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Assessment of selected medicinal plants indigenous to West Africa for antiprotozoal activity

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ABSTRACT

Ethnopharmacological relevance: The disease burden of protozoal infections is enormous in West Africa and other developing regions of the world. Malaria is one of the most important parasitic disease in tropical areas caused by protozoans of the genus *Plasmodium* and more than a third of the world's population (about two billion people) lives in malaria-endemic areas. Leishmaniasis and trypanosomiasis are other parasitic protozoan infections caused by protozoan of the genus *Leishmania* and *Trypanosoma* respectively. The development of resistance to available antiprotozoal drugs has necessitated the search for new and effective compounds. Plant-based products with long history of traditional use in treating infectious diseases can be explored in this regard.
Aim of the study: To evaluate *in vitro* the antiplasmodial, antileishmanial and anti-trypanosomal activities of fractions of 18 medicinal plants belonging to 14 different families.
Materials and methods: Fractions (hexane, chloroform and methanol) of eighteen medicinal plants belonging to fourteen families, with historical use as traditional antiprotozoal therapy were screened *in vitro* for activity against chloroquine-sensitive and chloroquine-resistant strains of *Plasmodium falciparum*, *Leishmania donovani* (promastigotes, axenic amastigotes and intracellular amastigotes in THP1 cells) and *Trypanosoma brucei brucei*, using standard procedures.
Results: The methanol fraction of *Corchorus walcottii* showed selective antileshimanial activity against intracellular *L. donovani* amastigotes with an IC_{50} average of 5.94 μg/ml. Methanol fraction of *Cassia obtusifolia*, methanol and chloroform fractions of *Corchorus walcotti* and methanol fraction of *Vitex grandifolia* exhibited activity against *T. brucei brucei* blood stage trypamastigotes with IC_{50} values of 5.88, 5.73, 7.29 and 8.73 (μg/ml) respectively. Methanol fractions of *Crotalaria mucronata* and *Pseudocedrela kotschyi*, with the chloroform fraction of *Launaea taraxacifolia* showed >50% growth inhibition against chloroquine-sensitive (D6) strain of *P. falciparum* with values as 60%, 73% and 52%. At concentrations of 15.8667 μg/mL, the most active fractions antimalarial activity was exhibited by methanol extracts of *Pseudocedrela kotschyi* (IC_{50} = 29.7 μg/mL (D6) S.I = 1 μg/ml (W2) S.I = 1.3) and *Crotalaria mucronata* (IC_{50} = 46.45 μg/mL (D6) S.I > 1.0, 46.86 μg/mL (W2) S.I = 1.0) and chloroform extract of *Launaea taraxicifolia* (IC_{50} = 21.55 μg/mL (D6) S.I >2.2, 18.0 μg/mL (W2) S.I >2.6).
Conclusion: The results showed that the methanol extracts of *Pseudocedrela kotschyi* and, *Crotalaria mucronata* with chloroform extract of *Launaea taraxicifolia* may contain useful antimalarial leads. *Cassia obtusifolia, Corchorus walcottii* and *Vitex grandifolia* may be promising candidates for isolation of antiprotozoal compounds which could serve as new lead structures for development of new drugs against these neglected tropical (leshmanasis and trypanosomiasis) diseases and may provide scientific support for the traditional use of these plants against protozoal related treatments.

1. Introduction

Despite the dramatic evolution of western medicine and the availability of prescription medicine, medicinal herbs are still very popular globally for the treatment of various diseases (Bray et al., 1990). The treatment of parasitic diseases with medicinal plants is an old practice.

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Table 1
Ethnomedicinal importance of selected medicinal plants.

