Print ISSN: 2319-2003 | Online ISSN: 2279-0780

IJBCP International Journal of Basic & Clinical Pharmacology

DOI: http://dx.doi.org/10.18203/2319-2003.ijbcp20194103

Original Research Article

Hyperglycaemia lowering activity and hypoglycaemic risk assessment of Sarenta, an Ivorian traditional herbal remedy

Geneviève A. N'guessan-Irié[1]*, Ange A. Tako[2], Etienne K. Effo[1], Landry S. Kouakou[1], Gisèle N. Siransy-Kouakou[1]

[1]Department of Pharmacology, [1,2]Training and Research Unit of Pharmaceutical and Biological Sciences, Felix Houphouet-Boigny University, Abidjan, Côte d'Ivoire

Received: 28 June 2019
Accepted: 31 July 2019

***Correspondence to:**
Dr. Geneviève A. N'guessan-Irié,
Email: jemigrace@gmail.com

ABSTRACT

Background: Diabetes remains a major public health problem for which traditional medicine is a better therapeutic alternative for low-income populations, including African populations. The aim of this work was to evaluate the effect of Sarenta, an herbal preparation used in Ivorian traditional medicine as anti-diabetic, on hyperglycaemia and on basic glycaemia.
Methods: Hyperglycaemia lowering activity was led in rats receiving glucose at 5 g/kg body weight by gavage after oral pre-treatment with either Sarenta at 125, 206 or 209.5 mg/kg b. wt., either glibenclamide at 10 mg/kg b. wt., or physiological saline solution. Hypoglycaemic risk was assessed by administering the same doses of Sarenta to native i.e. NaCl-treated rats. For both tests, blood glucose was measured before any substance was administered and then every hour for 4 hours.
Results: After 4 hours, Sarenta at 206 mg/kg b. wt. and 209.5 mg/kg b. wt. significantly reduced the induced hyperglycaemia in rats by 33.87% and 37.39%, respectively. The degree of the hyperglycaemia lowering effect of the remedy at these two doses was not significantly different from that of glibenclamide. In addition, Sarenta at 209.5 mg/kg b. wt. resulted in a significant reduction of basic blood sugar to 29.78% four hours after administration.
Conclusions: The remedy Sarenta has a hyperglycaemia lowering activity that could partially justify its traditional use in the treatment of diabetes. However, considering its hypoglycemic effect, precautions should be taken when using this traditional medicine.

Keywords: Plant, Diabetes, Blood glucose

INTRODUCTION

Diabetes, a metabolic condition characterized by chronic high blood sugar level, is no longer just a disease of developed and wealthy countries.[1] By 2045, more than 600 million people worldwide will have diabetes.[2] In Côte d'Ivoire, the only national data available indicated a prevalence already at a level of 5.19%.[3]

Diabetes can also be a major cause of damages in the heart, vessels, eyes, kidneys and nerves.[4] It is therefore essential to properly control the disease in order to significantly reduce the risk of complications.

High costs of conventional medicines for people in low-income countries, in addition to the difficulties of access to these drugs, direct patients towards traditional remedies. Indeed, about 80% of rural populations living in developing countries depend on traditional medicine to meet their primary health needs.[5] Then, the World Health Organization, recognizing the importance of traditional medicine, recommends its valuation on evidence of effectiveness, quality, and safety.[6]

Sarenta is an Ivorian traditional remedy, mainly herbal and indicated in multiple pathologies including diabetes. Several pharmacological studies undertaken by our laboratory team have highlighted safety then analgesic, antioxidant and anti-inflammatory properties without ulcerogenic risk of this remedy.[7,8] The anti-diabetic activity of Sarenta does not appear to have been studied experimentally by other scientists. The present study therefore proposed to evaluate the remedy in vivo in rats blood sugar.

