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Research Article

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# Comparative study of Antihyperglycemic activity of aqueous extracts from the leaves of *Bridelia ferruginea, Lophira lanceolata* and *Oxytenanthera abyssinica*, with their mixture.

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## Abstract

*Bridelia ferruginea, Lophira lanceolata* and *Oxytenanthera abyssinica* are medicinal plants whose mixture is used for the treatment of diabetes by traditional medicine in Benin.

The aim of this work is to evaluate the anti-hyperglycemic activity of each of these plants to their synergy of mixture extract on type 2 diabetes.

The experiments performed in rabbits by oral glucose overload are showed that aqueous extracts of *Bridelia ferruginea* 500 mg / kg, *Oxytenanthera abyssinica* 1500 mg / kg and *Lophira lanceolata* 500 mg / kg are the most active. Of these extracts, *Bridelia ferruginea* (500 mg / kg, per os) significantly prevented oral glucose tolerance test (OGTT) as the glibenclamide reference product at 10 mg / kg.

Decoctions of leaves of *Bridelia ferruginea , Lophira lanceolata* and *Oxytenanthera abyssinica* due to their antihyperglycemic effects, could therefore be used only in the traditional treatment of diabetes mellitus in Benin.

**Keywords:** Diabetes, phytochemistry, *Bridelia ferruginea, Lophira lanceolata, Oxytenanthera abyssinica*, antihyperglycemia.

## Introduction

Long time considered as a disease specific to developed countries, diabetes is increasingly a major concern in developing countries and particularly in sub-Saharan Africa. In 2014, the World Health Organization (WHO) estimates that 422 million people with diabetes worldwide will be infected, up from 108 million in 1980. By 2030, they will be 600 million, of whom more than 42 million in Sub-Saharan Africa (Salignon and al., 2016). There are two forms: type 1 and type 2. Type 2 diabetes alone accounts for 90% of diabetes cases (Farnsworth, 1993).

In Benin, like other countries in the West African sub region, diabetes is becoming alarming. Indeed, in 2003, the prevalence of diabetes by 1.1% (Djrolo et al., 2003) increased to 2.6% in 2008 (Houinato et al., 2008) and to 4.6% in Djrolo et al., 2012).

Many medicinal plant recipes have been developed and used for the treatment of diabetes by traditional medicine. One of these recipes has been the subject of studies by Bagnan *et al* (2009). Indeed, they have demonstrated the antihyperglycemic properties of extracts of the mixture of leaves of three medicinal plants namely *Bridelia ferrruginea, Oxytenanthera abyssinica* and *Lophira lanceolata* on type 2 diabetes.

Following this work, we have reported in this article, on the one hand, a comparative study of the antihyperglycaemic activity of each aqueous extract of the three plants taken separately with the aqueous extract of the mixture and, on the other hand , Gastric tolerance and acute toxicity of the extracts.

## Experimental

### Material and method

### Plant material

The dried leaves of *Bridelia ferruginea, Oxytenanthera abyssinica,* and *Lophira lanceolata* were collected respectively in Dangbo, Abomey-Calavi and Ahozon (Ouidah) in Benin.

### Extraction

The aqueous extracts of these plants were obtained by decoction of 100 g of the powder of the leaves in 500 ml of boiling water for 30 minutes with stirring. After filtration twice successively extracts with hydrophilic cotton followed by evaporation at 50 ° C. using a Rotavapor of Stuart type RE 300B (United Kingdom) and then placed in a Memmet oven at a temperature of 50 ° C. in order to perfect the evaporation, the extracts obtained are stored in the freezer at -4 ° C before use.

### Animal material

Seventy (70) albino rabbits (Oryctolagus cuniculis) of both sexes, outside the young rabbits, pregnant or lactating females and rabbits with lesions in the eyes, were used for experimental manipulation. The mean weight of the rabbits is 1.60 ± 0.04 kg.

### Phytochemical analysis

Analysis is based on the differential reactions (coloring and precipitation) of the main groups of chemical compounds contained in the powders according to the method of Houghton and Raman (2009).

### Anti-hyperglycaemic effect and acute oral toxicity

The antihyperglycaemic effect and acute oral toxicity of extracts of each plant were evaluated according to the method used by Lawson-Evi et *al*. (1997), Keita et *al.* (1998) and Agbodjogbé et *al*., (2015) with modifications.

Extracts plant and glibenclamide are administered to the rabbits by feeding 15 minutes and 2 hours before the oral hyperglycemia test (OGTT) respectively.

The anti-hyperglycaemic effect and the acute toxicity of the extracts are made on rabbits previously subjected to a fasting of 18 hours before the experiment. These rabbits are divided into 14 groups of 5. The basic blood glucose is determined.

The different lots are defined as follows:

Group 1: Control group in the state of hyperglycemia caused by oral overload (HGPO) of 2 g **/** kg body weight of (+) - D-glucose in 7 mL of distilled water.
Group 2: Reference group received 10 mg of glibenclamide (Daonil) per kg of body weight before the OGTT.
Group 3, 4 and 5: Treated with the aqueous extract of the leaves of *Bridelia ferruginea* at the respective doses of 500; 1000; 1500 mg / kg body weight.
Groups 6, 7 and 8: treated with the aqueous extract of the leaves of *Lophira lanceolata* at the respective doses of 500; 1000; 1500 mg / kg body weight 2 hours before the OGTT.
Groups 9, 10 and 11: treated with the aqueous extract of the leaves of *Oxytenanthera abyssinica* at the respective doses of 500; 1000; 1500 mg / kg body weight.
Groups 12, 13, and 14: are used to test the toxicity of the aqueous extract of the leaves of each plant at the same doses 3000 mg / kg body weight.

After administration of the plant extracts or the reference product (glibenclamide), blood samples were taken to evaluate their anti-hyperglycaemic effect for five (05) hours. Blood sampling is taken by puncture in the marginal vein of the left ear of the rabbits.

At time T0 just before the OGTT, a blood sample is taken, followed by further withdrawals at 30; 60; 90; 120; 180; 240 and 300 minutes after the OGTT.

