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Revisión / Review

Plant species from the Euphorbiaceae (spurge) family used for medicinal purposes in Zimbabwe: A review

[Especies de plantas de la familia Euphorbiaceae (tártago) utilizadas con fines medicinales en Zimbabue: Una revisión]

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Abstract: The present review was aimed at documenting medicinal uses of species of the Euphorbiaceae family in Zimbabwe. Literature was collected from online databases such as BioMed Central, Web of Science, Springerlink, Google Scholar, Scielo, PubMed, Science Direct, ACS Publications, Scopus and JSTOR. This study showed that 29 species are used to manage human and animal diseases in Zimbabwe. These species are used against 49 medical conditions, mainly as ethnoveterinary medicine (21 use reports), and traditional medicine against respiratory (23 use reports), gastro-intestinal (14 use reports), male reproductive (11 use reports), antenatal and postpartum (10 use reports each) and sexually transmitted infections (9 use reports). *Acalypha brachiata*, *Bridelia cathartica*, *B. mollis*, *Croton megalobotrys*, *Euphorbia ingens*, *E. matabelensis*, *Flueggea virosa*, *Monadenium lugardiae*, *Pseudolachnostylis maprouneifolia*, *Ricinus communis* and *Spirostachys africana* have the highest number of medicinal uses. There is need to unravel the therapeutic potential of the family through further ethnopharmacological research.

Keywords: Ethnobotany, Euphorbiaceae, Phyllanthaceae, Phytochemistry, Zimbabwe

Resumen: La presente revisión tuvo como objetivo documentar los usos medicinales de especies de la familia Euphorbiaceae en Zimbabwe. La literatura se recopiló de bases de datos en línea como BioMed Central, Web of Science, Springerlink, Google Scholar, Scielo, PubMed, Science Direct, ACS Publications, Scopus y JSTOR. Este estudio mostró que se utilizan 29 especies para el tratamiento de enfermedades humanas y animales en Zimbabwe. Estas especies se utilizan para tratar 49 condiciones médicas, principalmente como medicina etnoveterinaria (21 informes de uso), y medicina tradicional para enfermedades respiratorias (23 informes de uso), gastrointestinales (14 informes de uso), reproductivas masculinas (11 informes de uso), prenatales y posparto (10 informes de uso cada una) e infecciones de transmisión sexual (9 informes de uso). *Acalypha brachiata*, *Bridelia cathartica*, *B. mollis*, *Croton megalobotrys*, *Euphorbia ingens*, *E. matabelensis*, *Flueggea virosa*, *Monadenium lugardiae*, *Pseudolachnostylis maprouneifolia*, *Ricinus communis* y *Spirostachys africana* son las especies con mayor número de usos medicinales. Es necesario desvelar el potencial terapéutico de esta familia a través de futuras investigaciones etnofarmacológicas.

Palabras clave: Ethnobotánica; Euphorbias; Phyllanthaceas; Fitoquímica; Zimbabwe

INTRODUCTION

The Euphorbiaceae family, commonly referred to as the spurge family is well-known in terms of its species used as sources of traditional medicines. Moreover, the Fabaceae, Lamiaceae, Euphorbiaceae, Apocynaceae, Malvaceae, Apiaceae and Ranunculaceae families are listed as being the medicinally most important plant families on a worldwide scale (Phumthum *et al.,* 2019). The Euphorbiaceae family includes approximately 6200 species in 200 genera which are mostly trees, shrubs, herbs, climbers and succulents recorded throughout the world except the cold alpine and arctic regions (Koekemoer *et al.,* 2014; Christenhusz & Byng, 2016). Extensive phylogenetic studies focusing on family Euphorbiaceae *sensu lato* (Wurdack *et al.*, 2004; Wurdack *et al.,* 2005; Hoffmann *et al.*, 2006; Tokuoka, 2007; APG, 2009) have supported recognition of five segregates, that is, Euphorbiaceae *sensu stricto*, Pandaceae, Phyllanthaceae, Picrodendraceae and Putranjivaceae. There is growing interest in the ethnopharmacological aspects of the Euphorbiaceae *sensu lato* such as medicinal, phytochemical constituents, biological activities and toxicity (Abdel-Fattah, 1987; Seigler, 1994; Wiart, 2006; Mwine & Van Damme, 2011; Rahman & Akter, 2013; de Souza & Alves, 2014; Neeraj & Lal, 2019; Munawaroh *et al.,* 2020; Benjamaa *et al.*, 2022). The present review attempts to collate the available information on the medicinal uses and value of species of the Euphorbiaceae *sensu lato* family in Zimbabwe. It is hoped that this review may provide scientific basis that explain the ethnopharmacological uses of the Euphorbiaceae *sensu lato* family in order to facilitate and guide future research. Such studies are important in order to identify highly valuable or under-investigated taxa that may serve as a basis for drug lead discovery programmes.

MATERIALS AND METHODS

Literature search on the Euphorbiaceae species used as traditional medicines in Zimbabwe was conducted from September 2022 to March 2023. This information was retrieved from different online databases such as BioMed Central, Web of Science, Springerlink, Google Scholar, Scielo, PubMed, Science Direct, ACS Publications, Scopus and JSTOR. In addition to this, pre-electronic sources such as books, journal articles, dissertation, book chapters, theses and other scientific articles obtained from the University library were used. Keywords and terminologies such as Zimbabwe, ethnobotany, ethno-medicine, ethno-pharmacology, indigenous, medicine, phytomedicine, traditional medicine, Zimbabwean Euphorbiaceae, Zimbabwean Phyllanthaceae, medicinal Euphorbiaceae, medicinal Phyllanthaceae, Zimbabwean traditional medicine, Euphorbiaceae and Phyllanthaceae were used to search for relevant articles as shown in the PRISMA flow diagram (Figure No. 1). From each article, the following information was collected: scientific names of the plant species, growth form, plant part(s) used, method of preparation and medicinal uses. The medicinal use categories were classified following the Economic Botany Data Collection Standard (Cook, 1995). The scientific names of the Euphorbiaceae species from original data sources were updated to recently accepted names according to the Plants of the World Online website (POWO, 2023).