METHODS

Extraction procedure

The remedy Sarenta, obtained from the traditional therapist agency (Nadieco Pharma SARL), has been evaporated in a Memmert oven for 72 hours at 50°C. The dry residue was crushed to have a fine powder of the remedy that was packaged in a bottle and kept in the refrigerator at a temperature of 5°C for later use. At the same time, the dosages claimed by the traditional therapist (2 tablespoons once a day i.e. 30 ml, 2 tablespoons twice a day i.e. 60 ml and one tea glass once a day i.e. 45 ml of the remedy) were evaporated and the dry residues allowed calculating the corresponding concentrations and then the doses to be administered to the rats, knowing that it is permissible to administrate 10 ml/kg body weight in this way, 30 ml of the remedy corresponded to a dose of 125 mg/kg b. wt., 60 ml corresponded to 206 mg/kg b. wt. and 45 ml corresponded to 209.5 mg/kg b. wt.

Pharmacological tests

Oral glucose tolerance test

The test was carried out according to the method described by Kambouche et al.[9] Healthy adult Wistar albino rats weighting between 128-179 g, under 16 hours fasting conditions, were divided into five groups of six rats. First the basic blood glucose of each rat was read using a glucometer. Then immediately, the following substances were administered to rats by gavage according to their group:

Group 1, as control, received normal saline (NaCl 0.9% at 10 ml/kg b. wt. per os).

Group 2 received standard drug (glibenclamide 10 mg/kg b. wt. per os).

Groups 3, 4, and 5 received respectively graded doses of Sarenta (105, 206 and 209.5 mg/kg b. wt. per os).

Thirty minutes later (T0) we induced hyperglycaemia by administering glucose to rats by gavage at the dose of 5 g/kg b. wt.

Blood glucose was then measured at 30 min, 1 h, 2 h, 3 h and 4 h after glucose gavage in rats.

The variation in blood glucose was calculated using the following formula:

$$\frac{Gt - G0}{G0} \times 100$$

G0=Blood glucose measured at 30 min after glucose gavage in rats.

Gt=Blood glucose measured at 1 h, 2 h, 3 h or 4 h after glucose gavage in rats.

Hypoglycaemic risk assessment

The test was carried out according to the method described by Puri.[10] Healthy adult Wistar albino rats weighting between 128-179 g, under 16 hours fasting conditions, were divided into four groups of six rats. First the basic blood glucose of each rat was read using a glucometer. Then immediately, the following substances were administered to rats by gavage according to their group:

Group 1, as control, received normal saline (NaCl 0.9% at 10 ml/kg b. wt. per os);

Groups 2, 3, and 4 received respectively graded doses of Sarenta (105, 206 and 209.5 mg/kg b. wt. per os).

Blood glucose was then measured at 1 h, 2 h, 3 h and 4 h after substances administration.

The variation in blood glucose was calculated using the following formula:

$$\frac{Gt - G0}{G0} \times 100$$

G0=Blood glucose measured before substances administration.

Gt=Blood glucose measured at 1h, 2h, 3h or 4h after substances administration.

Statistical method

Values were expressed as mean±SD (standard deviation) with n=6 rats per group. Data were analyzed with GraphPad Prism.7® software by Wilcoxon statistical test, with criterion set for statistical significance at $p<0.05$ for risk of $\alpha=0.05$.

Ethical approval

The experimental procedures were conducted after the approval of the Ethical Guidelines of the University (Ivory Coast) Committee on Animal Resources. All these

procedures used, were in strict accordance with the guidelines for Care and Use of Laboratory Animals and the statements of the European Union regarding the handling of experimental animals (86/609/EEC).

RESULTS

Peak hyperglycaemia occurred 1 hour after glucose administration in rats, with a higher blood glucose level in rats pre-treated with normal saline. Sarenta, at 206 mg/kg b. wt. and 209.5 mg/kg b. wt., resulted in a decrease in rat blood glucose levels 2, 3 and 4 hours after induction of hyperglycaemia. Indeed, the percentages of blood glucose reduction at these sampling times were 4.83%, 19.35% and 33.87% for the dose of 206 mg/kg b. wt. The percentages of blood glucose reduction for the dose of 209.5 mg/kg b. wt. were also 6.5%, 21.95% and 37.39% (Figure 1). The intensity of the hyperglycaemia lowering effect of the remedy at these two doses was superimposed on that of glibenclamide (Figure 2).

