Review of phytochemical, pharmacological and socio-economic properties of *Albertisia delagoensis* (N.E. Br.) Forman (Menispermaceae)

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Review

Abstract

Background: Albertisia delagoensis is a small shrub or liana which naturally occurs in open wooded grasslands in southern Africa. A critical appraisal of the phytochemical, pharmacological and socio-economic properties of *A. delagoensis* are provided.

Methods: Research articles focusing on the phytochemical, pharmacological and socio-economic properties of *A. delagoensis* were mined from online databases such as Google Scholar, PubMed, Science Direct, SciELO and SpringerLink. No time limit was set for the search and all research outputs that aligned with the scope of the review were included.

Results: Albertisia delagoensis has diverse uses as a food plant and also medicinal uses such as anthelmintic, improve sexual performance in men, and traditional medicine for back pain, body pains, chest pains, diarrhoea, hypertension, influenza, menstrual pain, sores and vomiting. *Albertisia delagoensis* exert biological activities such as antiplasmodial and cytotoxicity, and several phytochemical compounds such as cocsoline, cocsuline, cycleanine, dicentrine, O-methylcocsoline, roemrefidine, 3,4-dihydroxybenzoic acid, allantoic acid, nicotinic acid, phthalic acid and *proto*-quercitol have been isolated from the species.

Conclusion: Many applications of *A. delagoensis* as source of food and herbal medicines as well as its phytochemistry and pharmarcological properties need further investigations.

Keywords: Albertisia delagoensis, ethnomedicinal uses, indigenous knowledge, Menispermaceae, moonseed family

Background

Albertisia delagoensis (N.E.Br.) Forman (Fig. 1) is a member of the Menispermaceae family. The family Menispermaceae is commonly referred to as moonseed family as members of this family are characterized by "half-moon shaped seeds", or curved seeds and embryos (Ortiz *et al.* 2007). Menispermaceae is a cosmopolitan family consists of approximately 68 genera and 440 species distributed in the tropics, subtropics and a few species in temperate regions (Jacques & Bertolino 2008, Christenhusz & Byng 2016, Xu & Deng 2017). The majority of the species are twining woody plants, rarely upright shrubs, small trees, herbaceous plants or epiphytes (Xu & Deng

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2017). Some members of the Menispermaceae family are known for their medicinal and toxic characteristics (Wen-Yen 1975, Ortiz *et al.* 2007, Wiart 2021). Research by Wen-Yen (1975) showed that about three quarters (72.9%) of species belonging to the Menispermaceae family in China, possess medicinal properties, particularly *Arcangelisia flava* (L.) Merr., *Fibraurea tinctoria* Lour., *Sinomenium acutum* (Thunb.) Rehder & E.H. Wilson, *Stephania cepharantha* Hayata, *S. sinica* Diels, *S. tetrandra* S. Moore and *Tinospora sagittata* (Oliv.) Gagnep. var. *sagittata*. Research by Schmelzer & Gurib-Fakim (2008) showed that six *Albertisia* Beccari species, namely *A. delagoensis, A. cordifolia* (Mangenot & J.Miège) Forman, *A. mangenotii* (Guillaumet & Debray) Forman, *A. scandens* (Mangenot & J.Miège) Forman, *A. undulata* (Hiern) Forman and *A. villosa* (Exell) Forman are widely used as traditional medicines in tropical Africa. Detailed information about their botany, distribution, medicinal uses, plant parts used, dosage, administration, phytochemical constituents, biological activities and toxicological properties are documented in the monograph entitled "plant resources of tropical Africa 11: medicinal plants 1" (de Ruijter 2008a-c). Some members of the Menispermaceae family are used as traditional medicines against diseases and ailments such as gastro-intestinal problems, ear, eye, blood circulatory problems, musculoskeletal, neurological, psychological, respiratory infections, skin problems, urology and reproductive health problems (De Wet & Van Wyk 2008, Jahan *et al.* 2010, Kumar *et al.* 2010, Meenu & Radhakrishnan 2020). Moreover, some species are characterized by many types of alkaloids, particularly the bisbenzylisoquinoline alkaloids which are derived from the benzyltetrahydroisoquinoline skeleton (Menachery 1996, Otshudi *et al.* 2005, Meenu & Radhakrishnan 2020). Pharmacological research on Menispermaceae revealed that crude extracts and phytochemical compounds isolated from some of the species are characterized by antibacterial, antifungal, antiplasmodial, antinociceptive, anti-arthritic, cytotoxic, anthelmintic, antidiabetic, anti-inflammatory, anticancer and analgesic properties (Lohombo-Ekomba *et al.* 2004, Jahan *et al.* 2010, Semwal *et al.* 2010, Logesh *et al.* 2020).

