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Comparative of the antihyperglycemic activity of *Sclerocarya birrea*, *Khaya senegalensis*, *Heliotropium indicum* and *Ocimum gratissimum* to rats wistar

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Abstract: The barks of thunk of *Sclerocarya birrea* (ANARCADIACEA) and *Khaya senegalensis* (ANARCADIACEA) associated with the leaves of *Heliotropium indicum* (BORRAGINACEA) and *Ocimum gratissimum* (CESALPINIACEA) usually constitutes a traditional remedy use in Côte d'Ivoire for the treatment of diabetes. This remedy is use according administration a small dose to 35mg/kg. For that reason, each healing plant above was studied to estimate their real effect on the glycaemia of hyperglycemic rats the rats were submitted at oral load of glucose (4g/kg) after received only dose of plant extract. The result showed that, rats whose administrated the aqueous extract of *Scleroracaryo birrea*, *Khaya senegalensis* and the aqueous extract of *Khaya senegalensis* had significant antihypergliycemic effects respectively 30% and 20% ($p<0,05$; $n= 8$) after 2 hours. These reductions of blood glucose reached 40% and 26% at the 4 hour. The aqueous extract of *Ocimum gratissimum* didn't show a significant effect on the glucose blood of the rats, the decrease was 4,5% ($p<0,05$; $n= 8$). Concerning the aqueous extract of *Heliotropium indicum*, we noticed no antihyperglycemic effect on the blood of the rats tested. The phytochemical analysis revealed the presence of alkaloids, coumarins and tannins to *Sclerocarya birrea. Khaya senegalensis* contained alkaloids and coumarins and polyphenols to *Heliotropium indicum.* The aqueous extract of *Ocimum gratissimum* contained flavonoid and tannins. Conclusion: The antihyperglycemic effect of the traditional preparation could be due of antidiabetic activities of *Sclerocarya birrea* and *Khaya senegalensis*. However, the aqueous of *Heliotroppium indicum and Ocimum gratissimum* hadn't antidiabetic effect so, its can be considered as additives in this traditional preparation. Others detailed investigations are in progress to isolate active ingredient and to determine their mechanism.

Keywords: Diabetes, Aqueous Extracts, Antihyperglycemic Effect, Rats Wistar

1. Introduction

Diabetes were the chronic diseases emergence whose treatment constituted a economic problem in Africa. In the old days unknown, these diseases until becoming a real public health problem [10,11].

According to WHO, the number of diabetes patients in the world could reach 300 millions at the year 2025. In Africa, 14 millions of people suffer from diabetes and this number should be double to 2025. It concerns most of people from 30 to 50 years for the type- 2 diabetes [2].

In Côte d'Ivoire, 5,7% of diabetic were diagnosed in hospitals. But, this situation is below of reality why many patients don't attend hospitals [11,13].

In view of this expansion of diabetes, WHO in its resolution AFR/RC50/R3 of August 31, 2000, encourage African countries to develop regional strategies on traditional medicine in order to begin research on medicinal plants and promote their optimal uses in health service system [10].

The stem-bark of *Sclerocarya birrea* (Anarcadiacea) is taken as antidysenteric and by infusing leaves of *Heliotropium indicum* (Borraginacea) is used externally as an anti-inflammatory agent in western Africa [2,9]. Hot water extract of the leaves of *Ocimum gratissimum* (Cesalpiniacea) and Decoction stem bark of *Khaya senegalensis* (Anarcadiacea), are taken orally to treat hemorrhage and diarrhea in Côte d'Ivoire [2,9].

The aim of this study was to examine the possible antihyperglycemic effect of aqueous extracts of *Sclerocarya birrea*, *Khaya senegalensis*, *Heliotropium indicum* and *Ocimum gratissimum* whose mixing constituted traditional remedy to treat diabetes in South of Côte d'Ivoire.

2. Material and Methods

2.1. Plant Material

2.1.1. Botanicals Species

The vegetal materials were constituted by fresh barks of trunk of *Khaya senegalensis,* and *Sclerocarya birrea*, also fresh leaves of *Heliotropium indicum* and *Ocimum gratissimum*. The barks have been collected in May 2009 in the savannas area of Korhogo (the north of Côte d'Ivoire) and escorted to the urban market in Abidjan, the south of the country. In the same time the leaves have come to around Abidjan. A sample plants have been identified by Pr Aké-Assi [2,9] and registered at the herbarium to National Floral Center of University FHB-Abidjan under N° 235, N° 3023, N° 385, N° 3512 respectively to *Khaya senegalensis*, *Sclerocarya birrea*, *Heliotropium indicum* and *Ocimum gratissimum*.