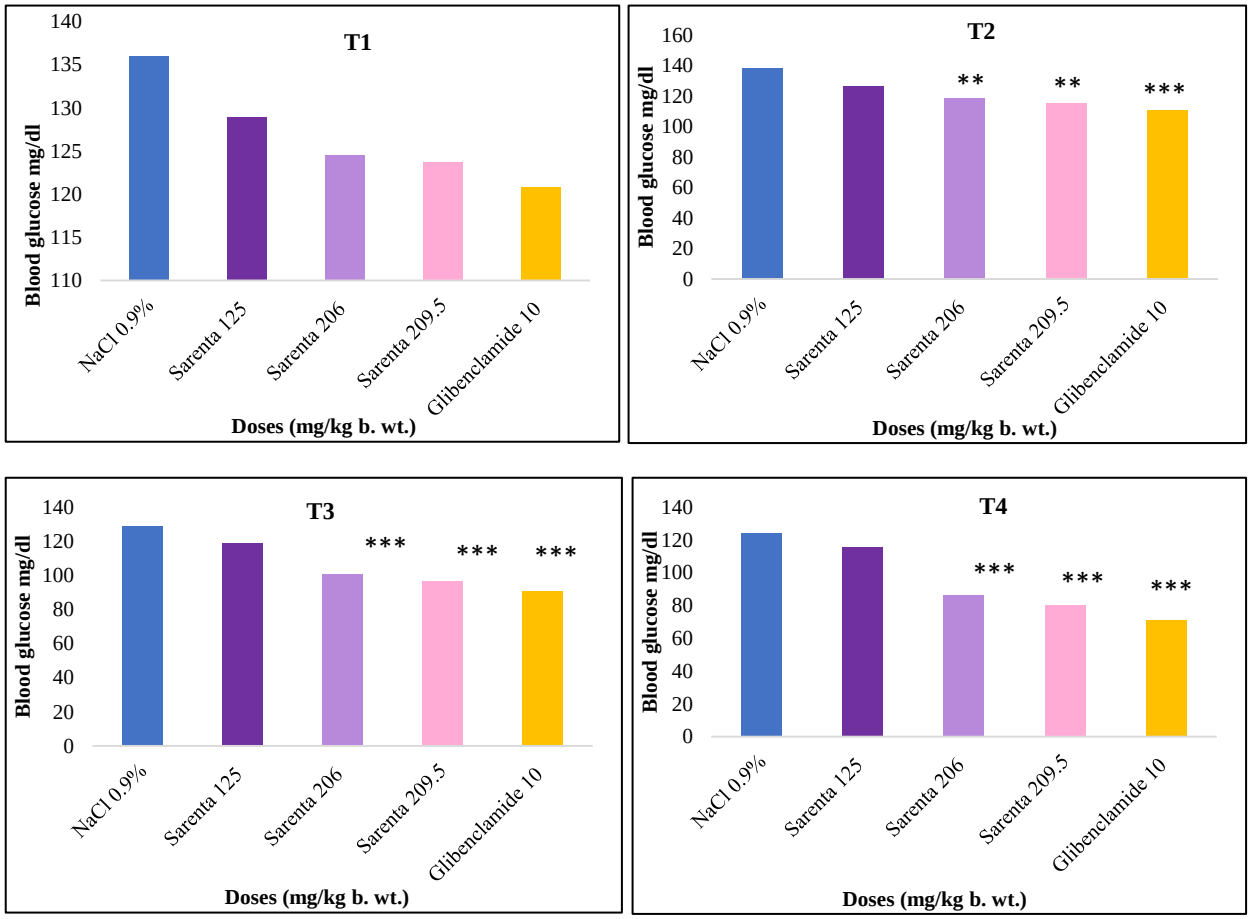

Figure 1: Blood glucose levels after oral glucose tolerance test in rats receiving Sarenta.

T1: Peak hyperglycaemia 1 hour after glucose administration; T2: Blood glucose levels 2 hours after glucose administration; T3: Blood glucose levels 3 hours after glucose administration; T4: Blood glucose levels 4 hours after glucose administration. *0.01<p≤0.05; **0.001<p<0.01; ***p<0.001.

Table 1: Basic blood glucose in rats according to sampling times.