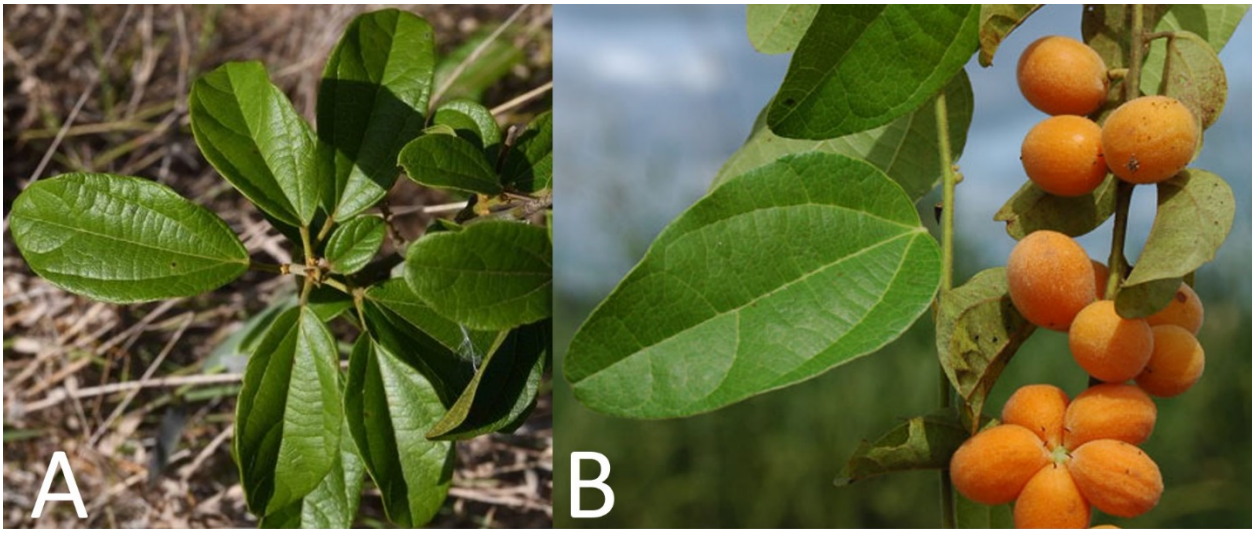

Figure 1: *Albertisia delagoensis*. A: Branch showing leaf shape and B: branch showing sessile orange fruits (https://www.inaturalist.org/observations/38054041)

The underground organs, stems and fruits of some species of the Menispermaceae family are widely used as sources of food. For example, the tubers of *Dioscoreophyllum cumminsii* (Stapf) Diels serve as food in east Africa (Arenas & Giberti 1987), stems of *Odontocarya asarifolia* Barneby are consumed by the Indians of the South American Chaco region (Arenas & Giberti 1987), while the rhizomes of *Stephania brachyandra* Diels are eaten in China (Von Altschul 1973). The fruits of *Haematocarpus validus* (Miers.) Bakh.f. ex Forman are eaten as snacks in Bangladesh and India (Bohra *et al.* 2018, 2020, Momin *et al.* 2018). Bohra *et al.* (2018) recommended domestication of *H. validus* in India based on its multipurpose uses as a source of edible fruits, wide usage as traditional medicine and natural colourant. Similarly, *A. delagoensis* is regarded as an important useful plant species in Mozambique and South Africa, and the species is included in the monograph "medicinal and magical plants of southern Africa: an annotated checklist (Arnold *et al.* 2002). It is therefore, within this context that the current study was undertaken aimed at reviewing the phytochemical, pharmacological and socio-economic properties of *A. delagoensis*.

Albertisia delagoensis is an important plant species in the daily lives of people in southern Africa as the species is associated with interesting traditional uses. Documenting the phytochemical, pharmacological and socio-economic properties of *A. delagoensis* is important as these fields of research are relatively underdeveloped in the region. Moreover, in the last few decades, southern African region has seen great changes in access to modern health care

and education, shifts of populations from rural to urban areas, changes from subsistence to commercial farming, unprecedented environmental degradation and indigenous knowledge associated with useful plant resources (Van Wyk *et al.* 2013, Roberts 2014, Roberts & Roberts 2017, Van Wyk & Gericke, 2018). Other researchers such as Gelfand *et al.* (1985) and Hedberg & Staugård (1989) argued that compilation of an inventory of medicinal plants in southern Africa should be regarded as basic research effort and first step towards an ethnopharmacological screening process of important medicinal plant species which are likely to become part of a future "essential drugs list" for the comprehensive primary health care in the region. Similarly, Van Wyk (2011, 2015, 2017) argued that many of African medicinal and aromatic plants remain scientifically poorly known and in need of detailed investigation although the botanical and cultural diversity of the African continent provides numerous opportunities for the development of innovative new pharmaceutical drugs. Furthermore, the absence of standards, insufficient knowledge of phytochemical and pharmacological properties, chemical variation and proper biomarker identification contribute to lack of optimised commercialization of herbal medicinal products in southern Africa (Van Wyk & Wink 2015, 2017, Viljoen *et al.* 2022). Recently, many pharmaceutical companies have renewed their attention to the phytochemical and pharmacological studies of traditional medicinal plants in an effort to bring out potential sources and new molecules for different pharmaceutical product development programmes (Heinrich & Gibbons 2001, Cordell & Colvard 2005, Heinrich *et al.* 2006, Andrade-Celto & Heinrich 2011, Katiyar *et al.* 2012, Albuquerque *et al.* 2014, Leonti *et al.* 2017, Süntar 2020). Heywood (2011) opined that ethnopharmacological emphasizing medicinal uses, phytochemistry and pharmacological properties of medicinal plants cannot be disassociated from the food production, human nutrition and the conservation of the biodiversity that constitutes the resource base of such species.

Materials and Methods

A systematic review of electronic databases such as Taylor and Francis, Science Direct, Google scholar, Scopus, Web of Science, SpringerLink, SciELO, Pubmed and Elsevier. Pre-electronic sources such as national, international journal and other scientific publication, dissertations, theses, books and grey literature with information on the botany, traditional uses, medicinal uses, herbal preparations, phytochemistry and biological activities of *Albertisia delagoensis* were used. No time limit was set for the search and all literature sources published in English and aligned with the scope of the research were included. The key word *Albertisia delagoensis* and synonyms of the species such as *Anisocycla triplinervia*, *Epinetrum delagoense*, *Junodia triplinervia*, *Synclisia delagoensis* and *Synclisia zambesiaca* were paired with relevant terms such as "ethnomedicinal uses", "biological activities", "phytochemicals", "ethnobotany", "pharmacological properties" and "traditional uses".