RESULTS AND DISCUSSION

Medicinal plant diversity

This study recorded 29 species traditionally used to manage and treat human and animal diseases in Zimbabwe (Table No. 1). Of these, 25 species are indigenous to Zimbabwe (86.21%), while 4 species which include *Euphorbia hirta* L., *E. tirucalli* L., *Jatropha curcas* L. and *Ricinus communis* L. are exotic, either naturalized as weeds or cultivated in home gardens and agricultural fields as hedge, source of oil or ornamental (Maroyi, 2006). About three quarters of the recorded species (72.41%) belong to the Euphorbiaceae *sensu stricto* while eight species (27.59%) belong to the Phyllanthaceae. Plant species used as sources of traditional medicines belonging to the Phyllanthaceae include *Antidesma membranaceum* Muell. Arg., *Bridelia cathartica* G. Bertol., *B. micrantha* (Hochst.) Baill., *B. mollis* Hutch., *Flueggea virosa* (Roxb. ex Willd.) Voigt, *Margaritaria discoidea* (Baill.) G.L. Webster, *Pseudolachnostylis maprouneifolia* Pax and *Uapaca kirkiana* Müll. Further discussions on documented species used as sources of traditional medicines will not emphasize the segregates as only Euphorbiaceae *sensu stricto* and Phyllanthaceae have been identified and moreover the Zimbabwean literature focusing on plant taxonomy and ethnobotany of the country (Gelfand *et al.,* 1985; Palgrave, 2002; Mapaura & Timberlake, 2004) does not categorize members of

the Euphorbiaceae *sensu lato* into the five segregates, that is, Euphorbiaceae *sensu stricto*, Pandaceae, Phyllanthaceae, Picrodendraceae and Putranjivaceae.

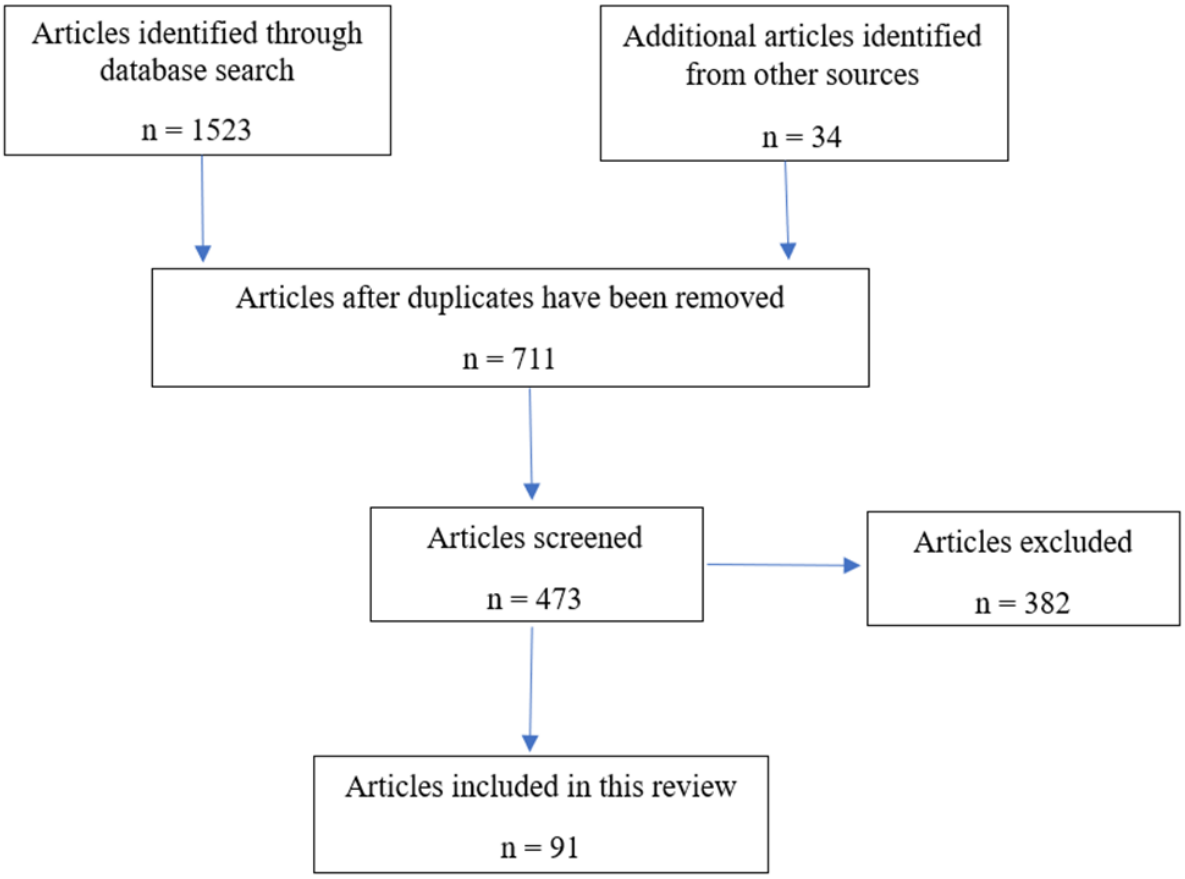

Figure No. 1
Flow diagram showing identification and screening of articles used in this review