Groups	Basic blood glucose (mg/dl)					
	T0	T1	T2	T3	T4	P value
Normal saline NaCl 0.9%	97.83 ±11.14	96.17±9.56	93±9.94	90,67±8.09	88.67±10.01	
Sarenta 125 mg/kg b. wt.	89.167±9.02	91.5±9.24	89.67±9.24	80.83±10.12	74.17±12.07	0.0268
Sarenta 206 mg/kg b. wt.	83±11.52	82±12.01	80.17±13.15	76.17±11.21	69.83±10.45	0.0004
Sarenta 209.5 mg/kg b. wt.	94.5±17.05	76.83±13.23	73±15.36	71.5±14.92	66.83±9.62	0.0001

At the dose of 209.5 mg/kg b. wt., Sarenta resulted in a significant decrease in rat basic blood glucose to 29.78% 4 hours after administration. However, the doses of 206 mg/kg b. wt. and 125 mg/kg b. wt. resulted in a slightly decrease in rat basic blood glucose to 15.87% and 16.82% respectively 4 hours after administration (Table 1).

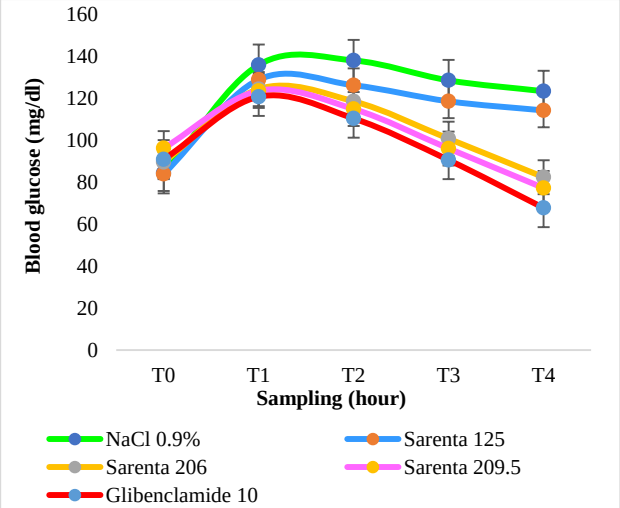

Figure 2: Decreased blood glucose under Sarenta.

DISCUSSION

The scale of diabetes worldwide, particularly in low-income countries, calls for increased research to find new, effective and less costly therapeutic solutions. Moreover, the use of herbal medicine in the treatment of diabetes is common in Africa, as evidenced by the fact that 31% of diabetic patients hospitalized in the endocrinology department of the Hospital and University Center Mohamed in Marrakech (Morocco) made exclusive use of herbal medicine.[11]

Many plants including *Cassia occidentalis*, *Moringa oleifera*, *Ocimum gratissimum* and *Tamarindus indica* are known for their anti-diabetic activity.[12-15] All the plants mentioned are present in the composition of Sarenta, which could explain the indication of this remedy in diabetes.

The traditional remedy Sarenta exerted a hyperglycaemia lowering action of similar intensity to that of glibenclamide which is a powerful hypoglycaemic sulfonylurea. From a mechanistic point of view, sulfonylureas have been reported experimentally to induce lower blood sugar levels in hyperglycaemic rats by stimulating the production of insulin by the beta cells of the pancreas, thereby promoting the storage of glycogen in the liver.[16] further experiments may specify the type of action of the remedy at the cellular level.

Furthermore, in the absence of hyperglycaemia, Sarenta at 209.5 mg/kg b. wt. resulted in a significant decrease in the basic blood glucose in rats. It is well known that any extract or molecule likely to decrease blood glucose under fasting conditions of 16 hours in rats acts by inhibiting liver and kidney production of glucose, either directly or indirectly through insulin release.[17] Thus, the remedy may have acted by one of these mechanisms, probably through insulin release like glibenclamide.

Finally, the dry residues obtained from the remedy were not proportional to the starting volumes so that the doses were not reproducible. Standardization of the different preparation processes would make it possible to move towards an antidiabetic plant drug.