Description of *Albertisia delagoensis*

Albertisia is a genus of approximately 20 species with 13 species confined to tropical and subtropical Africa, and seven species confined to southeast Asia (De Wet & Van Wyk 2013). The genus name *Albertisia* is in honour of Prince Albert of Belgium. The species name "*delagoensis*" is derived from Delagoa Bay, a historic name for southern Mozambique, the locality where the type specimen was collected (Glen 2004). The vernacular names of *A. delagoensis* include **cudodo, cumbato, ihubeshana, mlomo mnandi, umgandanganda, umqhumane** and **ungandingandi** (Pooley 1998, De Wet & Van Wyk 2008). The synonyms of *A. delagoensis* include *Anisocycla triplinervia* (Pax) Diels, *Epinetrum delagoense* (N.E.Br.) Diels, *Junodia triplinervia* Pax, *Synclisia delagoensis* N.E.Br. and *Synclisia zambesiaca* N.E.Br. (De Wet & Van Wyk 2013). *Albertisia delagoensis* is a dioecious small shrub or liana growing up to two metres in height. The stems are green and densely hairy when young, becoming woody and smooth with age, characterized by leaf scars. The leaf arrangement is usually alternate, the leaves are simple and entire, elliptic to broadly oblong is shape (Figure 1A), greyish green on the abaxial side and dark green on the adaxial side. The leaves of *A. delagoensis* are slightly hairy on both sides with densely pubescent veins on both sides which are pinnately veined, with two to three prominent lateral veins from the base. The leaf apex is obtuse to rounded with cuneate base connected to densely pubescent and long petiole. The flowers of *A. delagoensis* are unisexual and regular, with an axillary male inflorescence and solitary female inflorescence. The fruit is ellipsoid drupe, sessile, pubescent and bright orange when ripe (Figure 1B). The seeds are obovoid-oblong in shape and curved. *Albertisia delagoensis* is confined to the eastern parts of Mozambique and South Africa (Fig. 2) in well-drained sandy soil, open wooded grasslands, bushveld and wooded grassland.

Figure 2. Distribution of *Albertisia delagoensis* in southern Africa (https://www.gbif.org/occurrence/map?taxon_key=5592693

Food uses

The leaves of *A. delagoensis* are eaten as leafy vegetables in South Africa (Ntuli *et al.* 2011, 2012) while the fruits of the species are eaten as a snack and/or used to produce a non-alcoholic beverage (Fox & Norwood Young 1982, Peters *et al.* 1992, Welcome & Van Wyk 2019). The non-alcoholic beverage has been produced since ancient times and form an interesting and conspicuous part of cultural diversity and local food traditions in South Africa (Fox & Norwood Young 1982). The leaves of *A. delagoensis* have nutritional value by virtue of high carbohydrates, fats and proteins (Table 1), which are comparable to the recommended dietary allowance (RDA) representing the average daily essential nutrients needed to meet the basic nutrient requirements for a health person. The leaves of *A. delagoensis* are also important sources of essential amino acids such as alanine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine and valine (Table 1). Ntuli (2019) identified essential minerals elements such as calcium, copper, iron, magnesium, manganese, nitrogen, phosphorus, potassium and zinc from the leaves of *A. delagoensis*. Similarly, Hawkes *et al.* (2011) identified an organic compound, nicotinic acid from the leaves of *A. delagoensis* which is a form of Vitamin B_3, an essential human nutrient. All these nutrients, amino acids and essential mineral elements identified from the leaves of *A. delagoensis* provide energy, nutritional needs and are also important for maintaining specific functions of the body.

Medicinal uses

The leaf, rhizome and root infusions and/or decoctions of *A. delagoensis* are mainly used as anthelmintic, improve sexual performance in men, and traditional medicine for back pain, body pains, chest pains, diarrhoea, hypertension, influenza, menstrual pain, sores and vomiting (Table 2; Fig. 3). The leaf infusions of *A. delagoensis* are taken orally as traditional medicine against intestinal complications in both Mozambique and South Africa (Izidine 2003, Hawkes *et al.* 2011). In South Africa, a handful of freshly chopped roots of *A. delagoensis* are mixed with two handfuls of freshly chopped whole plant material of *Senecio serratuloides* DC. (family Asteraceae) and boiled as traditional medicine for hypertension (De Wet *et al.* 2016, Ramulondi 2017, Ramulondi *et al.* 2019, Balogun & Ashafa 2019, Aumeeruddy & Mahomoodally 2020, Van Vuuren *et al.* 2022). *Albertisia delagoensis* is an important traditional medicine in Mozambique and its different plant parts such as leaves, rhizomes and roots are sold in informal herbal medicine markets in the country (Mander *et al.* 2006).

Table 1: Nutritional composition of the leaves of *Albertisia delagoensis* and the recommended dietary allowance (RDA)

Chemical composition	Value*	Recommended dietary allowance (RDA)
Alanine (mg/g)	0.99	-
Arginine (mg/g)	0.85	-
Ash (%)	5.0	-
Aspartic acid (mg/g)	1.09	-
Calcium (%)	0.63	1000 – 1300 mg/100g
Carbohydrates (%)	65.87	130.0 mg/100g
Copper (mg/100g)	20.6	1.0 – 2.0 mg/100g
Cysteine (mg/g)	0.40	-
Fat (%)	1.02	300.0 mg/100g
Glutamic acid (mg/g)	1.04	-
Glycine (mg/g)	0.56	-
Histidine (mg/g)	0.32	-
Iron (mg/100g)	112.0	8.0 – 15.0 mg/100g
Isoleucine (mg/g)	0.67	-
Leucine (mg/g)	1.10	-
Lysine (mg/g)	0.92	58.0 – 89.0 mg/100g
Magnesium (%)	0.27	310.0 320.0 mg/100g
Manganese (mg/100g)	235.0	5.0 mg/100g
Methionine (mg/g)	0.14	-
Nitrogen (%)	3.91	-
Phenylalanine (mg/g)	0.73	-
Phosphorus (%)	0.27	1250.0 mg/100g
Potassium (%)	1.76	4700.0 mg/100g
Proline (mg/g)	0.86	-
Protein (%)	20.18	34.0
Serine (mg/g)	0.44	-
Sodium (mg/100g)	434.3	2300.0 mg/100g
Threonine (mg/g)	0.41	-
Tyrosine (mg/g)	0.73	-
Valine (mg/g)	0.86	-
Zinc (mg/100g)	14.0	8.0 – 11.0 mg/100g

