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Effect of Aqueous Extracts From Hildegardiabarteri Leaves on Lipid Metabolism of Wistar rats: Possible Implication In Arterial Pressure Variation

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Abstract: The aim of this work is to evaluate the impact of aqueous extracts of the leaves of Hildegardiabarteri on the lipid metabolism of wistar rats: possible involvement in blood pressure variations. To achieve our goal an aqueous powder extract of the dried leaves of Hildegardiabarteri was made with a yield of 13.18% and then the phytochemical screening (screening) was carried out by the method of Houghton and Raman in order to identify the phytochemicals who are present there. This test reveals that our extract is rich in bioactive molecules extractable by water of which: an abundance of tannins, flavonoids, mucilages, reducing compounds, saponosides, triterpenoids, coumarins of quinone derivatives and catechic tannins or Condensed (not abundant). We had 09 lots of 02 rats (180-220g of pc). After a fasting of 18 hours, by oesophageal gavage, the batch (Diuresis base) received only distilled water, lot2 received furosemide alone at 20mg / kg bw and those 3-9 received it Aqueous extract of the leaves of Hildegardiabarteri at the respective doses: 10; 25; 50; 67.5; 100; 135 and 202.5 mg / kg body weight. Diuretic activity (on urine) and biochemical (blood) assays such as: blood glucose, triglyceride, total cholesterol, LDL and HDL were performed 24 hours after gavage.

From this study it appears that the aqueous extract of the leaves of Hildegardiabarteri would have a modest diuretic activity in 6 H and a significant 24H at the dose of 67.5mg / kg bw thanks to the presence of flavonoids (flavones). Analysis of the biochemical parameters revealed that extracts of Hildegardiabarteri leaves at a dose of 67.5 mg / kg bw would lead to a significant decrease in blood glucose levels due to insulin secretion by β cells or Hypoglycemic mechanisms (lipogenesis), hypertriglyceridaemia which is a consequence of lipogenesis or a side effect of diuretics, and a decrease in LDL cholesterol. Of all these observations, it would be beneficial to use aqueous extracts of the leaves of Hildegardiabarteri to lower blood pressure values above normal. Thus, the antihypertensive dose of Hildegardiabarteri would be less than or equal to the dose of 10 mg / kg bw

Keywords - Hildegardiabarteri, wistar rats, lipid profile, diuretic activity, and furosemide.

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I. INTRODUCTION

Plants have long played a very important role in the evolution of mankind because they can synthesize a large number of complex organic molecules, often with potential biological activities. They constitute marvelous vegetable plants which give us the joy of being cured by a therapeutic gesture [1]. It is traditionally used to heal, relax, flavor food and store food.

Until today, the popular use of plants remains of great importance. According to data provided by WHO (World Health Organization), 80% of the world's population treats their health problems with traditional remedies, partly because they often do not have access to medicines Prescribed by modern medicine and, on the other hand, because these plants often have a real effectiveness [2]. Indeed, the majority of current drugs, are of plant origin or manufactured from their models (synthesis or chemical hemisynthesis of the active ingredients). Plant medicine has thus become a great science, in which we start from the plant towards the active principle. However, evaluation of phytotherapeutic properties remains a very interesting and useful task, especially for plants used in the traditional pharmacopoeia. In addition, secondary metabolites are and remain the subject of numerous in vivo and in vitro investigations, in particular the search for new natural constituents such as phenolic compounds, terpenes in essential oils ... Etc. Treatment by plants is mainly facilitated by the fact that this practice is intimately linked to customs and traditions, which creates a climate of trust and an easy approach of traditional practitioners. These traditional knowledge holders are of great help in countries especially those in the developing world such as Benin, where the health of the population is being called into question by many factors, including the high cost of conventional services and medicines, The inadequacy of health education campaigns, to name but a few.

Among these medicinal plants which give life to numerous scientific researches in Africa and in particular in Benin, there is Hildegardiabarteri[3]. Sterculiaceae commonly known as Kariya in French and Azélokoenfon. It is used in traditional medicine for various purposes. Its seeds have important nutritional properties and traditionally, the aqueous decoctate of its leaves in association with the leaves of *Croton zambesicus*, *Commiphora africana*, *Ocimum basilicum* and *Cola nitida* is used in bath in the treatment of hypertension in Benin. The genus is named in honor of Saint Hildegard de Bingen for her contribution to herbal medicine [4]. Scientific studies in Benin [5]. Therefore, a fundamental question arises today about the true specific pharmacological effects that this plant could have on the variation of certain biochemical parameters at the vascular level. Justifies the choice of our theme: Effect of the aqueous extracts of the leaves of Hildegardiabarteri on the lipid metabolism of the rats "wistar": possible implications in the variations of blood pressure.