The blood glucose was quantified using a "SD CHECK GOLG Blood glucometer" glucometer manufactured by Standard Diagnostics, Inc. (Korea).

For the evaluation of gastric tolerance and toxicity, treated rabbits were observed for 2 and 24 hours for immediate acute toxicity and then for 48 and 72 hours for delayed acute toxicity in order to determine the percentage of deaths per group.

### Statistical analysis

The values presented are expressed as averages with the standard error of the mean (X ± SEM). The statistical analysis of the results is carried out using STAT Soft Inc.'s Statistica Version 5.5 software. The comparison of the means is carried out according to the ANOVA test followed by the tests "t series for matched samples" and "t series for samples Independent ". The difference is considered significant when $p < 0.05$.

## Results

### Phytochemical analysis

The photochemical analysis of the leaves of each plant and their mixture are presented in Table 1. This analysis reveals the presence of alkaloids, tannins, flavonoids, anthocyanins, leuco-anthocyanins, steroids, saponosides, anthracene derivatives combined.

**Table 1 :** Phytochemical screening results.

| Chemical groups | | Observations | | | |
|---|---|---|---|---|---|
| | | ***Oxythenantera abyssinica*** | ***Bridelia ferruginea*** | ***Lophira lanceolata*** | ***Melange destrois plantes*** |
| Alkaloides | Alkaloides | +++ | + | ++ | +++ |
| Polyphenolic compounds | Tanins | + | + | + | + |
| | Catechic tannins | +++ | + | ++ | ++ |
| | Tannins qalliques | ++ | + | + | + |
| | Flavanoids | Flavone ++ | Flavone ++ | Flavone ++ | Flavone ++ |
| | Anthocyanosides | + | ++ | + | ++ |
| | Leuco anthocyanes | + | ++ | ++ | ++ |
| Saponosides | Saponosides | H= 1cm À 8/10 | H= 1cm À 9/10 | H= 1cm À 9/10 | H= 1cm À 8/10 |
| Triterpenoides et Steroids | Steroids | +++ | ++ | ++ | ++ |
| | Triterpenoides | - | ++ | - | - |
| cardénolides | | | | | |
| Quinon derivatives | Quinon derivatives | - | + | + | + |
| Cyanogenic derivatives | Cyanogenic derivatives | - | - | - | - |
| Mucilage | Mucilage | - | - | - | - |
| Coumarines | Coumarines | + | ++ | - | + |
| Reducing compounds | Reducing compounds | ++ | ++ | - | ++ |
| Anthracene derivatives | Fre | - | - | - | - |
| | Combined | C heterosides + | O et C heterosides + | C heterosides ++ | C heterosides + |

Caption: +++: Strong presence; ++: Mean presence; +: Weak presence; -: absence; H: height of the foam; IM: moss index.

Moreover, in all the samples, an absence of cyanogenic derivatives, cardenolides, mucilages and free anthracene derivatives is noticed.

Nevertheless, characterization is noted by the absence of coumarins, reducing compounds and triterpenoids in the leaves of *Lophira lanceolata*, quinone compounds in the leaves of *Oxythenantera abyssinica* and a presence of triterpenoids in the leaves of *Bridelia ferruginea*.

## Anti hyperglycemic Activity

## Oral Hyperglycaemia (HGPO)

Oral administration of glucose in the rabbit control group caused significant and maximal hyperglycemia (1.57 ± 0.13 g / L) at the 60th min, a significant increase (p = 0.0058) of 42 , 73% of the initial value.

This blood glucose level begins to decline significantly from the 90th min to reach values of 8.18% from the initial value at the 180th min with and a 14.54% change from Initial value at the 300th min.

In rabbits previously treated with glibenclamide compared with controls, the highly significant changes and blood glucose observed were 30 min (p = 4.7.10-6) and 60 min (p = 1.410.10-4) after administration of glucose, Are identical (-1.91%).

At the 90th min, the antihyperglycaemic effect was observed with a significant decrease of 10.27% compared with the control (p = 0.0010). It is maximal, at the 120th min, with a decrease of 19.85% (Figs.1 to 4).

## Anti hyperglycaemic effect of the aqueous extract of the leaves of *Bridélia ferruginea*

The results obtained at different doses of the aqueous extract of *Bridelia ferruginea* leaves are illustrated in figs. 1a and 1b.

**Figs 1: Effect of the aqueous extract of the leaves of *Bridelia ferrugenia***

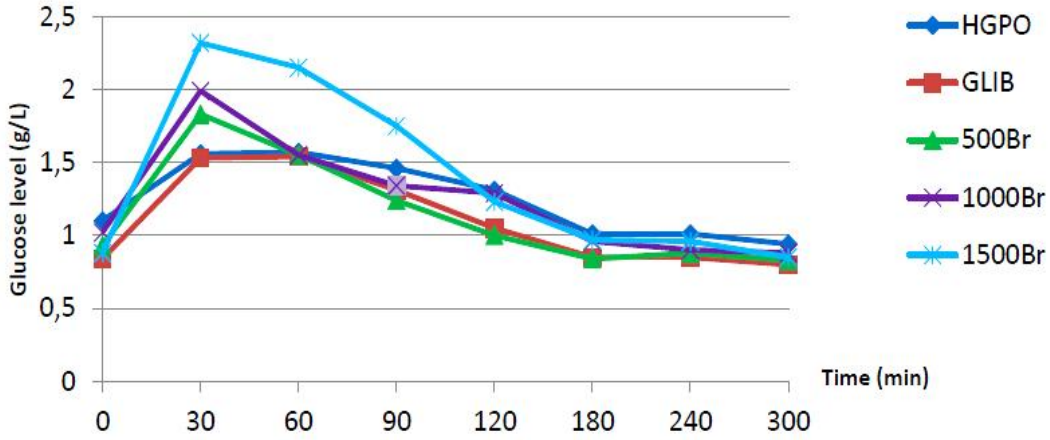


**Fig 1a**: effect of the aqueous extract of the leaves of *Bridelia ferrugenia* on the evolution of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM p < 0.05 compared to placebo (ANOVA followed by the Student t test).