Table No. 1
Medicinal Euphorbiaceae plants of Zimbabwe

Plant species	Local names: E = English, H = Hlengwe, N = Ndebele, Nd = Ndau, S = Shona and T = Tonga	Habit	Parts used	Uses	References
Acalypha allenii Hutch.	None found	Herb	Roots	Antenatal, diarrhoea and oedema	Gelfand *et al*., 1985 Schmelzer, 2008a
Acalypha brachiata C. Krauss	Heart-leaved brooms (E), ubukubelo (N) and chitambura	Herb	Roots	Abdominal pains, asthma, depressed fontanelle, diarrhoea, fattening infants, itching body, infertility in men and wounds	Chinemana *et al*., 1985 Gelfand *et al*., 1985 Mavi, 1996 Schmelzer, 2008a

	(S)				
Acalypha caperonioides Baill.	Chimunamato (S)	Herb	Leaves	Fattening infants	Gelfand *et al*., 1985
Acalypha petiolaris Hochst.	Heart-leaved brooms (E), ubukubelo(N) and chitambura (S)	Herb	Roots	Asthma, neuralgia, rheumatism and sterility in men	Nyagumbo *et al*., 2022 Schmelzer, 2008a Watt et al., 2008 Wild & Gelfand, 1959
Androstachys johnsonii Prain	Lebombo ironwood (E) and musimbiti (S)	Tree	Roots	Aphrodisiac	Chigora *et al*., 2007 Maroyi, 2013
Antidesma membranaceum Muell. Arg.	Pink tassle-berry (E) and mungamunyu (S)	Shrub	Leaves and roots	Cough	Gelfand *et al*., 1985 Nyagumbo *et al*., 2022
Bridelia cathartica G.Bertol.	Knobby bridelia (E), mupurungu and mutsvitsvirondo (S)	Tree	Roots	Diarrhoea, epilepsy, erectile dysfunction, headache, infertility in men and menstrual problems	Chinemana *et al*., 1985 Maroyi, 2011 Maroyi, 2013 Maroyi, 2018a Shopo et al., 2022 Wild & Gelfand, 1959
Bridelia micrantha (Hochst.) Baill.	Mitzeerie (E) and mutugusi (S)	Tree	Leaves and roots	Abortifacient and cough	Gelfand *et al*., 1985 Maroyi, 2017a
Bridelia mollis Hutch.	Velvet-leaved bridelia (E), satima (H), umgojomba (N) and musosoriondo (S)	Tree	Bark, leaves and roots	Cough, diarrhoea, skin blisters, stomach pains, and bloat and lumpy skin in livestock	Chinemana *et al*., 1985 Gumbochuma *et al*., 2013 Jambwa & Nyahangare, 2020 Maroyi, 2012b Maroyi, 2013 Maroyi, 2019 McGregor, 1991 Nyagumbo *et al*., 2022
Croton gratissimus Burch.	Lavender croton (E), inkiza emhlope (N) and mufarata (S)	Shrub	Bark, leaves, roots and twigs	Respiratory disorders and ectoparasites such as lice	Cimponda & Mukanganyama, 2010 Jambwa & Nyahangare, 2020 Maroyi, 2021 Nyagumbo *et al*., 2022 Nyahangare *et al*., 2015 Nyahangare, 2019 Nyahangare *et al*., 2019
Croton megalobotrys Müell. Arg.	Feverberry (E)	Tree	Bark and roots	Abortifacient, dropsy, infertility in women, purgative and swelling of testicles	Gelfand *et al*., 1985

Euphorbia cooperi N.E.Br. ex A.Berger	Candelabra euphorbia (E), umhlonhlo (N) and chihacha (S)	Tree	Twigs	Ectoparasites such as fleas	Maroyi, 2021 Nyahangare, 2019 Nyahangare *et al*., 2015
Euphorbia griseola Pax.	Umhlonhlwane (N) and mukondekonde (S)	Tree	Not specified	Ectoparasites	Nyahangare *et al*., 2015
**Euphorbia hirta* L.	None found	Herb	Leaves, leaf sap and latex	Hypertension and sore eyes	Chituku *et al*., 2022 Gelfand *et al*., 1985 Maroyi, 2017a Maroyi, 2018b Mavi, 1996
Euphorbia ingens E. Mey. ex Boiss.	Candelabra tree (E), umhlonho (N) and mukonde (S)	Tree	Latex, roots and stems	Asthma, bronchitis, cough, emetic, pulmonary disorders, purgative and ectoparasites such as fleas and ticks	Gelfand *et al*., 1985 Harvey & Armitage, 1961 Harvey, 1962 Nyagumbo *et al*., 2022 Nyahangare, 2019 Nyahangare *et al*., 2015 Schmelzer, 2008b Wild & Gelfand, 1959
E. ingens	-	-	Latex smoked mixed with bark fibre of *Brachystegia spiciformis* Benth.	Asthma	Gelfand, 1956 Gelfand *et al*., 1985 Wild & Gelfand, 1959
Euphorbia matabelensis Pax	Three-forked euphorbia (E), umhlanziso (N), murimbo (S) and musambamachechec he (T)	Tree	Bark, latex and roots	Abortifacient, antidote, cough, diarrhoea, lactation, purgative, diarrhoea in animals, respiratory infections and diarrhoea in poultry and newcastle disease	Chavhunduka, 1976 Chinemana *et al*., 1985 Gelfand, 1956 Gelfand *et al*., 1985 Hammadi *et al*., 2019 Jambwa & Nyahangare, 2020 Jambwa *et al*., 2023 Masimba *et al*., 2011 Nyagumbo *et al*., 2022 Schmelzer, 2008c
Euphorbia schinzii Pax	None found	Shrub	Roots	Lactation and postpartum	Gelfand, 1965 Wild & Gelfand, 1959
**Euphorbia tirucalli* L.	Rubber euphorbia (E), ingotsha (N) and rusungwe (S)	Tree	Latex, roots and whole plant	Gonorrhoea, sexually transmitted infections (STIs) and used as ethnoveterinary medicine	Gelfand *et al*., 1985 Jambwa, 2021 Jambwa *et al*., 2022 Maroyi, 2017a Maroyi, 2018b