II. MATERIAL

2.2.1 vegetable Material

The plant material used consists of the leaves of Hildegardiabarteri, harvested at Dassa in March 2016 by the team of the Botanical Garden of UAC. The leaves were dried in the open air at room temperature for about four weeks. These dried leaves were finely ground using a RETSCH knife mill. The powder obtained is then stored in glass jars in order to avoid external contamination.

II-2-2 Animal equipment

The animal material consists of blood (serum) and urine from Wistar rats. These male rats weighing between 180-200g are bred at the laboratory of the Laboratory of Biomembranes and Cell Signaling.

III. METHODS

3.3.1 Preparation of aqueous extract of leaves of Hildegardiabarteri:

To obtain the aqueous extract of the leaves of *Hildegardiabarteri*, 200 g of the powder obtained, weighed using a Sartorius® analytical balance, was mixed in 2 L of distilled water, all in a glass flask Of 3L and brought to boiling with stirring for 30 minutes on a heating callotte at 60 ° C. After cooling, the decoctate obtained is filtered three times through the hydrophilic cotton and filter paper. The filtrate obtained is evaporated at 60 ° C. using the Rotavapor® rotary evaporator. The paste deposited on the bottom of the flask of the evaporator is recovered in jars and dried in an oven at 45 ° C. After drying completely, the dry extracts joined to the bottom of the jars are scraped with the aid of the stainless steel spatula, crushed in porcelain mortar and then kept in glass bottles previously labeled. These extracts will be used to prepare the concentration ranges tested. The yield is determined by the ratio of the weight of the dry extract after evaporation to the weight of the dry vegetable matter used for the extraction multiplied by 100

3.3.2 Effect Of Aqueous Extracts From Hildegardiabarteri Leaves On Diuretic Active In Wistar Rats

3.3.3 Influence of the administration of the aqueous extract of Hb leaves on the urinary volume of wistar rats

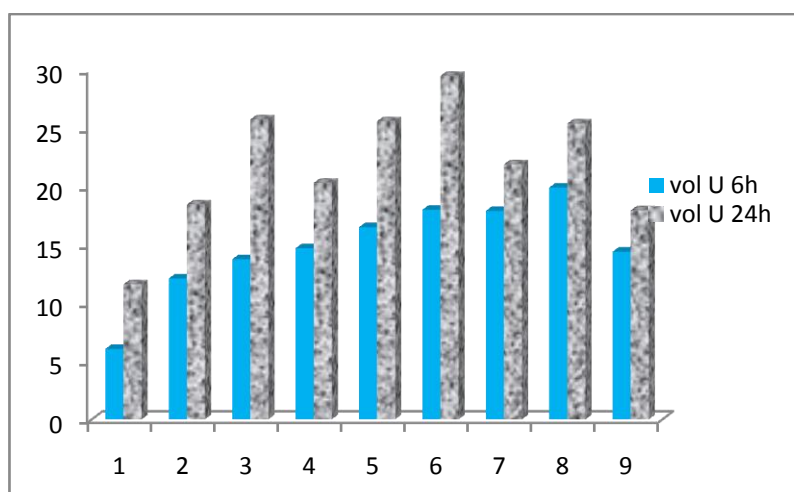


Figure 1: Variation of urinary volume under the influence of different doses of Hb as a function of time (urine of 6H and 24H)

On reading this figure, it can be seen that:

The administration of furosemide (MR) at a dose of 20mg / kg body weight leads to an increase in urinary volume (12.1 ± 0.9) from the first hour to the 6th hour compared to the control. The overload elimination time is within the first three hours after administration.

- The administration of the aqueous extract of the leaves of Hildegardiabarteri leads to an increase in the urinary volume compared to furosemide and to the control from the 2nd hour after administration and continues until 24 hours after. This increase is more significant and therefore significant at the dose of 67.5 mg / kg body weight ($29.5 \text{ ml} \pm 3.5$).

3.3.4 Influence of the administration of the aqueous extract of the Hb leaves on the volume of urinary excretion (VEU) of wistar rats

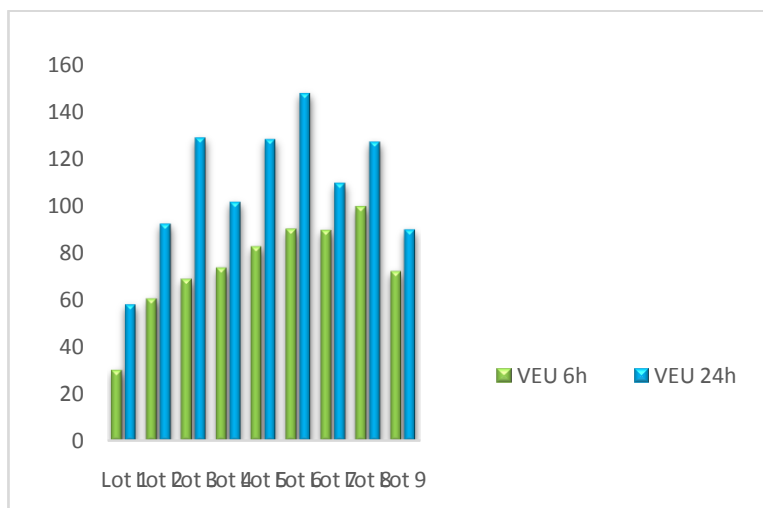


Figure 2: Variation in volume (ml) of urinary excretion (VEU) under the influence of different doses of Hb as a function of time