*Ntuli (2019)

Phytochemical and pharmacological properties of *Albertisia delagoensis*

Several phytochemical compounds have been identified and isolated from the leaves and rhizomes of *A. delagoensis* (Fig. 4). Alkaloids such as cocsoline, cocsuline, cycleanine, dicentrine and O-methylcocsoline belonging to the bis-benzylisoquinoline class of alkaloids and an aporphine alkaloid roemrefidine have been isolated from the leaves and rhizomes of *A. delagoensis* (De Wet *et al.* 2004, 2005, De Wet 2005, Hawkes *et al.* 2011). Other phytochemical compounds identified and isolated from the leaves of *A. delagoensis* include 3,4-dihydroxybenzoic acid, allantoic acid, nicotinic acid, phthalic acid and *proto*-quercitol (Hawkes *et al.* 2011). Lohombo-Ekomba *et al.* (2004) argued that the antibacterial, antifungal, antiplasmodial and cytotoxic activities exhibited by *A. villosa* could be attributed to the bis-benzylisoquinoline alkaloid, cycleanine, a major constituent of the root bark of the species. Similarly, research by Hawkes *et al.* (2011) showed that the aporphine alkaloid roemrefidine is also characterized by antibacterial, antiplasmodial and febrifugal activities. Therefore, the different alkaloids and other phytochemical compounds isolated from *A. delagoensis* may have different pharmacological activities and thus support the use of different infusions and/or decoctions of the species as traditional medicine in Mozambique and South Africa.

Table 2: Medicinal uses of *Albertisia delagoensis*

Medicinal uses	Parts used	Country	Reference
Antenatal	Rhizome and root infusion taken orally	South Africa	De wet 2005, De Wet *et al.* 2007, de Ruijter 2008b
Anthelmintic	Rhizome and root infusion taken orally	Mozambique and South Africa	Izidine 2003, De wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Quattrocchi 2011, De Wet & Van Wyk 2013
Antiemetic	Leaf infusion orally	South Africa	De Wet 2005, De Wet *et al.* 2007, Hawkes *et al.* 2011, Quattrocchi 2011
Antipyretic	Not specified	Mozambique	De Wet *et al.* 2007, Hawkes *et al.* 2011, Quattrocchi 2011, De Wet & Van Wyk 2013
Appetite stimulant	Rhizome and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b
Back pain	Root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, De Wet & Van Wyk 2013
Body pains	Root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Quattrocchi 2011
Chest problems	Root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, Quattrocchi 2011, De Wet & Van Wyk 2013
Cleansing baby's stomach	Leaf and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter, 2008b
Constipation	Not specified	Mozambique	Izidine 2003
Diarrhea	Leaf and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, Quattrocchi 2011, Stark *et al.* 2013
Epilepsy	Root decoction taken orally	Mozambique	Bruschi *et al.* 2011
Fever	Leaf and root infusion and/or decoction taken orally	Mozambique and South Africa	De Wet 2005, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, Quattrocchi 2011
Hypertension	Root decoction prepared mixed with whole plant parts of *Senecio serratuloides* DC.	South Africa	De Wet *et al.* 2016, Ramulondi 2017, Ramulondi *et al.* 2019, Balogun & Ashafa 2019, Aumeeruddy & Mahomoodally 2020, Van Vuuren *et al.* 2022
Improving sexual performance in men	Rhizome and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, De Wet & Van Wyk 2013
Influenza	Rhizome and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Quattrocchi 2011
Intestinal complications	Leaf infusion taken orally	Mozambique and South Africa	Izidine 2003, Hawkes *et al.* 2011
Menstrual pain	Rhizome and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Hawkes *et al.* 2011, Quattrocchi 2011, De Wet & Van Wyk 2013
Moon sickness	Root decoction taken orally	Mozambique	Bruschi *et al.* 2011
Prenatal care	Root decoction taken orally	South Africa	De Wet & Van Wyk 2008
Sores	Rhizome and root ash applied topically	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Quattrocchi 2011
Stomach problems	Root infusion taken orally	South Africa	De Wet 2005, De Wet & Van Wyk 2008, Latolla 2017
Stomach problems in babies	Leaf and root decoction taken orally	South Africa	De Wet & Van Wyk 2008, De Wet & Van Wyk 2013
Vomiting	Rhizome and root infusion taken orally	South Africa	De Wet 2005, De Wet *et al.* 2007, de Ruijter 2008b, De Wet & Van Wyk 2008, Quattrocchi 2011