2.1.2. Plants Extracts

The fresh leaves and barks of the plants collected were dried under the shade and ground into powder. The aqueous extract of each of these four plants is prepared from 300 g of powder which is introduced into a 3litres of distilled water. It is about a decoction of 10%. The decoction is realized by heating the extract in simmering water at 100° C during 2 hours.

After cooling, the decoction is filtered and lyophilized; 25,5g, 20,1g, 28,5g and 21,3 g of powder were obtained with extraction yields of 8,5%, 6,7%, 9,5% and 7,3% respectively to *Khaya senegalensis*, *Sclerocarya birrea*, *Heliotropium indicum* and *Ocimum gratissimum*.

2.2. Animal Material

The experimental animals were male wistar rats (*Rattus norvegicus*) between 165- 190 g were obtained from the department of Biosciences of the University FHB-Abidjan. The experiment was made for each extract on 24 rats raised in plastics cages. Animals are kept in room having an ambient temperature of 25±2°C and stable hygrometry. The daylight lighted from 7h am to 18h pm and the rest of the time were darkness. Animals are placed in collective cage by 4 and have free access to water.

2.3. Phytochemical Screening

The AEKS obtained were subjected to preliminary phytochemical screening to identify the chemical constituents which could be potential pharmacologic effect [14]. The methods of analysis used where those described by Nemlin and Konkon [10,12].

2.4. Induction of Oral Glucose Tolerance Test

An Oral Glucose Tolerance Test (OGTT) was performed on non-diabetic rats. Animals were deprived of food for 14h and during the experiment but were allowed free access to water. Each Extract was administered orally at only dose of 35 ± 5 mg/vo 1 hour before glucose load (4g/kg) to group of 8 rats. Two other groups of 8 rats each received orally distilled water (5ml/kg) and Glibenclamide (0,2mg/kg). The rats received the water is considered as the controls and glibenclamide was used as standard hypoglycemic agents.

Blood samples were taken before administration of extracts and glucose and subsequently at 1, 2, 3 and 4 hours after.

2.5. Determination of Blood Glucose Levels

Blood samples were collected from the digit of 14hours fasted rat. This capillary blood samples level were determinated using a glucometer ONE TOUCH BASIC (Lifescan, USA).

2.6. Statistical Analysis

Blood glucose levels of each group were expressed in mg/dl as mean ±SEM (Standard error of the mean). Student's t-Test was used to determine the significance of

differences between various groups. P < 0,05 were taken as significant [6].

3. Results

The results of the blood glucose levels of aqueous extract of *Khaya senegalensis* (AEKS), aqueous extract of *Sclerocarya birrea* (AEKS), aqueous extract of *Ocimum gratissimum* (AEKS) and aqueous extract *Heliotropium indicum* (AEHI) are shown in figure 1.

After 2 hours of treatment, both the AEKS and AESB showed a significant ($p<0,05$; n= 8) decrease in blood glucose levels compared to control (fig. 1) respectively 30% and 20%.

After 4 hours, there were also for the dose 35±5mg/kg, significant decrease in the blood glucose levels of 40% and 26% respectively to the AEKS and the AESB.

These results are shown that the AEKS possessed more antihyperglycemic properties than the AESB (fig 1).

After 2 hours and 4 hours, there was no significant change in the treatment with the AEOG, the decrease of blood levels was 4,5% ($p<0,05$; n=8) of the rats tested (fig 3). Concerning the AEHI, we noticed also no antihyperglycemic effect on the glucose blood levels of the rat for the dose 35± 5mg/kg (fig 1).

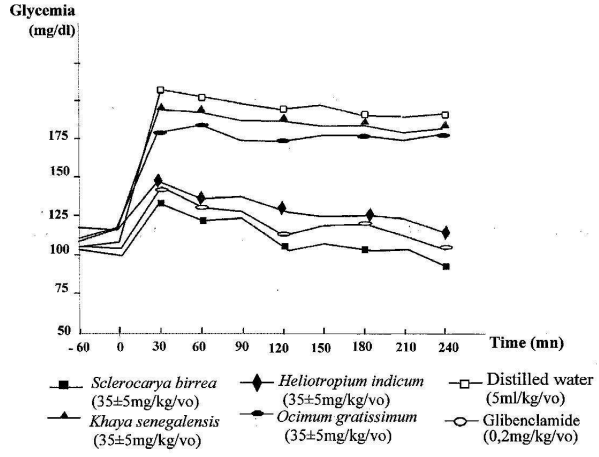

Figure 1. *Comparison of the effects on the glycemia of the aqueous extracts of Sclerocarya birrea, Heliotropium indicum, Ocimum gratissimum, Khaya senegalensis, de Glibenclamide and Distilled water to the rats.*

4. Discussion

This study had for essential objective to evaluate the potential activity of antidiabetic plants such as *Sclerocarya birrea* (Anarcadiacea), *Khaya senegalensis* (Anarcadiacea), *Heliotropium indicum* (Borraginacea) and *Ocimum gratissimum* (Cesalpiniacea) in an oral glucose tolerance model rats.