ACKNOWLEDGEMENTS

The authors thank Nadieco Pharma SARL agency for having provided the remedy, and the Hospital and University Center of Cocody for the technical tray made them available.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved of the Ethical Guidelines of the University (Ivory Coast) Committee on Animal Resource

REFERENCES

1. Besançon S, Sidibé AT, Nientao I. Le diabète au Mali: aspects diététiques. Développement et Santé. 2009;193:38-43.
2. International Diabetes Federation. IDF Diabetes Atlas, 8th ed. 2017.
3. International Diabetes Federation. IDF Diabetes Atlas, 6th ed. 2013.
4. Fagot-Campagna A, Romon I, Fosse S, Roudier C. Prévalence et incidence du diabète, et mortalité liée au diabète en Franc : Synthèse épidémiologique, 2010. Available at: http://opac.invs.sante.fr/doc_num.php?explnum_id=102. Accessed on 12 March 2019.
5. World Health Organization. WHO Traditional Medicine Strategy 2002–2005, 2002. Available at: http://whqlibdoc.who.int/hq/2002/WHO_EDM_TRM_2002.1.pdf. Accessed on 23 January 2019.
6. World Health Organization. WHO Traditional Medicine Strategy 2014–2023, 2013. Available at: https://www.who.int/medicines/publications/traditional/trm_strategy14_23. Accessed on 30 January 2019.
7. Kouakou-Siransy G, Effo KE, Irié-Nguessan G, Koua D. Analgesic efficacy, quality and safety of "Sarenta": An herbal preparation from Ivorian traditional medicine. Int J Pharmacol. 2017;13(3):257-65.
8. Effo KE, Djadji ATL, N'Guessan BN, Kouakou SL, Anzoua E, Fatto N, et al. Evaluation of the Anti-inflammatory activity and ulcerogenic risk of "Sarenta", an Ivorian herbal preparation. Int J Pharm Pharmacol 2018;2(3):2581-3080.
9. Kambouche N, Merah B, Derdour A, Bellahouel S, Younos C, Soulimani R. Activité antihyperglycémiante d'un stérol β-sitoglucoside isolé de la plante Anabasis articulata (Forssk) Moq. Phytothérapie. 2011;9(1):2-6.
10. Puri D. The insulinotropic activity of a Nepalese medicinal plant Biophytum sensitivum: preliminary

experimental study. J Ethnopharmacol. 2001;78(1):89-93.
11. Ouhdouch F, Errajraji A, Diouri A. La phytothérapie dans le traitement du diabète type 2. Diabetes Metab. 2008;34(3):99.
12. Arya S, Jogender S, Singh S. Antidiabetic activities of Cassia occidentalis. Recent Res Sci Technol. 2013;5(1):51-3.
13. Gbekley HE, Karou DS, Gnoula C, Agbodeka K, Anani K, Tchacondo T, et al. Étude ethnobotanique des plantes utilisées dans le traitement du diabète dans la médecine traditionnelle de la région maritime du Togo, Pan Afr Med J. 2018;30:186.
14. Aguiyi J, Obi C, Gang S, Igweh A. Hypoglycaemic activity of Ocimum gratissimum in rats. Fitoterapia. 2000;71(4):444-6.
15. Maiti R, Jana D, Das U, Ghosh D. Antidiabetic effect of aqueous extract of seed of Tamarindus indica in streptozotocin-induced diabetic rats. J Ethnopharmacol. 2004;92(1):85-91.
16. Gebreyohannis T, Shibeshi W, Asres K. Effects of Solvent Fractions of Caylusea abyssinica (Fresen) Fisch. & Mey. on blood glucose levels of normoglycemic, glucose loaded and Streptozomicin-induced diabetic rodents. J Nat Remedies. 2014;14:67-75.
17. Shrayyef M, Gerich J. Normal glucose homeostasis. In: Principle of Diabetes Mellitus. Springer; 2010: 19-35.

Cite this article as: N'guessan-Irié GA, Tako AA, Effo EK, Kouakou LS, Siransy-Kouakou GN. Hyperglycaemia lowering activity and hypoglycaemic risk assessment of Sarenta, an Ivorian traditional herbal remedy. Int J Basic Clin Pharmacol 2019;8:1939-43.