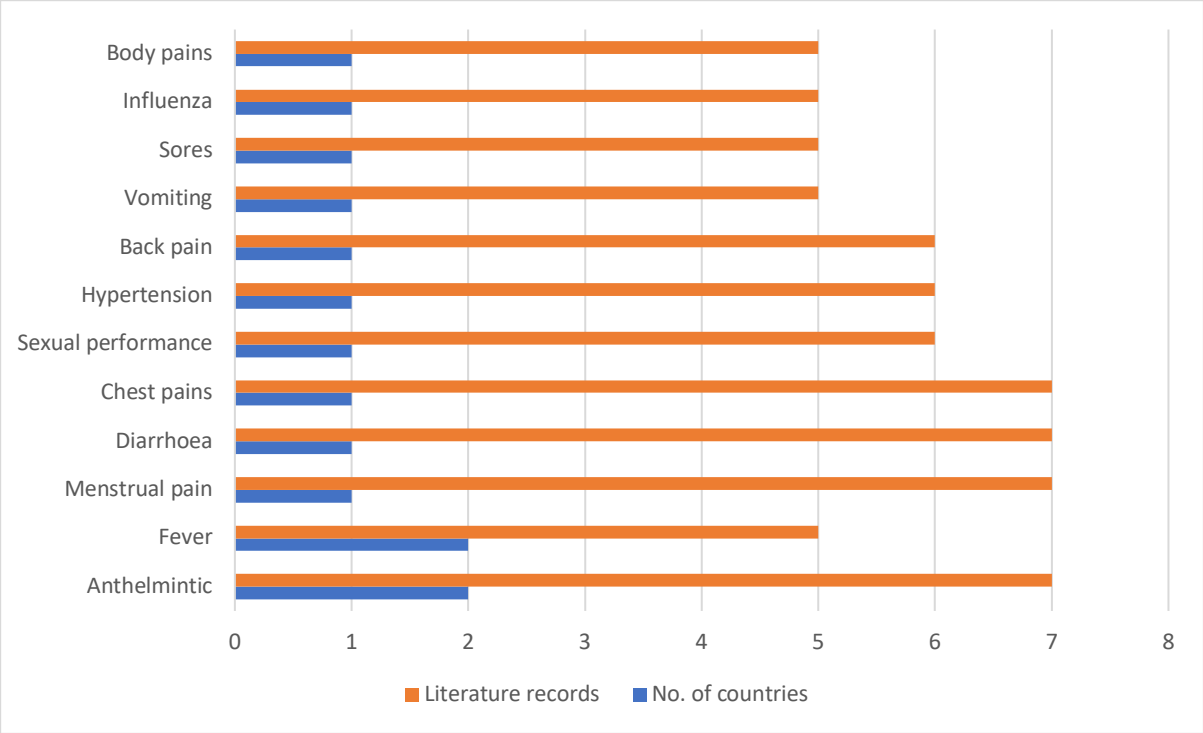

Figure 3. Medicinal uses of *Albertisia delagoensis* in Mozambique and South Africa

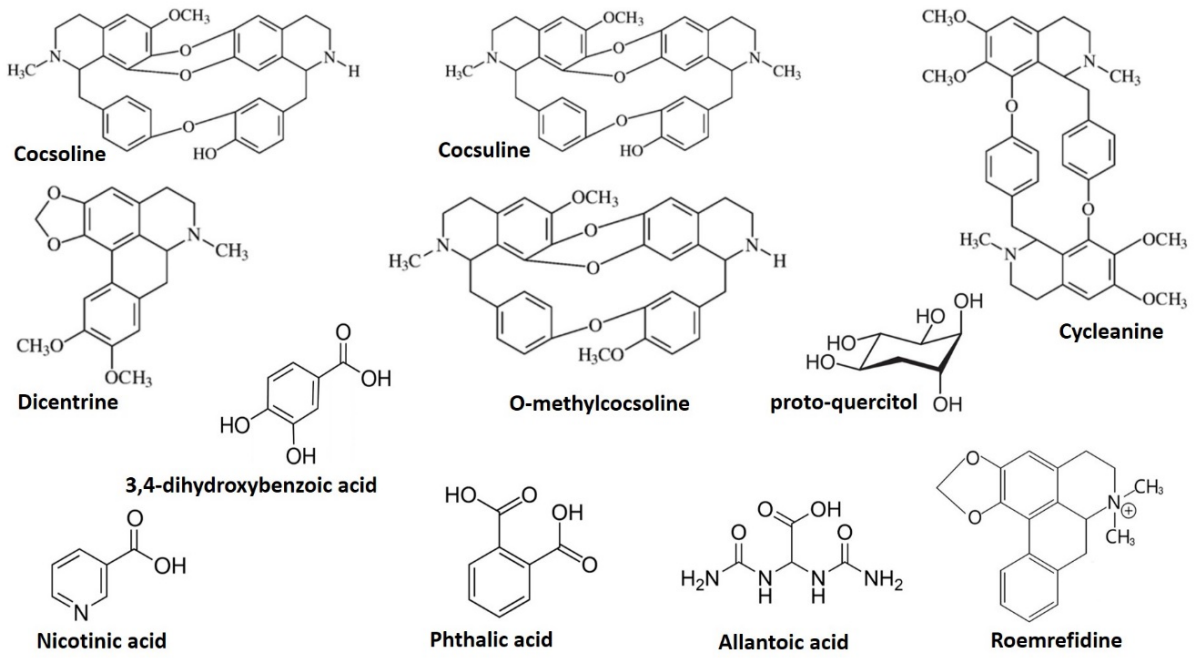

Figure 4 Chemical structures of phytochemical compounds isolated from the leaves and rhizomes of *Albertisia delagoensis*

De Wet (2005) and De Wet *et al.* (2007) evaluated the antiplasmodial activities of methanol extracts of *A. delagoensis* leaves and rhizomes against the chloroquine-resistant Gambian FCR-3 strain of *Plasmodium falciparum* using the tritiated [^{3}H]-hypoxanthine incorporation assay with chloroquine and quinine as positive controls. The leaf and rhizome extracts exhibited activities against the tested pathogen with half maximal inhibitory concentration (IC_{50}) values of 4.1 µg/ml and 1.6 µg/ml, respectively (De Wet 2005, De Wet *et al.* 2007). Similarly, Zyl *et al.* (2009) evaluated the antiplasmodial activities of the methanol extracts of *A. delagoensis* leaves and rhizomes against a chloroquine-resistant *Plasmodium falciparum* strain using the [^{3}H]-hypoxanthine incorporation assay. The

extract exhibited activities at a concentration of less than 5.0 µg/ml (Zyl *et al.* 2009). The antiplasmodial activities exhibited by the leaves and rhizomes of *A. delagoensis* corroborate some of the medicinal applications of the species.