Flueggea virosa (Roxb. ex Willd.) Voigt	Snowberry tree (E), changa-ome (H), umhagawuwe (N), musososoti (Nd) and musososoti (S)	Shrub	Bark, fruits, leaves and roots	Abdominal pains, aphrodisiac, antidote, backache, bronchitis, cancer, contraceptive, cough, depressed fontanelle, diarrhoea, headache, infertility in men and women, intestinal parasites, malaria, menstrual problems, pain, pneumonia, rash, respiratory tract infections, rheumatism, snake bite antidote, swollen legs, syphilis and wounds, and to prevent abortion	Chinemana *et al*., 1985 Chituku *et al*., 2022 Gelfand *et al*., 1985 Harvey & Armitage, 1961 Maroyi, 2013 Nyagumbo *et al*., 2022 Wild & Gelfand, 1959
[#]*Jatropha curcas* L.	Jatropha and physic nut (E)	Shrub	Leaf sap, oil and roots	Abdominal pains, earache, snake bites and ecto-parasites	Maroyi, 2017a Maroyi, 2018b Shopo *et al*., 2022
Macaranga capensis (Baill.) Benth. ex Sim	River macaranga(E) and musoswe (S)	Tree	Roots	Aphrodisiac	Chigora *et al*., 2007 Maroyi, 2013
Margaritaria discoidea (Baill.) G.L. Webster	Bushveld peacock-berry (E)	Shrub	Roots	Pneumonia	Gelfand *et al*., 1985 Nyagumbo *et al*., 2022
Monadenium lugardiae N.E.Br.	Chisvosve (S)	Shrub	Latex and whole plant	Abortifacient, anaesthetic, chest pains, dropsy, emetic, gonorrhoea, halucinations, purgative, rheumatism, ritual purposes, stomach pains, ecto-parasites such as ticks and fleas, and worms in dogs	Brandwijk, 1962 Gelfand *et al*., 1985 Gundidza, 1989 Jambwa & Nyahangare, 2020 Nyagumbo *et al*., 2022 Nyahangare, 2019 Nyahangare *et al*., 2015 Nyahangare *et al*., 2019 Schmelzer, 2008d Watt & Breyer-Brandwijk, 1962
Pseudolachnostylis maprouneifolia Pax	Duiker-berry (E), umqobampunzi (N) and mushozhiwa (S)	Tree	Bark, leaves and roots	Abdominal pains, antidote, antiemetic, aphrodisiac, bilharzia, cancer, convulsions, cough, diarrhoea, dizziness, epistaxis, eye cancer, fever, gonorrhoea, headache, infertility in women, nausea, pneumonia, postpartum, prostration, side pains, skin cancer, skin infections, skin rashes, vomiting and wounds, footrot and blood in urine in cattle	Chavhunduka, 1976 Chinemana *et al*., 1985 Gelfand, 1956 Gelfand *et al*., 1985 Harvey & Armitage, 1961 Jambwa & Nyahangare, 2020 Maroyi, 2012a Matowa *et al*., 2020 Mlilo & Sibanda, 2022 Schmelzer, 2008e Shopo *et al*., 2022 Wild & Gelfand, 1959

P. maprouneifolia	-	-	Roots mixed with those of *Lannea discolor* (Sond.) Engl. and *Grewia monticola* Sond.	Gonorrhoea	Harvey & Armitage, 1961
**Ricinus communis* L.	Castor oil bean (E) and mupfuta (S)	Shrub	Leaves, oil, roots and seeds	Abdominal disorders, abortifacient, antidote, augment labour, backache, bilharzia, blood and colon cancer, cathartic, chest pain, constipation, convulsions, depressed fontanelle, diarrhoea, earache, headache, heart pains, hiccoughs, hysteria, lucky charm, madness, measles, mental problems, oedema, palpitations, pneumonia, purgative, sores, sore eyes, sprains, stomachache, syphilis, toothache and wounds, and haematomata in ruminants, diarrhoea, constipation and external parasites such as ticks	Chaikhyoussef, 2015 Chavhunduka, 1976 Chinemana *et al*., 1985 Chituku *et al*., 2022 Gelfand *et al*., 1985 Harvey, 1962 Jambwa & Nyahangare, 2020 Maroyi, 2013 Maroyi, 2017a Maroyi, 2021 Maroyi, 2018b Maroyi & Matowa *et al*., 2020 Mwale *et al*., 2007 Ndamba *et al*., 1994 Nyagumbo et al., 2022 Nyahangare, 2019 Nyahangare *et al*., 2019 Nyahangare *et al*., 2015 Shopo *et al*., 2022
Schinziophyton rautanenii (Schinz) Radcl.-Sm.	False balsa (E), umgoma (N), mungongoma (S) and muoma (T)	Tree	Bark	Dropsy, herpes and other venereal diseases	Shopo *et al*., 2022
Spirostachys africana Sond.	Tamboti (E), ubande (N) and munhiti (S)	Tree	Bark, latex, roots and wood	Abdominal pains, drive away bad spirits, stomach pains, venereal diseases, ectoparasites such as ticks and septic wounds	Chigora *et al*., 2007 Gelfand *et al*., 1985 Jambwa & Nyahangare, 2020 Maroyi, 2021 Nyahangare, 2019 Nyahangare *et al*., 2015
Tragia okanyua Pax	None found	Climber	Roots	Abdominal pains, babies unable to walk, headache and menstrual problems	Bosch, 2008 Wild & Gelfand, 1959
Uapaca kirkiana Müll.	Mahobohobo (E), muzhanje (S) and umhobohobo (N)	Tree	Bark	Endoparasites in cattle	Maroyi & Chaikhyoussef, 2015

