



Review

An overview of anti-diabetic plants used in Gabon: Pharmacology and toxicology



B. Bading Taika^{a,b,*,1,2}, M. Bouckandou^b, A. Souza^c, H.P. Bourobou Bourobou^b, L.S. MacKenzie^a, L. Lione^a

^a Department of Pharmacy, Pharmacology and Postgraduate Medicine, School of Life and Medical Sciences, University of Hertfordshire, UK

^b IPHAMETRA Institute, Pharmacology and Toxicology Department, CENAREST, Libreville, Gabon

^c Institut National Supérieur d'Agronomie et de Biotechnologies (INSAB), Franceville, Gabon

ARTICLE INFO

Keywords:

Diabetes mellitus

Gabon

Medicinal plants

Anti-diabetic activity

Toxicity

ABSTRACT

Ethnopharmacological relevance: The management of diabetes mellitus management in African communities, especially in Gabon, is not well established as more than 60% of population rely on traditional treatments as primary healthcare. The aim of this review was to collect and present the scientific evidence for the use of medicinal plants that are in current use by Gabonese traditional healers to manage diabetes or hyperglycaemia based here on the pharmacological and toxicological profiles of plants with anti-diabetic activity. There are presented in order to promote their therapeutic value, ensure a safer use by population and provide some bases for further study on high potential plants reviewed.

Materials and methods: Ethnobotanical studies were sourced using databases such as Online Wiley library, Pubmed, Google Scholar, PROTA, books and unpublished data including Ph.D. and Master thesis, African and Asian journals. Keywords including 'Diabetes', 'Gabon', 'Toxicity', 'Constituents', 'hyperglycaemia' were used.

Results: A total of 69 plants currently used in Gabon with potential anti-diabetic activity have been identified in the literature, all of which have been used in in vivo or in vitro studies. Most of the plants have been studied in human or animal models for their ability to reduce blood glucose, stimulate insulin secretion or inhibit carbohydrates enzymes. Active substances have been identified in 12 out of 69 plants outlined in this review, these include *Allium cepa* and *Tabernanthe iboga*. Only eight plants have their active substances tested for anti-diabetic activity and are suitable for further investigation. Toxicological data is scarce and is dose-related to the functional parameters of major organs such as kidney and liver.

Conclusion: An in-depth understanding on the pharmacology and toxicology of Gabonese anti-diabetic plants is lacking yet there is a great scope for new treatments. With further research, the use of Gabonese anti-diabetic plants is important to ensure the safety of the diabetic patients in Gabon.

1. Introduction

Diabetes is a chronic metabolic disorder where management is a global problem. Diabetes is forecasted to become one of the world's main disability and killers in less than 25 years (Malviya et al., 2010). The total number of persons affected globally is projected to rise from 371 million in 2011 to 552 million in 2030, if prevention measures are not scaled up (IDF, 2011). Gabon, a small country with a population of 1.7 million, is the third country in sub-Saharan Africa that is the most affected by diabetes mellitus, with a national prevalence of more than 9% (Ntyonga-Pono, 2015).

Many factors are responsible for the rise of diabetes in Gabon. These factors include urbanisation, lifestyle changes with high fat food and few physical activities, obesity and the fact that more people are being diagnosed. In urban areas, diabetes is well managed, and patients have easy access to medicines. However, the expensive cost of treatments and their poor availability, as well as, the culture and religious beliefs of the population are leading to patients relying more on traditional healers and medicinal plants for the management of diabetes, especially in rural areas (Ntyonga-Pono, 2015).

In Africa, even in Gabon, plant based traditional medicine is widespread. These plants are used to treat all type of common pains and

* Corresponding author at: Department of Pharmacy, Pharmacology and Postgraduate Medicine, School of Life and Medical Sciences, University of Hertfordshire, UK.
E-mail address: bayissi@yahoo.fr (B. Bading Taika).

¹ Permanent address: 65 Cambridge avenue, London/UK.

² Current address: Cite Nzeng-Ayong, BP: 5393 Libreville/Gabon.

diseases, including those that modern medicines deal with such as cancer, renal insufficiency (Yokozawa et al., 2002), HIV (Helfer et al., 2014) and diabetes (Osabede et al., 2014). Several diabetes medicines used today have been developed or derived from plants that were once used in traditional medicine such as metformin, a biguanide derived from *Galega officinalis* L. (Fabaceae) (Osabede et al., 2014). Inversely, certain natural compounds from medicinal plants such as *Tabernanthe iboga* act like sulfonylureas, organic compounds that enhance insulin release from pancreatic beta cells (Souza et al., 2011).

Despite the World Health Organization (WHO) recommendations, the reduced cost of herbal medicines and the easy access of plants (many plants are cultured in gardens or surrounding villages), a large number of reported medicinal plants in Gabon are used by the population without any scientific supportive data (Osabede et al., 2014). Data which could represent a valuable source of information to limit toxicity-related issues, monitor plants and population safety and provide a good number of compounds for drug development in diabetes, are needed.

Current therapies for diabetes including insulin and various oral antidiabetic agents such as sulphonylureas and biguanides have limitations including hypoglycemic and weight gain (Panda et al., 2011; Gupta et al., 2016). Medicinal plants have previously been reported to be beneficial in hyperglycaemia control worldwide and have largely been used as anti-diabetic remedies (Patel et al., 2012). Anti-hyperglycaemic effects of plants claimed to be anti-diabetic have been mainly attributed to their ability to re-establish pancreatic tissues functions by increasing insulin production such as sulfonylureas, inhibiting glucose intestinal absorption such as acarbose an oligosaccharide, or increasing metabolism of insulin-dependent means (Kuethe and Efferth, 2010; Talreja and Kaur, 2014).