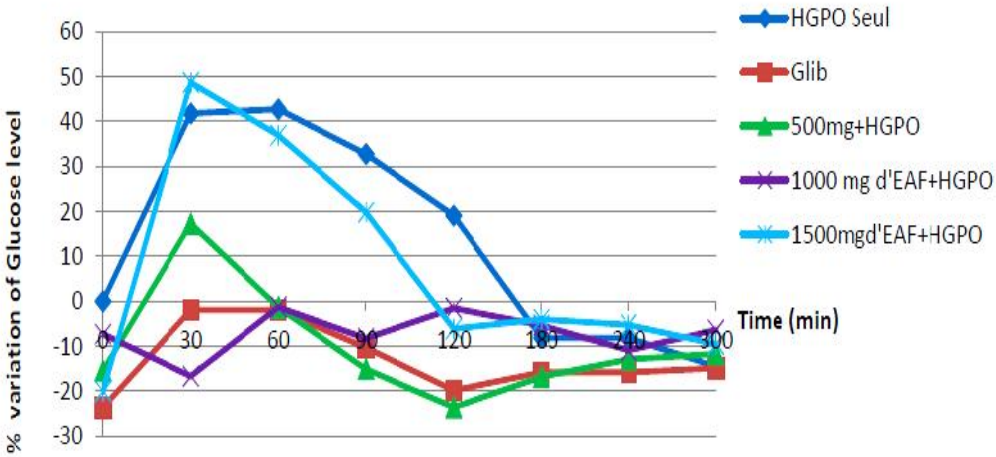


**Figure 1 b**: effect of the aqueous extract of the leaves of *Bridelia ferrugenia* on the variation of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM, p < 0.05 compared to placebo (ANOVA followed by the Student t test).

The aqueous extract of *Bridelia ferruginea* at doses 500, 1000 and 1500 mg / kg body weight induced an antihyperglycaemic effect at the 60th min with a reduction rate of 1.27% at doses 500 and 1000; And continues until the 300th min with a maximum value at the 120th min (23.66%) and 8.22% at the 90th min respectively. However, at 1500 mg / kg, the antihyperglycaemic effect at this dose was observed only at the 120th min with a reduction rate of 6.11%. This antihyperglycaemic action persists until the 300th min where the variation is 9.57%.

**Anti hyperglycaemic effect of the aqueous extract of the leaves of *Lophira lanceolata.***

The results obtained at the various doses of the aqueous extract of the leaves of *Lophira Lanceolata* are illustrated in figs. 2a and 2b.

**Figs 2: Effect of the aqueous extract of the leaves of *Lophira lanceolata.***

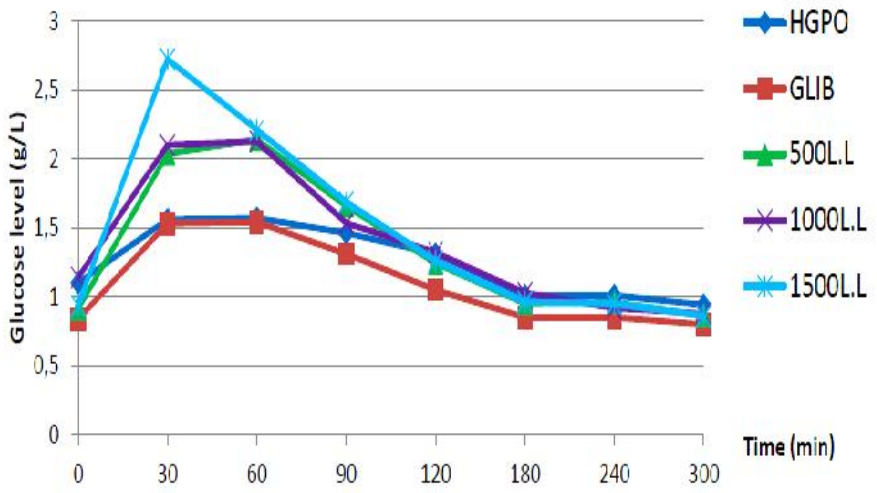


**Fig 2 a:** effect of the aqueous extract of the leaves of *Lophira lanceolata* on the evolution of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM, p < 0,05 compared to placebo (ANOVA followed by the Student t test).

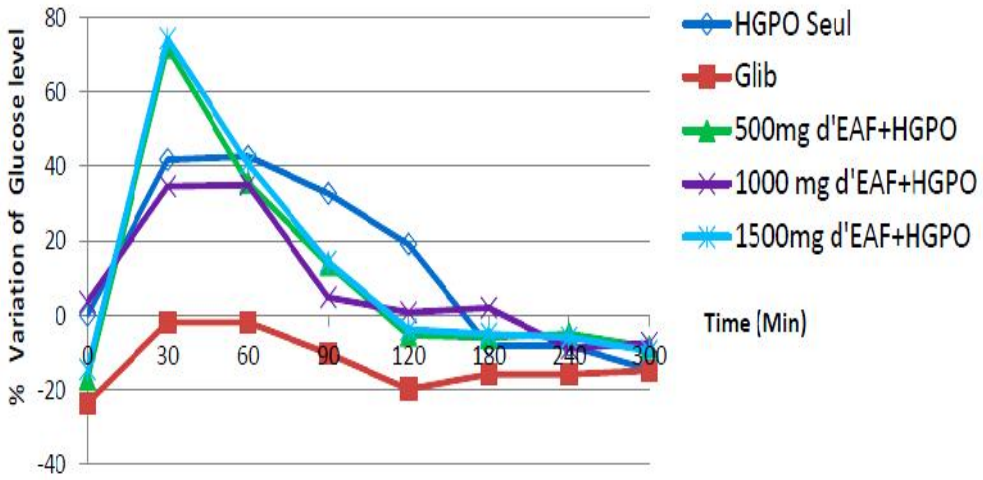


**Fig 2 b**: effect of the aqueous extract of the leaves of *Lophira lanceolata* on the variation of blood sugar in rabbits, N = 5 in each group, values = average ± ESM, P < 0.05 compared to placebo (ANOVA followed by the Student t test).