De Wet *et al.* (2007) evaluated the cytotoxicity activities of methanol extracts of *A. delagoensis* leaves and rhizomes against the giant cell tumour lung cancer cells and Graham cells (transformed human kidney epithelium cells) using the MTT (3-[4,5-dimethylthiazol-2yl]-2,5-diphenyltetrazolium bromide) cellular viability assay. The leaf and rhizome extracts exhibited activities on Graham cells with IC_{50} values of 200.0 µg/ml and 166.0 µg/ml, respectively (De Wet *et al.* 2007). De Wet (2005) and De Wet *et al.* (2009) also evaluated the cytotoxicity activities of crude alkaloidal extracts isolated from the leaves *A. delagoensis* using UACC62 (melanoma), MCF7 (breast) and TK10 (renal) cancer cell lines with 5-fluorouracil and adriamycin as positive controls. The crude alkaloid extract exhibited activities with total growth inhibition (TGI) and the GI_{50} (concentration required for 50% inhibition of cell growth) values lower than 6.25 µg/ml (De Wet 2005, De Wet *et al.* 2009). Earlier pharmacological investigations conducted by Rondanelli *et al.* (1986a,b) showed that the alkaloids isolated from *A. delagoensis* exhibited activities against continuous cell lines (VERO cells). Ramulondi *et al.* (2019) evaluated the cytotoxicity of the dichloromethane : methanol and aqueous extracts of *A. delagoensis* roots mixed with *Senecio serratuloides* whole plant extracts using the brine shrimp lethality assay with potassium dichromate as a positive control. The plant combinations increased toxicity at 4.0 mg/ml (Ramulondi *et al.* 2019).

Conclusion

This review established the traditional uses of *A. delagoensis* as food and herbal medicine. The species demonstrated diverse food and medicinal applications. *Albertisia delagoensis* contains several secondary metabolites that are pharmacologically and pharmaceutically valuable. The species also demonstrated some pharmacological activities such as antiplasmodial and cytotoxicity which need further investigation. Further research should focus on detailed pharmacological research, *in vivo* and clinical studies, as well as toxicological evaluations. The results obtained are promising and this species should be explored further to decipher its true ethnobotanical values and pharmacological worth.

Declarations

List of abbreviations: GI_{50} = concentration required for 50% inhibition of cell growth; IC_{50} = half maximal inhibitory concentration; MTT = 3-[4,5-dimethylthiazol-2yl]-2,5-diphenyltetrazolium bromide; RDA = recommended dietary allowance; TGI = total growth inhibition
Ethics approval: None, because it is a review article
Consent for publication: Not applicable
Availability of data and materials: None
Competing interests: The author declares that he has no conflict of interest.
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Authors' contributions: Author conceived the research and wrote the manuscript

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Literature Cited

Albuquerque UP, de Medeiros PM, Ramos MA, Júnior WSF, Nascimento ALB, Avilez WMT, de Melo JG. 2014. Are ethnopharmacological surveys useful for the discovery and development of drugs from medicinal plants? Revista Brasileira de Farmacognosia-Brazilian Journal of Pharmacognosy 24(2014): 110-115.

Andrade-Cetto A, Heinrich M. 2011. From the field into the lab: useful approaches to selecting species based on local knowledge. Frontiers in Pharmacology 2: 20.

Arenas P, Giberti GC. 1987. The ethnobotany of *Odontocarya asarifolia* (Menispermaceae), an edible plant from the Chaco. Economic Botany 41:361-369.

Arnold TH, Prentice CA, Hawker LC, Snyman EE, Tomalin M, Crouch NR, Pottas-Bircher C. 2002. Medicinal and Magical Plants of Southern Africa: An Annotated Checklist. Strelitzia, vol. 13. National Botanical Institute, Pretoria.

Aumeeruddy MZ, Mahomoodally MF. 2020. Traditional herbal therapies for hypertension: A systematic review of global ethnobotanical field studies. South African Journal of Botany 135:451-464.

Balogun FO, Ashafa AOT. 2019. A review of plants used in South African traditional medicine for the management and treatment of hypertension. Planta Medica 85:312-334.

Bohra P, Waman AA, Roy TK, Shivashankara KS. 2020. Blood fruit (*Haematocarpus validus* (Miers.) Bakh. f. ex Forman): A novel source of natural food colourant. Journal of Food Science and Technology 57:381-389.

Bohra P, Waman AA, Basantia D, Devi HL, Reang E. 2018. Domestication and conservation efforts in *Haematocarpus validus* (Miers.) Bakh. f. ex Forman (Menispermaceae). Current Science 115:1098-1105.

Bruschi P, Morganti M, Mancini M, Signorini MA. 2011. Traditional healers and laypeople: A qualitative and quantitative approach to local knowledge on medicinal plants in Muda (Mozambique). Journal of Ethnopharmacology 138:543-563

Christenhusz, MJM, Byng JW. 2016. The number of known plants species in the world and its annual increase. Phytotaxa 261:201-217.

Cordell GA, Colvard MD. 2005. Some thoughts on the future of ethnopharmacology. Journal of Ethnopharmacology 100:5-14

de Ruijter A. 2008a. *Albertisia cordifolia* (Mangenot & J.Miège) Forman. In: Schmelzer GH, Gurib-Fakim A (Eds.), Plant Resources of Tropical Africa 11: Medicinal Plants 1. PROTA Foundation, Backhuys Publishers, Leiden, pp. 54-55.

de Ruijter A. 2008b. *Albertisia delagoensis* (N.E.Br.) Forman. In: Schmelzer GH, Gurib-Fakim A (Eds.), Plant Resources of Tropical Africa 11: Medicinal Plants 1. PROTA Foundation, Backhuys Publishers, Leiden, pp. 55-56.

de Ruijter A. 2008c. *Albertisia villosa* (Exell) Forman. . In: Schmelzer GH, Gurib-Fakim A (Eds.), Plant Resources of Tropical Africa 11: Medicinal Plants 1. PROTA Foundation, Backhuys Publishers, Leiden, pp. 56-57.

de Wet H. 2005. An Ethnobotanical and Chemotaxonomic Study of South African Menispermaceae. PhD thesis, University of Johannesburg, Johannesburg.