2. Biodiversity and ethnobotanical uses of medicinal plants in Gabon

Gabon is a country covered with more than 80% of forest, and many plants are traditionally used for the treatment of various diseases (Mengome et al., 2009). Despite considerable progress in the management of several pathologies, including diabetes mellitus by conventional medicines, over 60% of Gabonese population is still dependent on plant remedies for economic and cultural reasons. In Gabon, rural areas are surrounded by wild vegetation, as Gabonese population density is low; people living in cities have easy access to domesticated or wild plants such as *Irvingia gabonensis* which is used as anti-inflammatory remedy (Vliet, 2012; Kuethe et al., 2007). Medicinal plants use and knowledge have been mastered by traditional healers for a long time in sub-Saharan Africa, including Gabon.

Ethnobotanical information indicates that more than 20,000 medicinal plants used for numerous pathologies (Iwu, 2014) are known in Africa while less than 1% of them have been scientifically investigated for their biological activities (Iwu, 2014). The use of medicinal plants is a cultural practice which represents the primary healthcare of 80% of the population of developing nations, including Gabon according to the World Health Organization (WHO) (Eyong, 2007; Swargiary et al., 2013).

In Gabon, more than 1600 medicinal plants have been reported (Vliet, 2012), however, little data is available in the literature. Among them, several herbs have shown their potential anti diabetic properties including *Irvingia gabonensis* (Odika or wild mango) (Hossain et al., 2012), *Pseudospondias longifolia*, *Antrocaryon klaineanum* and *Tabernanthe iboga* (Mebale et al., 2013; Souza et al., 2011).

The aim of this review was to collect and present the scientific evidences for the use of medicinal plants that are in current use by Gabonese traditional healers to manage diabetes or hyperglycaemia based, and outline any known pharmacological, toxicological and safety profiles. This review therefore provides a valuable source of information and highlights scientific gaps in knowledge of Gabonese

plants used in the management of diabetes.

3. Materials and methods

Relevant information on medicinal plants occurring in Gabon and traditionally used for the management of diabetes and/or hyperglycaemia were mostly obtained from ethnobotanical studies. These studies were made in different regions of Gabon (Estuaire, Ogooué-Lolo, Haut-Ogooué) with traditional healers, and in local markets of the capital and largest city, Libreville, where one third of the Gabon population lives. Traditional healers or market saleswomen/salesmen did not use the term 'Diabetes mellitus'. However, they easily described symptoms such as 'excessive urination with ants and flies gathering around it', 'abnormally feeling thirsty', 'loosing weight', principally to diagnose the disease. Also, we selected published papers using databases such as Online wiley library, Pubmed, GoogleScholar, SciFinder, Sciences direct, Scopus, Pubchem using 'Diabetes', 'Gabon', 'Toxicity', 'Constituents' as main keywords. Other web sources such as the Plant List, Kew Botanical Garden, PROTA, African and Asian journals were also used alongside books, Ph.D. and M.Sc. dissertations and unpublished data. We shortlisted potential anti-diabetic plants found in the literature or not, which were acknowledged by traditional healers or saleswomen/salesmen (vernacular name cited) in Gabon, with one or more experimental evidence (*in vivo* and/or *in vitro*) in animal models validating the anti-diabetic activity except for certain plants such as *Antrocaryon klaineanum*. Plants have been listed according to the family alphabetic order, local name, plants part(s) used and the traditional preparation, *in vivo* and/or *in vitro* anti-diabetic activity and other pharmacological activities applied traditionally in Table 1, and toxicity and chemical constituents in Table 2.

4. Results/discussion

All 69 medicinal plants have been presented in both Tables 1, 2, with known information from the literature outlined and cited. The data has been obtained from ethnobotanical studies originating from different regions in Gabon and from published research papers. Among these plants, 37 families were recorded with *Apocynaceae* being the most cited with 6 plant species, followed by *Annonaceae*, *Malvaceae* and *Poaceae* with 4 plant species each and *Anacardiaceae*, *Asteraceae*, *Euphorbiaceae*, *Fabaceae*, *Leguminosae* and *Mimosoideae* with 3 plant species each.

Generally, plant potential anti-diabetic activity was assessed by *in vivo* (animal models and humans) and *in vitro* (islets and hepatocytes) sugar (usually glucose) lowering effect. From a scientific perspective, only experimental validations at known doses and in specific design, may provide a good idea of a plant safety and efficacy. While, in traditional approach, the taste of the urine and the well-being of the patient after treatment prove plant preparations efficacy.

The majority of plants reviewed here (74%) has *in vivo* and/or *in vitro* studies that evidenced anti-diabetic properties and support their use by traditional healer for the management of diabetes. However, 26% of reviewed plants including *Antrocaryon klaineanum*, *Voacanga africana* and *Aucoumea klaineanum*, have no experimental evaluation of their anti-diabetic effects, either *in vitro* or *in vivo*. Although, these plants contained molecules such as flavonoids, alkaloids and saponins (Table 2), that have known anti-diabetic properties which can justify their use in the management of hyperglycaemia in traditional medicine.

Several reviews on medicinal plants and/or anti-diabetic plants from different parts of the world exist and highlight medicinal herbs value for the management of number of diseases including diabetes (Patel et al., 2012; Ezurike and Prieto, 2014; Lakshmi et al., 2016; Tjcek et al., 2017). Ethnobotanical surveys result's and data collected from literature on plants used for the management of diabetes in Gabon showed that plants are used either alone or in combination, such as with *Alstonia congensis* and *Xylopia aethiopica*, *Rauwolfia vomitoria* and

Download English Version:

<https://daneshyari.com/en/article/8532408>

Download Persian Version:

<https://daneshyari.com/article/8532408>

[Daneshyari.com](https://daneshyari.com)