Antihyperglycaemic effect was observed at 120 minutes for doses 500 and 1500 mg / kg with a decrease rate of 5.34% and 3.82%, respectively. This highly significant reduction in blood glucose between the instants of 30 to 240 min ($p \leq 0.0007$).

This effect continues until the 300th min with a decrease rate of 8.51%. The antihyperglycaemic effect is observed only after the 240th minute for the 1000 mg /kg OGTT.

The results obtained at the different doses of the aqueous extract of leaves are recorded in figs. 3a and 3b.

**Figs 3: Effect of the aqueous extract of the leaves of Oxytenanthera abyssinica.**

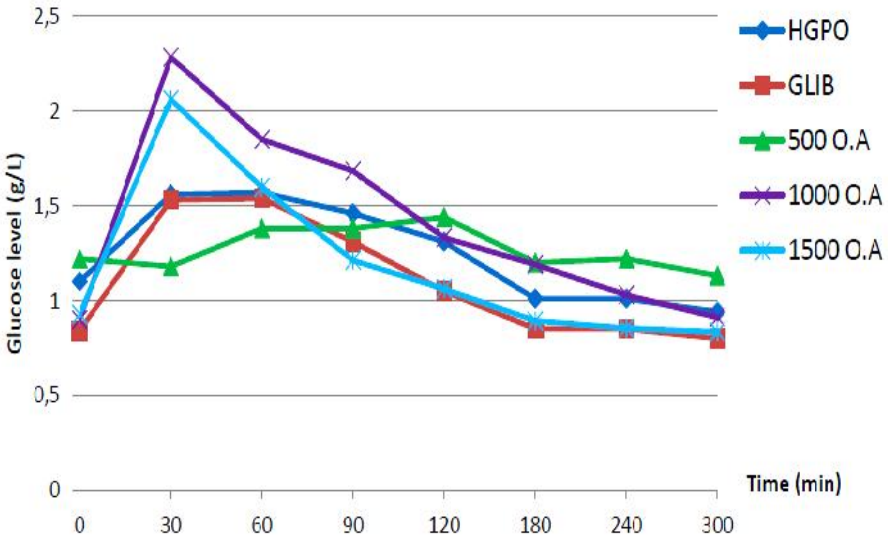


**Figure 3 a :** effect of the aqueous extract of the leaves of *Oxytenanthera abyssinica* on the evolution of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM, p < 0.05 compared to placebo (ANOVA followed by the Student t test).

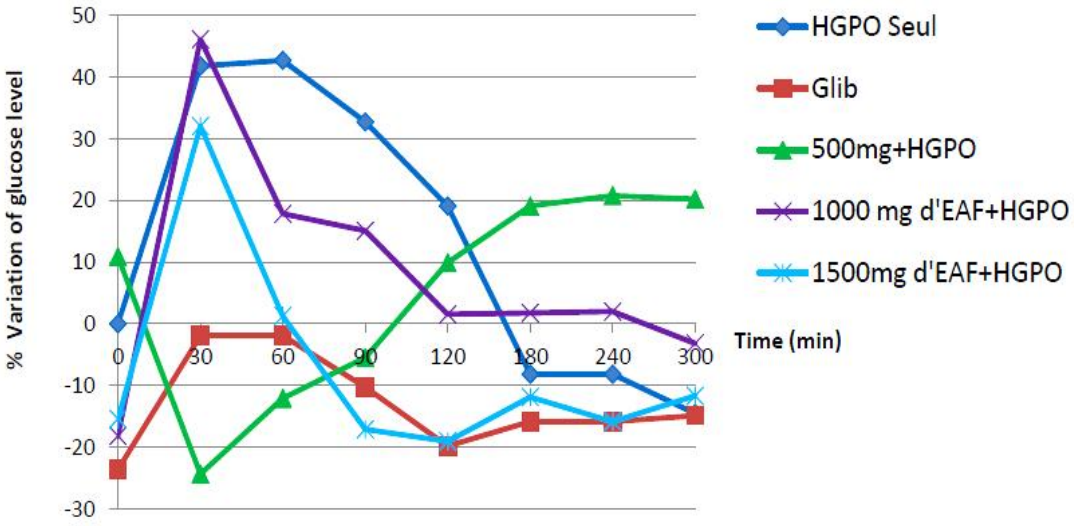


**Figure 3 b:** effect of the aqueous extract of the leaves of *Oxytenanthera abyssinica* on the variation of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM, p < 0.05 compared to placebo (ANOVA followed by the Student t test).

Different doses of the leaves of *Oxytenanthera abyssinica*, the 1500 mg / kg dose resulted in a significant reduction in blood glucose from the 90th min and then continued until the 300th min. This reduction is maximal at 120 min after PGHT as well as the effect of glibenclamide.

The dose of 500 mg / kg shows the antihyperglycaemic effect at the 30th min with a decrease rate of 24.36%. This reduction is significant over time and continues until the 300th min with a maximum value at the 180th min with a glycemic reduction rate of 46.53%. As for the 1500 mg / kg dose, it is from the 90th min that antihyperglycaemic

action occurred with a decrease of 17.12%, then persists until the 300th min. Yet no antihyperglycaemic effect was observed for the dose 1000 mg / kg body weight.

**Anti hyperglycaemic effect of the aqueous extract of the mixture of the leaves of the three plants.**

The results at different doses of the aqueous extract of the mixture (1 / 3-1 / 3-1 / 3) of the sheets are illustrated in figs. 4a and 4b.