	Names and parts used	Family name	English name	Vernacular name	Traditional uses	Pharmacological uses	Phytochemicals	Isolated compounds	Toxicity
1	*Balanites aegyptiaca* (leaves)	*Zygophyllaceae*	Desert date, thorn tree (Khare, 2008), soap berry tree		Jaundice, intestinal worm infections, wounds, malaria, syphilis, epilepsy, dysentery, constipation, diarrhea, hemorrhoids, stomach aches, asthma, fever (Mohamed et al., 1999) root bark has been used in diarrhea, in haemorrhoid and used as fish poison (Bukar et al., 2004)	Anthelmintic (Koko et al., 2000, 2005; Shalaby et al., 2010), Cardioprotective *cum* antioxidant activity (El Mastry et al., 2010), Antibacterial effects (Doughari et al., 2007), Anticancer activity (Gnoula et al., 2008), Anti-inflammatory (Speroni et al., 2005) and analgesic activity (Gaur et al., 2008), Mosquito larvicidal activity, extracts against *Anopheles arabiensis*, *Culex quinquefasciatus* (Zarroug et al., 1990; Wiesman and Chapagain, 2003; Chapagain et al., 2008), Antidiabetic activity (Mohamed et al., 1999; Mansour and Newairy, 2000), Antiviral activity (Hamid et al., 2001), Hypocholesterolemic activity (Abdel-Rahim et al., 1986), Wound healing activity (Annan and Dickson, 2008), xanthine oxidase and acetylcholinesterase inhibitory activities (Meda et al., 2010), anticonvulsant (Suky et al., 2011)	Alkaliods, Steroidal saponins, phenolic acids, flavonoid glycosides, spirostanol glycoside,	Trigonelline (Farag et al., 2015), *N*-trans-feruloyltyramine and *N*-cis-feruloyltyramine, vanillic acid, syringic acid and 3-hydroxy-1- 4-hydroxy-3-methoxyphenyl − 1-propanone (Sarker et al., 2000), balanitesin, pregn-S-ene-3b,16/l,2O(R)-triol 3-O-B-D - glucopyranoside and balagyptin (Kamel, 1998), balanitoside and balanitin (Hosny et al., 1992), quercetin 3-glucosides, quercetin 3-rutinoside, 3-glucoside, 3-glucosides, 3-rutinoside, 3-7 diglucoside and 3-rhamnogalactosides of isorhamnetin (Maksoud and El Hadidi, 1988),Balanitin A, B, C, D, E and Balanitin F and G (Varshney and Vyas, 1982)	
2	*Balanites aegyptiaca* (seeds)	*Zygophyllaceae*			An oral hypoglycemic and antidiabetic agent (Kamel et al., 1991), of jaundice and anthelmintic (Tahir et al., 1998; Farid et al., 2002), dysentery and constipation. The seed oil is used to treat tumors and wounds (Pettit et al., 1991; Khalid et al., 2007)				
3	*Bridelia ferruginea* (leaves)	*Euphorbiaceae*		**HAUSA**dorowanbirni or Kizni**IGBO**aga (Akubue& Mittal) olá (auctt.) **YORUBA**asaragba(IFE) ìrà (auctt.) ìràọdàn = 'ira'	Rheumatism, intestine disorders, dysentery, diabetes, thrush, epilepsy, infectious and sexually transmitted diseases (Owoseni et al., 2010) and eruption, skin cancer, cystitis, anthelmintic for roundworm (Talla et al., 2002; Dada-Adegbola	Antioxidant (Fabiyi et al., 2012; Oloyede and Babalola, 2012), antiviral, anti-inflammatory (Akuodor et al., 2011), antimicrobial activity (Adebayo and Ishola, 2009), (Kayodé and José, 2009) antidiabetics (Taiwo et al., 2013), Laxative effect (Nene-Bi et al., 2009), Wound healing effect (Annan and Houghton, 2008), Anxiolytic	Tannins, flavonoids and biflavonoids, lignans	Quercetin (Tona et al., 1998), quercetin-3-neohesperidoside (Abubakar et al., 2007), myricetin-3-glucoside (Pieters and Vlietinck, 2005), myricetin-3-rhamnoside (Talla et al., 2002), 5-demethoxy-peltatin-5-O--D-glucopyranoside (Ampofo, 1979), peltatin-5-O-D-glucopyranoside (Iwu, 1980), gallocatechin-(4-O-7) epigallocatechin (Cimanga et al., 2001), deoxypodophyllotoxin, 5′-demethoxy-β-peltatin-5O-β-D-glucopyranoside, β-peltatin, β-peltatin-5-Oβ-D-glucopyranoside (Rashid et al., 2000).	

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