De Wet H, Ramulondi M, Ngcobo ZN. 2016. The use of indigenous medicine for the treatment of hypertension by a rural community in northern Maputaland, South Africa. South African Journal of Botany 103:78-88.

De Wet H, Fouche G, Van Heerden FR. 2009. *In vitro* cytotoxicity of crude alkaloidal extracts of South African Menispermaceae against three cancer cell lines. African Journal of Biotechnology 8:3332-3335.

De Wet H, Van Wyk B-E. 2008. An ethnobotanical survey of southern African Menispermaceae. South African Journal of Botany 74:2-9.

De Wet H, Van Wyk B-E. 2013. Taxonomic notes on the genus *Albertisia* (Menispermaceae) in South Africa and Mozambique. South African Journal of Botany 84:1-5.

De Wet H, Van Heerden FR, Van Wyk B.-E, Van Zyl RL. 2007. Antiplasmodial activity and cytotoxicity of *Albertisia delagoensis*. Fitoterapia 78:420-422.

De Wet H, Van Herden FR, Van Wyk BE. 2005. Alkaloids of *Antizoma miersiana* (Menispermaceae). Biochemical Systematics and Ecology 33:799-807.

De Wet H, Heerden FRV, Van Wyk B-E. 2004. Alkaloids of *Antizoma angustifolia* (Menispermaceae). Biochemical Systematics and Ecology 32:1145-1152.

Fox FW, Norwood Young ME. 1982. Food from the Veld. Delta Books, Johannesburg.

Gelfand M, Mavi S, Drummond RB, Ndemera B. 1985. The Traditional Medical Practitioner in Zimbabwe: His Principles of Practice and Pharmacopoeia. Mambo Press, Gweru.

Glen HF. 2004. Sappi what's in a Name: The Meanings of the Botanical Names of Trees. Jacana Media, Johannesburg.

Hawkes GE, De Wet H, Li J. 2011. Polar compounds isolated from the leaves of *Albertisia delagoensis* (Menispermaceae). Molecules 16:9153-9160.

Hedberg I, Staugård F. 1989. Traditional Medicine in Botswana: Traditional Medicinal Plants. Ipeleng Publishers, Gaborone.

Heinrich M, Gibbons S. 2001. Ethnopharmacology in drug discovery: an analysis of its role and potential contribution. Journal of Pharmacy and Pharmacology 53:425-432.

Heinrich M, Kufer J, Leonti M, Pardo-de-Santayana M. 2006. Ethnobotany and ethnopharmacology: Interdisciplinary links with the historical sciences. Journal of Ethnopharmacology 107:157-160.

Heywood VH. 2011. Ethnopharmacology, food production, nutrition and biodiversity conservation: Towards a sustainable future for indigenous peoples. Journal of Ethnopharmacology 137:1-15.

Izidine SA. 2003. Licuáti Forest Reserve, Mozambique: Flora, Utilization and Conservation. MSc dissertation, University of Pretoria, Pretoria.

Jahan R, Khatun A, Nahar N, Jahan FI, Chowdhury AR, Nahar A, Seraj S, Mahal MJ, Khatun Z, Rahmatullah M. 2010. Use of Menispermaceae family plants in folk medicine of Bangladesh. Advances in Natural and Applied Sciences 4:1-9.

Jacques FMB, Bertolino P. 2008. Molecular and morphological phylogeny of Menispermaceae (Ranunculales). Plant Systematics and Evolution 274:83-97.

Katiyar C, Gupta A, Kanjilal S, Katiyar S. 2012. Drug discovery from plant sources: An integrated approach. Ayu 33: 10-19.

Kumar D, Badoni R, Semwal R, Kumar S, Jas G, Singh P, Rawat U. 2010. The genus Stephania (Menispermaceae): Chemical and pharmacological perspectives. Journal of Ethnopharmacology 132:369-383.

Latolla N. 2017. The Investigation of Chemical Variation in the Stems and Rhizomes of *Cissampelos capensis* L. f. (Menispermaceae) the Eastern Cape Medicinal Plant. MSc Dissertation, Nelson Mandela Metropolitan University, Port Elizabeth.

Leonti M, Stafford GI, Cero MD, Cabras S, Castellanos ME, Casu L, Weckerle CS. 2017. Reverse ethnopharmacology and drug discovery. Journal of Ethnopharmacology 198: 417-431.

Logesh R, Das N, Adhikari-Devakota A, Devakota HP. 2020. *Cocculus hirsutus* (L.) W.Theob. (Menispermaceae): A review on traditional uses, phytochemistry and pharmacological activities. Medicines 7:69.

Lohombo-Ekomba ML, Okusa PN, Penge O, Kabongo C, Iqbal Choudhary M, Kasende OE. 2004. Antibacterial, antifungal, antiplasmodial, and cytotoxic activities of *Albertisia villosa*. Journal of Ethnopharmacology 93:331-335.

Mander M, Diedericks N, Steytler N. 2006. Marketing of medicinal plants and products. In: Diedericks N (Ed.), Commercialising Medicinal Plants: A Southern African Guide. Sun Press, Stellenbosch, pp. 167-192.

Meenu MT, Radhakrishnan KV. 2020. Menispermaceae family of plants and its action against infectious diseases: A review. Mapana Journal of Sciences 19:33-71.

Menachery MD. 1996. The alkaloids of South American Menispermaceae. In: Pelletier SW (Ed.), Alkaloids: Chemical and Biological Perspectives. Pergamon, New York, pp. 269-302.

Momin KC, Sangma AN, Suresh CP, Singh YS, Rao SR. 2018. Blood fruit [*Haematocarpus validus* (Miers) Bakh. f. ex Forman] a potential nutraceutical and therapeutic fruit plant. International Journal of Minor Fruits Medicinal and Aromatic Plants 4:44-49

Ntuli N.R. 2019. Nutrient content of scarcely known wild leafy vegetables from northern KwaZulu-Natal, South Africa. South African Journal of Botany 127:19-24.