The results of this experimental animal indicated that both the aqueous extract of *Sclerocarya birrea* and *Khaya senegalensis* which are the same family of anarcadiacea possessed antihyperglycemic effects in hyperglycemic rat model. In fact, *Sclerocarya birrea* had more important antihyperglycemic activity than *Khaya senegalensis* (40% vs 25%) for the same dose of 35±5mg/kg/vo. This was be due to the presence of chemical compounds like flavonoids whose were in greater part to the aqueous extract of *Sclerocarya birrea* than *Khaya senegalensis.*

This result confirmed that the extracts of *Sclerocarya birrea* and *Khaya senegalensis*, like hypoglycemic sulfamid potentiated the neromediator which is insulin on peripheral tissues for the glucose metabolism. The action of this hypoglycemic hormone is favorited by training of flavonoides – glycosides [4]. And the hypoglycemic effect could be due to coumarins, chemical compounds whose possess hypoglycemic activities [14].

Also, tannins presented of *Khaya senegalensis* could prevent or cure the wounds which may be arise at diabetics.

Like plants extracts studied, glibenclamide, the reference oral antidiabetic in our assays, also produced significant reductions in the level blood glucose a 2th hours after its administration to hyperglycemic rats.

By basing on extension of action of drugs (2h, 4h) and glibenclamide (2h) in our study, we could consider *Khaya senegalensis* of medicinal plant with "quick action" than *Sclerocarya birrea.*

On contrary, the extracts of leaves of *Ocimum gratissimum* and *Heliotropium indicum* in a dose of 35mg/kg had no significant effect ($p<0,05$) on the glycemia of rats after glucose administration. It may be due of the specimen nature that contained few antidiabetic compounds or the period of crops [5]. So they could be use as additives substances in the preparation to the plants study.

Another comparative study was made on albino rats who received 100 ml/kg with extracts of *Artemisia, Marrube, Olivier* and *Zygophyllum* before with the oral glucose tolerance (4g/kg).The glycemic variation of these extracts compared to the witnesses animals revealed that *zygophyllum* presented the most important effect antihyperglycemic. The decrease of the glycemia inferred by this drug was 46% at 60th minute [7].

The oral glucose tolerance test in diabetes experimental is used for study the antidiabetic activity of the medicinal plant drugs [1,7,8] and preserve also laboratory animals [15].

4.1. The weaknesses of the Article

The antidiabetic tests were realized in this word with the low dose (35mg/kg) of *Sclerocarya birrea* and *Kaya Senegalensis* stem-barks aqueous, *Heliotropium indicum* and *Ocimum gratissimum* leaves aqueous. However, for each sample, it was not searched the effective dose and the dose allowing to obtain a maximum antidiabetic effect.

Besides, to study the antidiabetic plant effects, it‘s necessary to use the models rats which became spontaneously diabetes as human. For example, it is about the BioBreeding rat diabetes which could not use here.

4.2. The strengths of the Article

The oral glucose tolerance test we used to induce experimental diabetes had bioethics advantages. It allowed preserving the cells of Langerhans which secrete insulin. In certain inductions, these cells were destroyed.

The use of Glucometer could instantly had given multiple values of glycemia (4-5 determinations by animal). These values allowed having an exact average of glycemia.

This work has led to rapidly test the antidiabetic activity of several plants and to envisage the association of *Sclerocarya birrea* and *Khaya Senegalensis* stem-barks aqueous for their antidiabetic activity.

5. Conclusion

As matter of fact, the aqueous extract of barks of *Sclerocarya birrea* and *khaya senegalensis* presented each a interesting pharmacological profile because these plants showed and antidiabetic activity after glucose administration to rats (4g/kg/vo). An association in a preparation including the extracts of *Sclerocarya birrea* and *Khaya senegalensis* for the traditional treatment, of the diabetes would be justified with a possibility of synergy of action.

This study must be completed by others to determinate the active principle of these plants.

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