**Figs 4: effect of the water extract of the leaves of the mixture of the leaves of Br + L.L + Oxy.**

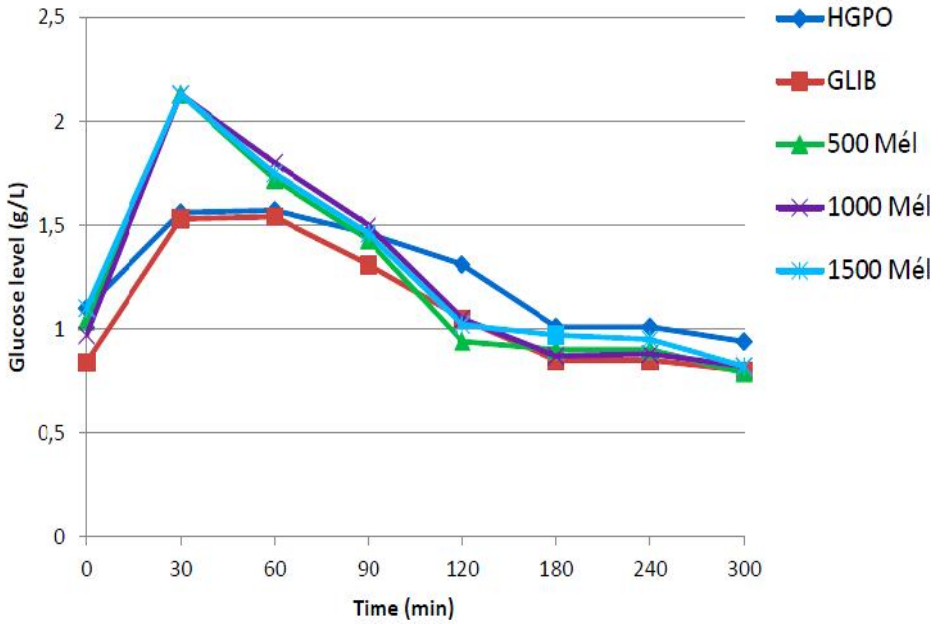


**Figure 4 a:** effect of the water extract of the leaves of the mixture of the leaves of Br + L.L + Oxy on the evolution of blood sugar in rabbits, N = 5 in each group, values = average ± ESM, p < 0.05 compared to placebo (ANOVA followed by the Student t test).

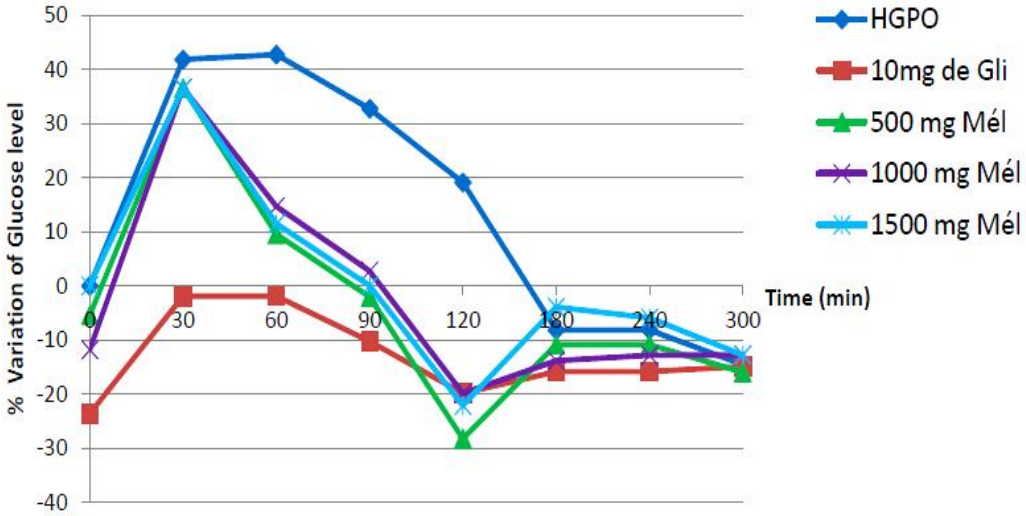


**Figure 4 b:** effect of the water extract of the leaves of the mixture of the leaves of Br + L.L + Oxy on the variation of blood sugar in rabbits, N = 5 in each group, values = medium ± ESM, p < 0.05 compared to placebo (ANOVA followed by the Student t test).

**500 mg / kg PC of the aqueous extract of the mixture.**

The antihyperglycemic effect of the mixture appears at the 90th min with a rate of decrease of 2.05%. This effect continues until the 300th min with a decrease rate of 5.11%. The maximum value of the reduction is 28.24% at the 120th min.

**1000 mg / kg PC of the aqueous extract of the mixture.**

At this dose, the antihyperglycaemic action appears at the 120th min with a decrease of 19.85% and persists until the 300th min where the decrease is 12.76%.

**1500 mg / kg of the aqueous extract of the mixture**

Antihyperglycaemic effect of this dose is observed at the 120th min with a decrease rate of 22.14%. This effect continues until the 300th min with a decrease rate of 12.76%.

**Comparison of antihyperglycemic effects of aqueous extracts of plants.**

This comparison is made with the test "t series for independent samples" and the results are illustrated in figs. 5a, 5b and 5c.

**Figs 5: compared to the dose 500 mg/kg of 3 plants and extracts of the extract from their mixture.**

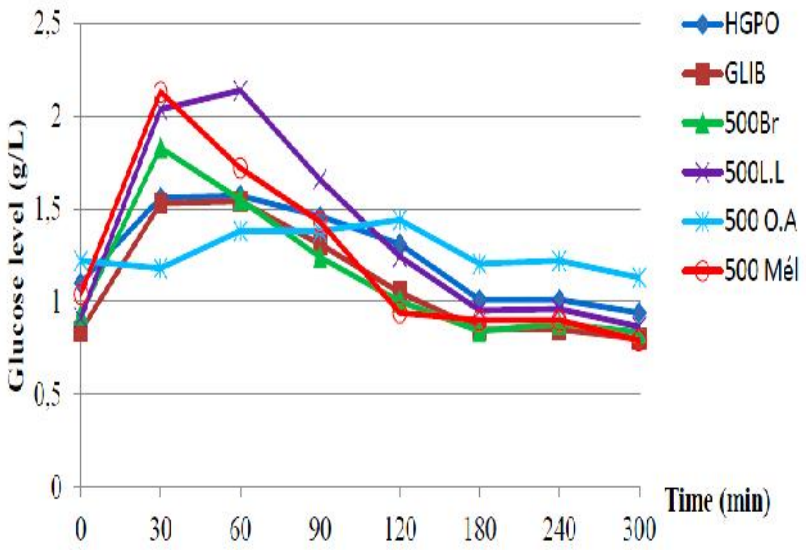


**Fig 5 a:** effect compared to the dose 500 mg/kg of 3 plants and extracts of the extract from their mixture on the evolution of blood sugar.