*** = Exotic; # = cultivated or collected from semi-natural landscapes; References: 1 = Gelfand *et al.*, 1985; 2 = Schmelzer, 2008a; 3 = Chinemana *et al.*, 1985; 4 = Mavi, 1996; 5 = Wild & Gelfand, 1959; 6 = Watt & Breyer-Brandwijk, 1962; 7 = Nyagumbo *et al.*, 2022; 8 = Chigora *et al.*, 2007; 9 = Maroyi, 2013; 10 = Maroyi, 2011; 11 = Maroyi, 2018a; 12 = Shopo *et al.*, 2022; 13 = Maroyi, 2017a; 14 = McGregor, 1991; 15 = Maroyi, 2019; 16 = Gumbochuma *et al.*, 2013; 17 = Jambwa & Nyahangare, 2020; 18 = Chimponda & Mukanganyama, 2010; 19 = Nyahangare *et al.*, 2015; 20 = Nyahangare, 2019; 21 = Nyahangare *et al.*, 2019; 22= Maroyi, 2021; 23 = Maroyi, 2018b; 24 = Chituku *et al.*, 2022; 25 = Harvey & Armitage, 1961; 26 = Harvey, 1962; 27 = Schmelzer, 2008b; 28 = Gelfand, 1956; 29 = Chavhunduka, 1976; 30 = Schmelzer, 2008c; 31 = Masimba *et al.*, 2011; 32 = Hammadi *et al.*, 2019; 33 = Jambwa *et al.*, 2023; 34 = Jambwa, 2021; 35 = Jambwa *et al.*, 2022; 36 = Gundidza, 1989; 37 = Schmelzer, 2008d; 38 = Maroyi, 2012a; 39 = Matowa *et al.*, 2020; 40 = Mlilo & Sibanda, 2022; 41 = Schmelzer, 2008e; 42 = Ndamba *et al.*, 1994; 43 = Mwale *et al.*, 2007; 44 = Maroyi & Cheikhyoussef, 2015; 45 = Bosch, 2008**

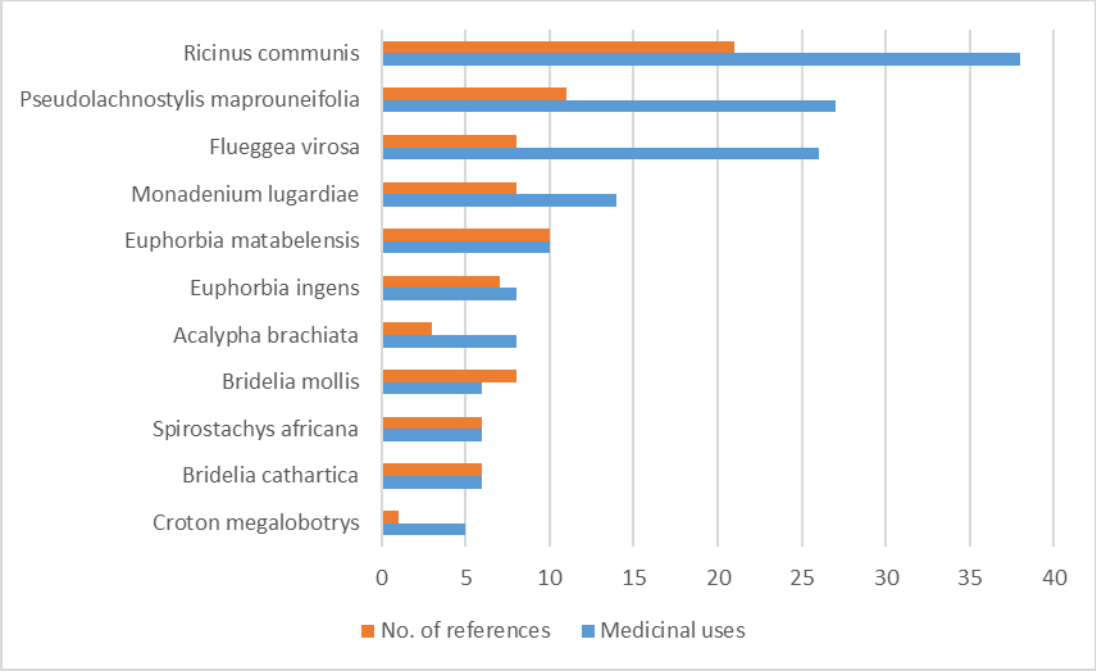

Figure No. 2
Numbers of medicinal uses and references of Euphorbiaceae species used as traditional medicines in Zimbabwe

