demonstrated in these studies[8, 9]. Some of the observed antimicrobial activity has been attributed to the presence of diterpenes[10, 11].

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[2] Zelnik, R., Rabenhorst, E., Matida, A., Gottlieb, H.E., Lavie, D and Panizza, S. (1978). Ibozol, a new diterpenoid from *Iboza riparia. Phytochemistry* **17**: 1795-1797.

[3] Van Puyvelde, L., Lefebvre, R., Mugabo, P., de Kimpe, N. and Schamp, N. (1987). Active principles of *Tetradenia riparia*.II. Antispasmodic activity of 8 (14), 15-sandaracopimaradiene-7α,18-diol. *Planta Medica* **52**: 156-158.

[4] Van Puyvelde, L. *et al.*(1979). New α-pyrones from *Iboza riparia. Phytochemistry* **18**: 1215-1218.

[5] Davies-Coleman, M. and Rivett, D.E.A. (1995). Structure of the 5,6-dihydro- α-pyrone umuravumbolide. *Phytochemistry* **38(3)**: 791-792.

[6] Van Puyvelde, L. and de Kimpe, N. (1998). Tetradenolide, an α-pyrone from *Tetradenia riparia. Phytochemistry* **49(4)**: 1157-1158.

[7] Campbell, W.E., Gammon, D.W., Smith. P., Abrahams, M. and Purves, T. (1997). Composition and antimalarial activity *in vitro* of the essential oil of *Tetradenia riparia. Planta Medica* **63**: 270-272.

[8] Vlietinck, A. J. *et al.* (1995). Screening of a hundred Rwandese plants for antimicrobial and antiviral properties. *Journal of Ethnopharmacology* **46**: 31-47.

[9] Boily, Y, and van Puyvelde, L. (1986). Screening of medicinal plants of Rwanda for antimicrobial activity. *Journal of Ethnopharmacology* **16:** 1-13.

[10] Van Puyvelde, L. *et al.* (1986). Active principles of *Tetradenia riparia*.I. Antimicrobial activity of 8 (14), 15-sandaracopimaradiene-7α,18-diol. *Journal of Ethnopharmacology* **17**: 269-273.

[11] Van Puyvelde, L. *et al.*(1994). *In vivo* inhibition of mycobacteria by Rwandese medicinal plants. *Phytotherapy Research* **8**: 65-69.

In an *in vitro* screen for antibacterial activity of hexane, ethanol and water extracts of South African plants, no inhibitory activity against *Staphylococcus aureus, Bacillus subtilis, Escherichia coli or Klebsiella pneumoniae* was demonstrated [12]

An *in vitro* study of the effects of methanolic extracts of fruit, leaf, stem and root on skeletal (toad *rectus abdominis*), smooth (guinea pig ileum) and uterine (non-pregnant guinea pig) muscle [13] showed weak activity on uterine muscle and on smooth muscle relaxation, but strong to moderate activity on smooth muscle stimulation and on skeletal muscle. In the same study, hyper- and hypotensive effects of the extracts were tested *in vivo* in the rabbit, but no activity was observed in the dose used (5mg/kg IV). The general toxicity of the extracts was assessed *in vivo* in the mouse (dose 1.0g/kg IP); toxic effects were recorded for root and fruit extracts but not for leaf or stem extracts.

Insecticidal activity of methanolic extracts (50mg/ml) of fresh and dried leaf, root and stem was assessed *in vitro*, using inhibition of oviposition in *Rhipicephalus appendiculatus* as a measure of acaricidal activity. None of the extracts was found to inhibit oviposition.[14]

Contraindications

None known

Adverse reactions

There is a single published report concerning the toxicity of this species[15] and dealing with several cases of poisoning, all of which occurred in adult males. The data were collected during 18 years of clinical practice amongst Zulu communities across a wide geographical and sociocultural range.

The symptoms included a severe toxic inflammatory response of mucous membranes, conspicuous at all body orifices. In more severe cases this went on to necrosis and large scale sloughing. A second symptom was profuse salivation; in one case an amount in excess of 5 litres of saliva was produced in 24 hours. In all cases of terminal illness, urine and stools consisted of almost pure blood, were dark in colour and contained shreds of exfoliated mucous membrane. Patients who were fatally ill went into anuria during the last 24-48 hours, but one man recovered after 24 hours of anuria. Most of the patients presenting with these symptoms had taken *Tetradenia riparia* as a cold or flu remedy, in every case exceeding the traditional dose and deviating from the accepted method of administration.

Precautions

No special precautions if used in the traditional manner

Dosage

To be determined

[12] McGaw, L.J., Jager, A.K. and van Staden, J.V.(2000). Antibacterial, anthelmintic and anti-amoebic activity of South African medicinal plants. *Journal of Ethnopharmacology* **72(1/2)**: 247-263.

[13] Chagnon, M. (1984). General pharmacological inventory of medicinal plants of Rwanda. *Journal of Ethnopharmacology* **12(3)**: 239-251.

[14] Van Puyvelde, L. *et al.* (1985). Screening of medicinal plants of Rwanda for acaricidal activity. *Journal of Ethnopharmacology* **13(2)**: 209-215.

[15] Bodenstein, J. W. (1977). Toxicity of traditional herbal remedies. *South African Medical Journal* **52**:790.