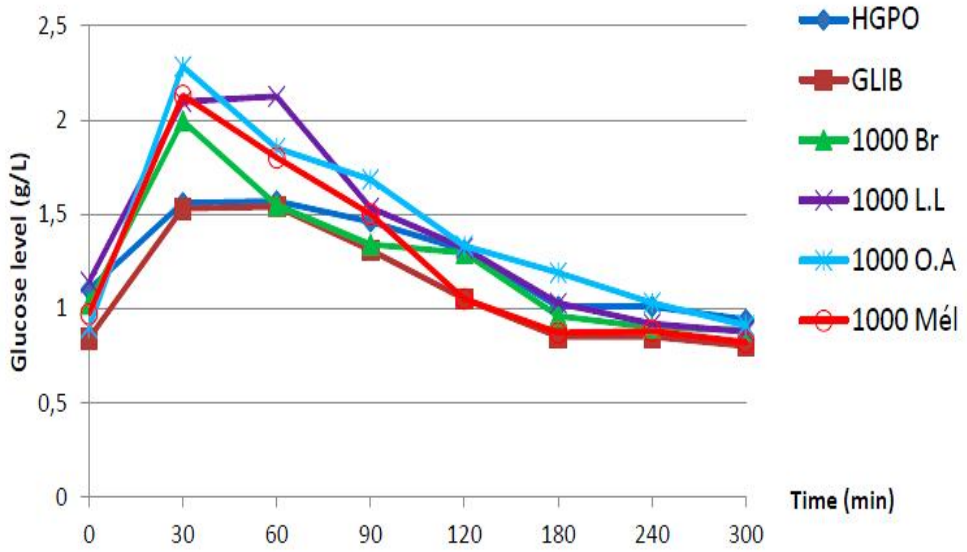


**Fig 5 b:** effect compared the dose of 1000 mg/kg of 3 plants and extracts of the extract of the evolution of the sugar mixture.

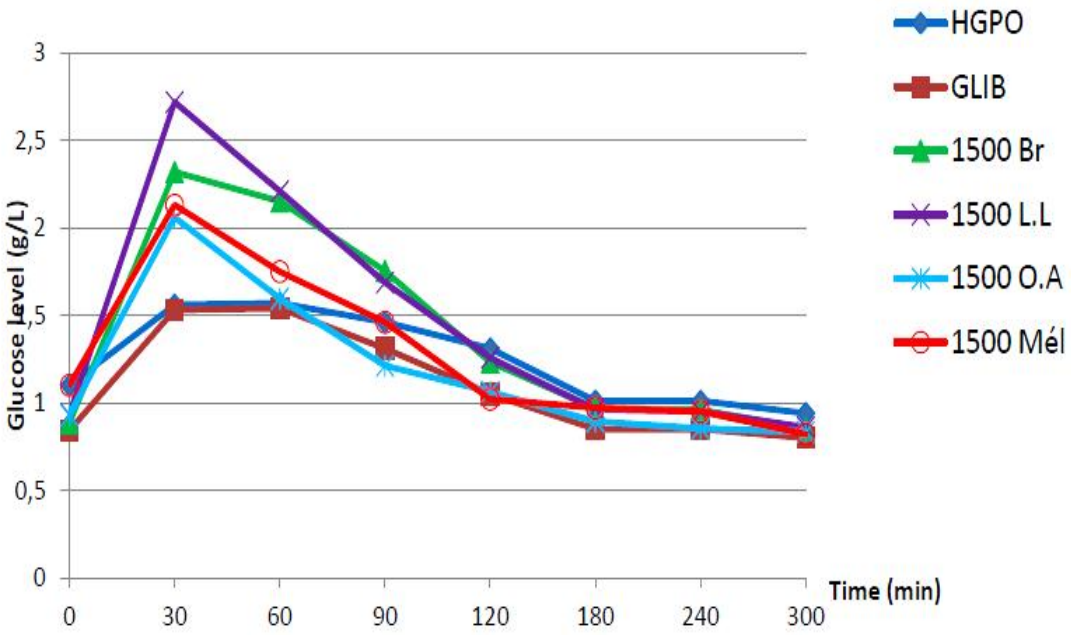


**Fig 5 c:** effect compared the dose of 1500 mg/kg of 3 plants and extracts of the extract from their mixture on the evolution of blood sugar.

### Doses 500 mg / kg

The curves of dose 500 mg / kg of *Bridelia ferruginea* and *Oxytenanthera abyssinica* showed very significant differences (p = 0.003) at 0 min (0.93 ± 0.10 g / L versus 1.22 ± 0.11 g / L) and between the times of 120 to 300 min (p ≤ 0.04).

Between the extracts of *Bridelia ferruginea* and *Lophira lanceolata* on the one hand and those of *Bridelia ferruginea* and the mixture on the other hand, no significant difference is observed.

Nevertheless, the extracts of *Lophira lanceolata* and the mixture showed a very significant difference (p = 0.02) between the blood glucose averages from the 0th to the 60th min. Similarly, significant differences (p ≤ 0.006) between mean blood glucose levels of *Oxytenanthera abyssinica* and the mixture are observed from time 0 min to 300 min except at 90 min.

### Doses 1000 mg / kg.

Dose of 1000 mg / kg of *Bridelia ferruginea* compared to that of *Oxytenanthera abyssinica*, a significant difference (p = 0.03) is observed between the mean glucose levels from 60 min (1.55 ± 0.14 g / L against 1.85 ± 0.25 g / L). The same applies to *Lophira lanceolata* and *Oxytenanthra abyssinica* from 0 min (1.14 ± 0.06 g / L to 0.90 ± 0.08 g / L) (p = 0.0002).

At 120 min, the difference between mean blood glucose (1.29 ± 0.19 g / L versus 1.05 ± 0.11 g / L) was significant (p = 0.03) between *Bridelia ferruginea* And mixing.