Euphorbia is the genus with the highest number of medicinal taxa with seven species followed by *Acalypha* with four species and *Bridelia* with three species (Table No. 1). *Ricinus communis* L. is the species with the highest number of medicinal uses and literature records, followed by *P. maprouneifolia* and *F. virosa* (Figure No. 2). These results are corroborated by research conducted in Botswana (Hedberg & Staugård, 1989), South Africa (Arnold *et al.*, 2002; Moffett, 2010; Van Wyk *et al.*, 2013) and tropical Africa (Schmelzer & Gurib-Fakim, 2008). Species such as *Acalypha allenii* Hutch., *A. brachiata* C. Krauss, *A. petiolaris* Hochst., *B. cathartica*, *B. micrantha*, *B. mollis* Hutch., *Croton megalobotrys* Müell. Arg., *Euphorbia cooperi* N.E.Br. ex A. Berger, *E. hirta*, *E. ingens* E. Mey. ex

Boiss., *E. matabelensis* Pax, *E. tirucalli*, *F. virosa*, *Monadenium lugardiae* N.E.Br., *P. maprouneifolia*, *R. communis* and *Spirostachys africana* Sond. are listed in monographs such as Traditional medicinal plants: Traditional medicine in Botswana (Hedberg & Staugård, 1989), Medicinal and magical plants of southern Africa: An annotated checklist (Arnold *et al.*, 2002), Plant resources of tropical Africa 11(1): Medicinal plants 1 (Schmelzer & Gurib-Fakim, 2008) and Sesotho plant and animal names and plants used by the Basotho (Moffett, 2010) and Medicinal plants of southern Africa (Van Wyk *et al.*, 2013).

Growth habit and parts used

Trees (52.0%), followed by shrubs (28.0%) and herbs (17.0%) are the primary sources of the medicinal Euphorbiaceae species in Zimbabwe (Figure No. 3A). The plant parts used for traditional medicine preparations are bark, fruits, latex, leaves, leaf sap, oil, roots, seeds, stems, whole plant parts and wood (Table No. 1). The roots are the most frequently used (23 species), followed by bark and leaves (9 species each) and latex (7 species) (Figure No. 3B). However, harvesting of roots of herbaceous plants for medicinal purposes is not sustainable as it threatens the survival of these plants used to treat human and animal diseases. It is well recognized by conservationists that medicinal plants primarily valued for their root parts and those which are intensively harvested for their bark often tend to be the most threatened by over-exploitation (Maroyi, 2012b). Three *Euphorbia* species documented in this study, namely, *E. cooperi*, *E. griseola* Pax and *E. schinzii* Pax are of conservation concern and are listed in the Zimbabwean Red Data List as these species are threatened with extinction mainly due to decline in area of occupancy, extent of occurrence and/or quality of habitat (Mapaura & Timberlake, 2002).

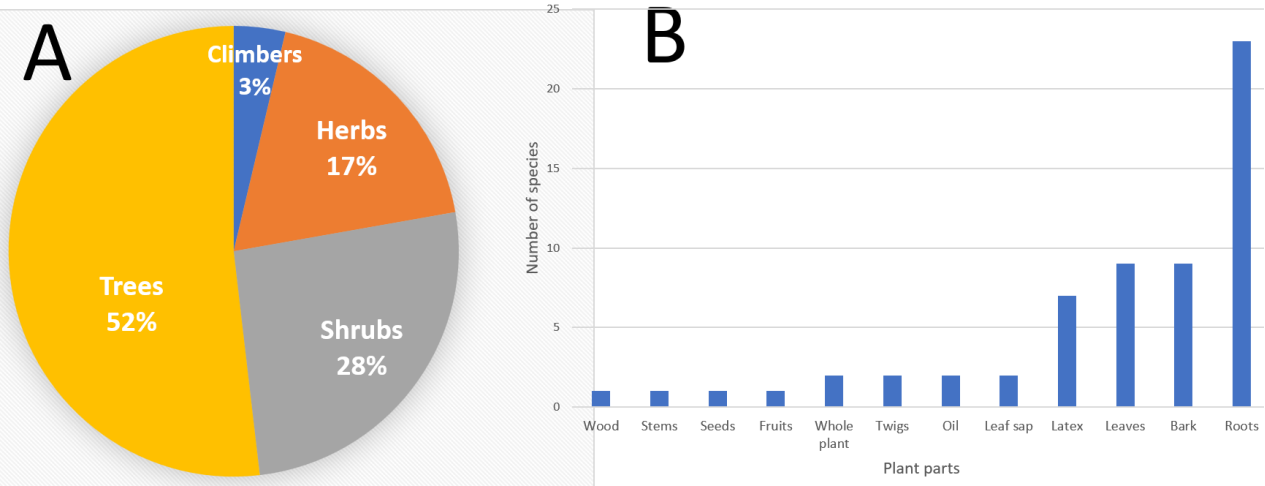

Figure No. 3
Characteristics of Euphorbiaceae species used as traditional medicines in Zimbabwe. A: Growth habit represented in pie diagram and B: Plant parts used represented in bar chart

Use categories with high numbers of use reports

The 49 medical reports of Euphorbiaceae species in Zimbabwe (Tables No. 1 and No. 2) are classified into 19 major health disorder categories following the International Classification of Primary Care classification system (Cook, 1995). Most use records are in respiratory problems (23 use reports), followed by ethnoveterinary medicine (21 use reports), gastro-intestinal problems (14 use reports), male reproductive problems (11 use reports), antenatal and postpartum (10 use reports each) and sexually transmitted infections (9 use reports) (Table No. 2). The categories gastro-intestinal problems, reproductive problems, respiratory problems and sexually transmitted infections are among the ten major causes of death in Zimbabwe (Nyabani, 2021).

Narayan & Donnenfeld (2016) argued that sub-Saharan Africa suffers from a disproportionate share of deaths and disability caused by communicable diseases such as respiratory problems, diarrhoeal disease, malaria and human immunodeficiency virus (HIV)/acquired immunodeficiency diseases (AIDS). Therefore, local people in Zimbabwe have developed knowledge and skills necessary to exploit medicinal plants from the surrounding environment against some of these diseases or ailments.