Ntuli NR, Tongoona P, Madakadze RM, Zobolo AM. 2011. Utilization of wild plant species for vegetables in northern KwaZulu-Natal, South Africa. South African Journal of Botany 77:549.

Ntuli NR, Zobolo AM, Siebert SJ, Madakadze RM. 2012. Traditional vegetables of northern KwaZulu-Natal, South Africa: Has indigenous knowledge expanded the menu? African Journal of Agricultural Research 7:6027-6034.

Ortiz RDC, Kellogg EA, Van der Werff H. 2007. Molecular phylogeny of the moonseed family (Menispermaceae): Implications for morphological diversification. American Journal of Botany 94:1425-1438.

Otshudi AL, Apers S, Pieters L, Claeys M, Pannecouque C, De Clercq E, Van Zeebroeck A, Lauwers S, Frédérich M, Foriers A. 2005. Biologically active bisbenzylisoquinoline alkaloids from the root bark of *Epinetrum villosum*. Journal of Ethnopharmacology 102:89-94.

Peters CR, O'Brien EM, Drummond RB. 1992. Edible Wild Plants of Sub-Saharan Africa. Royal Botanic Gardens, Kew, Richmond.

Pooley E. 1998. A Field Guide to Wild Flowers of KZN and the Eastern Region. Natal Flora Publications, Durban.

Quattrocchi U. 2011. CRC World Dictionary of Plant Names: Common Names, Scientific Names, Eponyms, Synonyms and Etymology. CRC Press, Boca Raton.

Ramulondi M. 2017. Toxicology and Herb-Drug Interaction of Selected Anti-Hypertension Plants Used by Lay Persons in Northern Kwazulu-Natal (South Africa). MSc Dissertation, University of Zululand, KwaDlangezwa.

Ramulondi M, De Wet H, Van Vuuren S. 2019. Toxicology of medicinal plants and combinations used in rural northern KwaZulu-Natal (South Africa) for the treatment of hypertension. Journal of Herbal Medicine 16:100251.

Roberts M. 2014. Healing Foods. Briza Publications, Pretoria.

Roberts M, Roberts S. 2017. Indigenous Healing Plants. Briza Publications, Pretoria.

Rondanelli R, Guaglio R, Guarnone E, Brè E, Olliaro P, Benzi CR. 1986a. Cytotoxic activity of some alkaloids from *Epinetrum delagoense* Diels: Electron microscopy studies. II. Farmaco 41:190-196.

Rondanelli R, Guaglio R, Sartirana E, Zizzi E, Olliaro P, Benzi CR. 1986b. Evaluation of the cytotoxic activity of some alkaloids from *Epinetrum delagoense* Diels. I. Farmaco 41:185-189.

Schmelzer GH, Gurib-Fakim A. 2008. Plant Resources of Tropical Africa 11: Medicinal Plants 1. Backhuys Publishers, Leiden.

Semwal DK, Badoni R, Semwal R, Kothiyal SK, Singh GJ, Rawat U. 2010. The genus *Stephania* (Menispermaceae): Chemical and pharmacological perspectives. Journal of Ethnopharmacology 132:369-383.

Süntar I. 2020. Importance of ethnopharmacological studies in drug discovery: Role of medicinal plants. Phytochemistry Reviews 19:1199-1209.

Van Vuuren SF, Motlhatlego KE, Netshia V. 2022. Traditionally used polyherbals in a southern African therapeutic context. Journal of Ethnopharmacology 288:114977.

Van Wyk B-E. 2011. The potential of South African plants in the development of new medicinal products. South African Journal of Botany 77:812-829.

Van Wyk B-E. 2015. A review of commercially important African medicinal plants. Journal of Ethnopharmacology 176:118-134.

Van Wyk B-E. 2017. A review of African medicinal and aromatic plants. In Neffati M, Najjaa H, Máthé Á (Eds.), Medicinal and Aromatic Plants of the World: Africa. Volume 3. Springer, Dordrecht, pp. 19-60.

Van Wyk B-E, Gericke N. 2018. People's Plants: A Guide to Useful Plants of Southern Africa. Briza Publications, Pretoria.

Van Wyk B-E, Wink M. 2015. Phytomedicines, Herbal Drugs and Plants Poisons. Briza Publications, Pretoria.

Van Wyk B-E, Wink M. 2017. Medicinal Plants of the World: An Illustrated Scientific Guide to Important Medicinal Plants and their Uses. Briza Publications, Pretoria.

Van Wyk B-E, Van Oudtshoorn B, Gericke N. 2013. Medicinal Plants of South Africa. Briza Publications, Pretoria.

Viljoen A, Chen W, Mulaudzi N, Kamatou G, Sandasi M. 2022. Phytochemical Profiling of Commercially Important South African Plants. Academic Press, London.

Von Altschul SR. 1973. Drugs and Foods from Little-Known Plants. Notes Herbaria, Harvard University Press, Cambridge.

Welcome AK, Van Wyk B-E. 2019. An inventory and analysis of the food plants of southern Africa. South African Journal of Botany 122:136-179.

Wen-Yen L. 1975. A preliminary study of Menispermaceous medicinal plants in China. Journal of Systematics and Evolution 13:32-55.

Wiart C. 2021. Medicinal plants in Asia and pacific for parasitic infections: Botany, ethnopharmacology, molecular basis and future prospects. Academic Press, London.

Xu Z, Deng M. (2017) Menispermaceae. In: Xu Z, Deng M (Eds.), Identification and Control of Common Weeds: Volume 2. Springer, Dordrecht, pp. 405-413

Zyl RLV, De Wet H, Van Wyk B-E, Van Heerden FR. 2009. Antimalarial activity of thirteen South African Menispermaceae species. Planta Medica 75:11-11.