The test revealed two very significant differences between *Lophira lanceolata* blood glucose averages and mixing at 0 min (1.14 ± 0.02 g / L versus 0.97 ± 0.11 g / L, p = 0.002) And 120 min (1.32 ± 0.10 g / L versus 1.05 ± 0.13 g / L; p = 0.003).

Very significant differences (p ≤0.01) are also observed between *Oxytenanthera abyssinica* and the mixture but this time from the 120th min and continues until the 240th min.

### Doses 1500 mg / kg.

Significant differences between the blood glucose averages of the *Lophira lanceolata* extracts and the mixture were found at 0 min (0.94 ± 0.14 g / L versus 1.10 ± 0.06 g / L, p = 0.04) and 30 min (2.72 ± 0.39 g / L vs. 2.13 ± 0.07 g / L, p = 0.01).

Very significant differences were also observed between the leaves of *Oxytenanthera abyssinica* and the mixture at 0 min (0.93 ± 0.08 g / L versus 1.10 ± 0.06 g / L, p = 0.003) and 240 min (0.85 ± 0.08 g / L versus 0.95 ± 0.01 g / L, p = 0.03).

For the extract of *Bridelia ferruginea* compared to that of the mixture, the differences observed between the means of the glycaemia are significant from 0 to 90 min.

The comparison between the leaves of *Bridelia ferruginea* and *Oxytenanthera abyssinica* at this dose also revealed a significant difference (p = 0.04) between the blood glucose averages of the two extracts between the 30th min and 180th min.

**Motricity, gastric tolerance, acute lethal dose.**

Oral administration of 3000 mg / kg body weight, aqueous leaf extract of each plant and their mixture showed no evidence of toxicity. Indeed, from 2 to 24 hours of observation, no mortality is recorded in the rabbits. They kept their normal motor skills and their lucidity. The same result was observed 48 and 72 hours later.

The acute toxicity and the lethal dose are then greater than 3000 mg / kg.

However, a biochemical analysis of the body's vital organs, such as the stomach, liver, kidneys and heart, is necessary to fully predict the safety of these plants at 3000 mg / kg.

## Discussion

The phytochemical study of extracts from the leaves of *Bridelia ferruginea, Lophira lanceolata* and *Oxytenanthera abyssinica* showed that these plants contain predominantly alkaloids, polyphenolic derivatives (catechol tannins, gallic tannins, flavonoids, leucoanthocyanins), saponins, steroids and Reducing compounds. This composition is similar to that found in *Oxytenanthera abyssinica* by Nounadondé (2005), that found in the plant mixture used by Agbodjogbé (2007), that of the mixture *Oxytenanthera abyssinica, Bridelia ferruginea, Lophira lanceolata* used by Bagnan (2009).

Oral administration of glucose in the control group of rabbits shows that the rabbit organism is able to absorb glucosidic overload well after the 180th min.

A single dose of glibenclamide, two (2) hours before the OGTT, causes a considerable drop in glycemia of 10.27% as compared to the control batch. Glibenclamide therefore increased insulin secretion by counteracting hyperglycemia from the 60th minute after the OGTT.

The evaluation of the OGTT in rabbits not treated with plant extracts showed that the rabbit organism reacted and reduced blood glucose to the base value (baseline). These results are qualitatively similar to those resulting from the work carried out by Keita et al. (1998), Skim et al. (1999), Nounadondé (2005), Gbénou and Oyéniran (2006), Agbodjogbé (2007), Bagnan (2009) and Dosseh (2011).

The leaves of these plants, by the presence of alkaloids, catechic and gallic tannins, flavonoids, steroids, anthocyanins, leucoanthocyanins and saponosides responsible for its anti-inflammatory, antiseptic, antioxidant, antioematous and regenerative properties of retinal purple , Can prevent and correct certain complications of diabetes, while normalizing blood sugar levels.

Administration of the aqueous extract of the leaves of each plant produced effects that varied over time depending on the doses applied. Our work showed that the extract of the leaves of *Bridelia ferruginea* showed an antihyperglycaemic effect at the 500 mg / kg dose which occurred at the 60th minute. And this with a decrease rate of 1.27% compared to the control.

At this dose, similar to the activity of glibenclamide, it can be said that 500 mg / kg is the threshold of efficacy of the extract.

For the extract of the leaves of *Lophira lanceolata*, doses 500 and 1500 mg / kg produced antihyperglycaemic effects. These effects occurred at the 120th min, later than the effects of the reference product. They are weak and lasted 3 hours. Comparison of the effects of the two doses indicated that there was a significant difference at the 30th min ($p = 0.013$) in favor of the 500 mg / kg dose. It can be deduced that the 500 mg / kg dose is better than the 1500 mg / kg dose.

The leaves of *Lophira lanceolata* are used to treat conjunctivitis, dysentery and hypertension. Their antihypertensive effect is beneficial in the treatment of advanced type 2 diabetes, as often advanced type 2 diabetics before diagnosis are overweight and hypertensive (Newinger, 2000).

As for the extract of the leaves of *Oxytenanthera abyssinica*, doses 500 and 1500 mg / kg also produced antihyperglycaemic effects. These effects occurred at the 30th and 90th min respectively as the effects of the reference product but were strong and lasted only one hour for the 500 mg / kg dose and 3 hours and 30 min for the Dose 1500 mg / kg. Comparison of the effects of the two doses indicated that there were significant differences ($p \leq 0.02$) in favor of the 1500 mg / kg dose. It can be deduced that the 1500 mg / kg dose is the efficiency threshold of the extract.

The leaves of *Oxytenanthera abyssinica* are used in the treatment of polyuria ( Newinger, 2000). This effect shows that the leaves of *Oxytenanthera abyssinica* are used in the treatment of diabetes. The different results of this study show antihyperglycaemic activity of the aqueous extracts of the three plants taken separately.

An evaluation of the extract of the mixture of the three plants shows that the 1000 mg / kg dose of the extract of the mixture of the three plants has a significant antihyperglycemic effect.