Table No. 2

Major disease categorises of Euphorbiaceae species used as traditional medicines in Zimbabwe

Disease category	Use records
Abdominal pains	7
Antenatal and postpartum	10
Antidote	5
Cancer	5
Charm and ritual	6
Convulsions and epilepsy	5
Ethnoveterinary medicine	21
Gastro-intestinal problems	14
Headache	5
Pregnancy	5
Purgative	6
Reproductive problems in men	11
Reproductive problems in women	7
Respiratory problems	23
Rheumatism	7
Sexually transmitted infections	9
Skin problems	7
Sores and wounds	6

Phytochemistry and pharmacological properties of Euphorbiaceae species

More than three quarters of the Euphorbiaceae species used as sources of traditional medicines in Zimbabwe (75.86%) are rich in chemical constituents (Table No. 3). The majority of these species are characterized by flavonoids (62.07%), followed by phenols (58.62%), triterpenes (55.17%), tannins (48.28%), saponins and steroids (44.83%), alkaloids (37.93%) and cyanogenic glycosides (31.03%) (Table No. 3). Results of the current study corroborate findings by Seigler (1994), who argued that the chemistry of the family Euphorbiaceae is diverse with alkaloids, cyanogenic glycosides, diterpenes, flavonoids, tannins and triterpenes as the major constituents. The majority of documented species present several proven biological activities (Table No. 3) such as analgesic, anticancer, antidiabetic, anthelmintic, anti-infammatory, antimicrobial, antioxidant, antiplasmodial, hepatoprotective and immunomodulatory. Despite the discovery of several secondary metabolites in the Euphorbiaceae family, its species attracted disproportionately little attention in the context of ethnopharmacological research over the years. Relative importance of the Euphorbiaceae species as medicinal plants is demonstrated by the fact that more than half (55.17%) of the species documented in this study are sold informal and formal medicinal plants markets in east, southern and west Africa (Cunningham, 1993; Williams *et al.*, 2001; Setshogo & Mbereki, 2011; Van Wyk, 2015; Van Wyk, 2017; Meke *et al.*, 2017; Barbosa *et al.*, 2020). These species include *A. brachiata*, *A. petiolaris*, *B. cathartica*, *B. micrantha*, *Croton gratissimus* Burch., *E. hirta*, *E. schinzii*, *J. curcas*, *Macaranga capensis* (Baill.) Benth. ex Sim, *M.*

lugardae, P. maprounifolia, R. communis, Schinziophyton rautanenii (Schinz) Radcl.-Sm., *Spirostachys africana* Sond., *Tragia akanyua* Pax and U. kirkiana. Research by Van Wyk (2015 & 2017) showed that *E. hirta, J. curcas* and *R. communis* have potential to be developed into health products and pharmaceutical drugs.

Table No. 3
Medicinal Euphorbiaceae plants of Zimbabwe

Species	Phytochemical compounds	Biological activities	References
A. johnsonii	Cyanogenic glycosides, flavonoids, phenols, saponins, tannins and triterpenes	Antimicrobial	Samie *et al.*, 2005 Molotja *et al.*, 2011 Molotja *et al.*, 2012 Mudau *et al.*, 2022
A. membranaceum	Alkaloids, benzopyranones, ferulic acid, flavonoids, phenolics, saponins, steroids and tannins	Antibacterial and anti-mycobacterial	Buske *et al.*, 1997 Buske *et al.*, 1999 Magadula *et al.*, 2012 Gitu, 2013
B. cathartica	Alkaloids, anthocyanins, cyanogenic glycosides, emodins, essential oils, fatty acids, flavonoids, phenolics, steroids, tannins and triterpenes	Antibacterial, antifungal, antimalarial and antioxidant	Maroyi, 2018a
B. micrantha	Alkaloids, anthocyanidin, anthraquinones, cyanogenic glycosides, essential oils, ester, flavonoids, oxalate, phenolics, saponins, sterols, tannins and triterpenes	Anthelmintic, anticonvulsant, antidiabetic, antimicrobial, antinociceptive, antioxidant, antiplasmodial, antischistosomal, cytotoxicity, hepatoprotective, β-lactamase inhibitory and sedative	Samie *et al.*, 2005 Maroyi, 2017a
B. mollis	Cyanogenic glycosides, fatty acids, flavonoids, phenolics, saponins, tannins and triterpenes	Anti-inflammatory, antileishmanial, antimicrobial, antioxidant, antiplasmodial and immunomodulatory	Maroyi, 2019 Mudau *et al.*, 2022
C. gratissimus	Botulin, cembranolides, lupeol, lupenone and steroids	Acetylcholinesterase inhibitory, antidiabetic, antioxidant, anti-inflammatory, antimalarial, antimicrobial and cytotoxicity	Clarkson *et al.*, 2004 van Vuuren & Viljoen, 2008 Mulholland *et al.*, 2010 Van Vuuren & Naidoo, 2010 Ndhlala *et al.*, 2013 Mthethwa *et al.*, 2014 Njoya *et al.*, 2018
C. megalobotrys	Alkaloids and cinnamate derivatives	Antibacterial, antifungal, antiplasmodial, anti-HIV and antioxidant	Selowa *et al.*, 2010 Maroyi, 2017b
E. cooperi	Catechin gallates, euphorbilactone, flavonoids, norsesquiterpene, phenolis, phorbol ester and triterpenes	Antibacterial, antiviral and antidepressant	El-Toumy *et al.*, 2018 Hlengwa, 2018 Kemboi *et al.*, 2020