The comparison of the antihyperglycaemic effects of the aqueous extracts of the leaves of the three different plants on the one hand and on the other hand on the effects of the extract of their mixture by the "series test for independent samples" Good results, with significant differences, in favor of the extract of the mixture *Bridelia ferruginea, Lophira lanceolata, and Oxytenanthera abyssinica.* It appears that the antihyperglycaemic effect of 1500 mg / kg of *Oxytenanthera abyssinica* is therefore more active than the effect of 1500 mg / kg of *Bridelia ferruginea, Lophira lanceolata* and their mixture.

Bagnan (2009), working mainly on the association of these three plants, showed that the 500 mg / kg ethanolic extract is more effective than the 500 mg / kg aqueous extract. In our study, the 500 mg / kg dose of the aqueous *Bridelia ferruginea* extract is more active than those of the other plants and their mixture.

As regards the toxicity of aqueous extracts of the leaves of *Oxytenanthera abyssinica, Bridelia ferruginea* and *Lophira lanceolata*, the dose 3000 mg / kg showed no signs of toxicity. The extracts at this dose are thus well tolerated by the rabbit organism, that is to say that the extracts are easily metabolized by the animals. According to the Hodge and Sterner (1943) and WHO (2002) chemical toxicity scale, these extracts are considered to be practically non-toxic. The lethal dose 50 is then greater than 3000 mg / kg.

## Conclusion

The evaluation of the antihyperglycaemic activity of *Oxytenanthera abyssinica, Bridelia ferruginea* and *Lophira lanceolata* through a decoction of their leaves is our contribution to the valorisation of the phytomedicines used in the traditional treatment of diabetes in Benin and also to the medicinal plants that can serve as a real alternative to one of the most serious diseases of diabetes.

## Conflict of interest statement

The authors declared no conflict of interest

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## References

1. Agbodjogbé K.W.D. 2007**.** Antihyperglycemic effect of a mixture of medicinal plants. Memory for the Master 2 Research in STAPS INJEPS / UAC (Porto-Nov) Benin, 57 p.
2. Bagnan S. 2009. Evaluation of the antihyperglycaemic activity of a combination of three plants used in the traditional treatment of diabetes in Benin. Doctoral thesis in pharmacy, FSS / UAC, Benin, 83 p.
3. Djrolo F., Amoussou-Guênou K.D., Zannou D.M. 2003. Prevalence of diabetes mellitus in Benin. Leuven Med, 122: 258-262.
4. Djrolo F., Houinato D., Gbary A., Akoha R., Djigbénoudé O., Sègnon J. 2012. Prevalence of diabetes mellitus in the adult population in Cotonou, Benin. Medicine of Metabolic Diseases.6 (2): 167-169.
5. Dodoo B. 2010. Evaluation of antihyperglycaemic activities of extracts of the leaf-bark mixture of *Casuarina equisetifolia*. Master's thesis for STAPS, INJEPS, Porto- Novo / UAC (Benin), 52 p.
6. Dosseh K. 2011. Evaluation of antihyperglycaemic activities of Aqueous extracts of the bark and leaves of *Casuariana equisetifolia*. Memory for the Research Master in STAPS, IJEPS, Porto-Novo / UAC (Benin), 58 p.
7. Ducobu J. 2003. Oral antidiabetic drugs in 2003. Rev Med Brux, 24: 361-368.
8. Farnsworth, R. N. 1993. Ethnopharmacology and future drug development: the North American experience. Journal of Ethnopharmacology, 38: 145-152
9. Gbénou J.D., Oyéniran C. 2006. Contribution to the study of the hypoglycemic properties of the essential oil of *Eucalyptus camaldulensis*. Communication, 14th CAMES Symposium on Traditional Medicine and the African Pharmacopoeia. Abidjan from 04 to 08 Dec.
10. Hodge H.C., Sterner J.H. 1943. Determination of substances acute toxicity by LD50. Bitter. Industrial Hygiene. Assoc. 10: 93.
11. Houghton J.P., Rama A., 2009. *Laboratory Handbook for the Fractionation of Natural Extract.* Pharmacognosy Research Laboratries, Department of Pharmacy, King's College, London , 212 p.
12. Houinato D., Ségnon-Agueh J.A., Djrolo F., Djigbennoudé O.2008. Final report of the STEPS survey in Benin: 85 p.
13. Keita A.M., Mariko E., Haidara T.K. 1998. Study of the hypoglycaemic activity of leaves *Sclerocarya birrea*. Revue Traditional African Medicine, 10, pp: 16-25
14. Lawson-Evi P., Eklu-Gadégbeku K., Aklikokou A.K., Gbeassor M. 1997. Hypoglycaemic activity of some medicinal plants. Pharm. Med. Trad. Afr. 9: 60-69.

15. N'diaye M., Diatta W., Sy G.Y., Fall A.D., Bassene E. 2008. Antihyperglycaemic activity of the ethanolic extract of leaves of *Lcacina senegalensis* Juss (icacinaceae). Medicine of Black Africa, 54: 236-240.
16. Nounadondé G.R. 2005. Contribution to the study of the hypoglycemic properties of plant extracts. Case of *Oxytenanthera abissinica* (*In-vivo* study in albino rabbits).Master's thesis STAPS, INJEPS, Porto-Novo / UAC Benin, 63 p.
17. WHO. 2014. Global status report on noncommunicable diseases. Geneve, World Health Organization.
18. Othmani - Mecif K., Benazzoug Y. 2005. Characterization of certain biochemical plasma and histological parameters (female genital tract) in the non-pregnant local rabbit population (*Oryctolagus cuniculus*) and during gestation. Science and Technology, 23: 91-96.
19. Salignon Pierre*.,* Stéphane Besançon ., Mathieu Doré.*2016 :* In Africa, diabetes and cardiovascular disease kill more than AIDS. Act. Lancet 2016 ; Published online January 24.
https://www.google.com/search?q=prevalence+diab%C3%A8te+afrique+subsaherienne&ie=utf-8&oe=utf-8&client=firefox-b.
20. Skim F., Kaaya A., Jaouhari J.T., Lazrek H.B., Jana M., Amri H. 1999.The hypoglycaemic activity of the leaves of *Globularia alypum* in rats. Fitoterapia, 70: 382-389.

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