E. hirta	Alkaloids, anthocyanins, ascorbic acids, essential oils, diterpenes, flavonoids, phenols, steroids, tannins and triterpenes	Analgesic, antibacterial, antidiabetic, anti-hypertensive, anti-inflammatory, antioxidant, antitumor, immunomodulatory, sedative and wound healing	Basma *et al.*, 2011 Kausar *et al.*, 2016 Ghosh *et al.*, 2019
E. ingens	Flavonoids, ingenol, phenols, saponins, tannins and triterpenes	Antibacterial, anticancer, antifungal, anti-HIV, antioxidant, anti-inflammatory and hypercholesterolemic	Hong *et al.*, 2011 Kemboi *et al.*, 2020 Okpako *et al.*, 2023
E. matabelensis	Flavonoids and ingenol	Antibacterial, anti-inflammatory, antioxidant and antiproliferative	Gundidza *et al.*, 1993 Hammadi *et al.*, 2019 Jambwa *et al.*, 2023
E. tirucalli	Diterpenes, fatty acids, phenols, sterols and triterpenes	Analgesic, anthelmintics, anticancer, anti-inflammatory, antimicrobial, antioxidant, antiplasmodial, cytotoxicity, hepatoprotective, immunomodulatory, larvicidal and molluscidal	Rahuman *et al.*, 2008 de Araújo *et al.*, 2014 Mali & Panchal, 2017 Wu *et al.*, 2012
F. virosa	Alkaloids, cyanogenic glycosides, flavonoids, phenols, quercetin, saponins, steroids, tannins and triterpenes	Analgesic, anticancer, anti-depressant, antidiabetic, anti-inflammatory, antimalarial, antimicrobial, antioxidant, anti-trypanosomal, cytotoxic and laxative	Wang *et al.*, 2008 Sanogo *et al.*, 2009 Sempombe *et al.*, 2014 Ajaib & Wahla, 2018 Renu *et al.*, 2018
J. curcas	Alkaloids, cyanogenic glycosides, carotenoids, coumarins, diterpenes, flavonoids, lignans, phenolic, phorbal esters, saponins, steroids, tannins and triterpenes	Analgesic, anticancer, anticoagulant, antidiabetic, antimicrobial, anti-inflammatory, antioxidant, hepatoprotective and larvicidal	Namuli *et al.*, 2011 Abdelgadir & Van Staden, 2013 Asuk *et al.*, 2015 Rampadarath *et al.*, 2016
M. capensis	Cyanogenic glycosides, coumarins, flavonoids, saponins, steroids and triterpenes	Antibacterial, antimycobacterial and α-glucosidase inhibiting	Mmushi *et al.*, 2010 Majeed, 2019 Hashim *et al.*, 2021
M. discoidea	Alkaloids, anthraquinones, flavonoids, phenolics, saponins, sterols and triterpenes	Analgesic, antibacterial, antifungal, anti-inflammatory, antioxidant and cytotoxicity	Adedapo *et al.*, 2009 Dickson *et al.*, 2010 Diallo *et al.*, 2015 Sofidiya *et al.*, 2015
M. lugardiae	Citric acid	Acaricidal and contractile	Gundidza, 1989 Nyahangare, 2019 Nyahangare *et al.*, 2019
P. maprouneifolia	Cyanogenic glycosides, flavonoids, phenols, saponins, tannins and triterpenes	Antibacterial, antifungal, anti-inflammatory, antioxidant and cytotoxicity	Samie *et al.*, 2010 Motlhanka, 2012 Lawal *et al.*, 2019

			Mudau *et al.*, 2022
R. communis	Alkaloids, anthraquinones, essential oils, fatty acids, flavonoids, glycosides, phenolics, ricinine, saponins, steroids, tannins and triterpenes	Antimicrobial, anti-inflammatory, antioxidant, immunomodulatory, hepatoprotective, laxative and larvicidal	Ilavarasan *et al.*, 2011 Wafa *et al.*, 2014 Ahmad *et al.*, 2016 Kumar, 2017 Suurbaar *et al.*, 2017 El-Toumy *et al.*, 2018
S. rautanenii	Alkaloids, amino acids, anthraquinones, coumarins, fatty acids, flavonoids, phenols, saponins, steroids, tannins and triterpenes	Anticancer, antioxidant, antiproliferative and cytotoxicity	Maroyi, 2018c
S. africana	Alkaloids, essential oils, flavonoids, phenols, saponins, steroids, tannins and triterpenes	Anthelminthic, antibacterial, antidiabetic, antifungal, antimalarial, antioxidant, cytotoxicity and larvacidal	Singh *et al.*, 2020 Molele *et al.*, 2023
U. kirkiana	Flavonoids, phenolics and tannins	Antioxidant	Chawafambira *et al.*, 2020a Chawafambira *et al.*, 2020b

CONCLUSION

The present review provides a summary of Euphorbiaceae species used as sources of traditional medicines in Zimbabwe. Such review studies are important for plant species widely used as traditional medicines as assessing their phytochemistry, pharmacological properties and toxicological evaluations are important. The Euphorbiaceae family is characterized by several species used as sources of traditional medicines and these species used for the treatment and management of different ailments and diseases. Literature search showed that there is paucity of information on cultural practices associated with usage of Euphorbiabaceae species, including information on dosages and administration. Therefore, future research should focus on detailed ethnopharmacological evaluations, assessing safety, mechanisms of action *in vivo* and clinical research aimed at corroborating the traditional medical applications of Euphorbiaceae species. Notably, compilation of information about Eupborbiaceae species growing in Zimbabwe in documented in this study warrant further diverse research scope in disease prevention, management, local and regional commercial trade as traditional medicines and health products.

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