FIG. 2: shows the variations of the VEU calculated after obtaining the various urine volumes under the effect of furosemide and of the aqueous extract of the Hb leaves. On reading this figure, it can be seen that:

The administration of furosemide (MR) at a dose of 20 mg / kg of body weight leads to an increase in VEU. A very low diuretic activity was observed in 6 h ($\text{VEU} = 60.5\% \pm 4.5$) and in 24h ($\text{VEU} = 92.25\% \pm 6.75$).

The administration of the aqueous extract of the leaves of Hildegardiabarteri causes an increase of the VEU with respect to the furosemide and the control. This increase is more significant and therefore significant at the dose of 67.5 mg / kg body weight. A modest diuretic activity was observed in 6 h ($\text{VEU} = 90\% \pm 10$) and a significant diuretic activity in 24 h ($\text{VEU} = 147.5 \pm 17.5$).

3.3.5 Influence of The Administration of The Aqueous Extract of Hb Leaves on The Urinary Ph of Wistar Rats

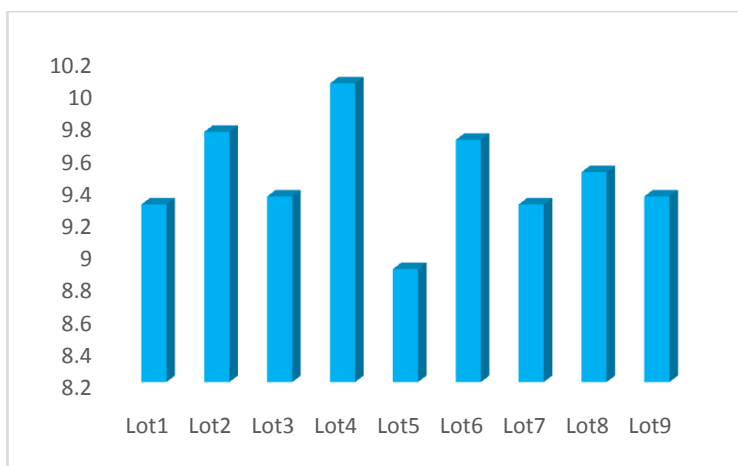


Figure 3: Influence of the administration of the aqueous extract of Hb leaves on the urinary pH of wistar rats

On reading this figure, there is a very slight variation in the urinary pH which remains basic at the different doses of the extract compared to the control and the Furosemide. However, at a dose of 50 mg / kg body weight, there was a significant decrease in pH at a dose of 50 mg / kg bw (8.9 ± 0.8), unlike the dose of 25 mg / kg bw (10.05 ± 0.05).

3.3.6- Effect of Aqueous Extract of Hildegardia Barteri Sheets on Biochemical Parameters In Wistar Rats:

3.3.7 Influence of administration of aqueous Hb leaf extract on wistar rats glucose

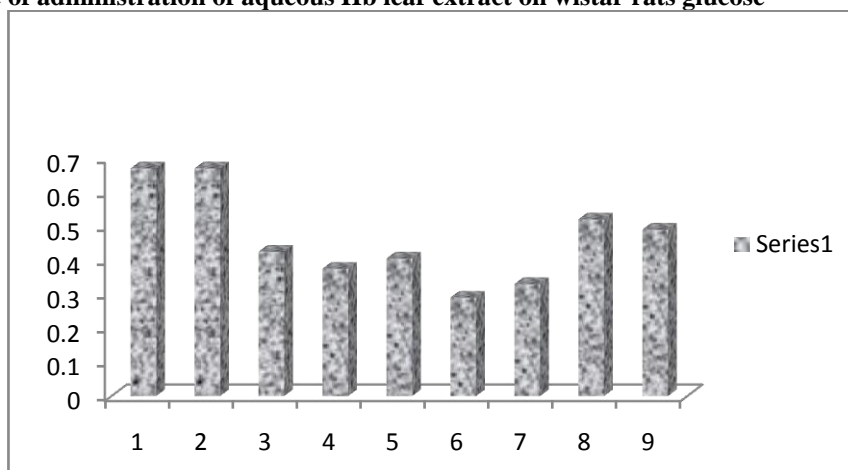


Figure 4: Variation in blood glucose (g / l) under the influence of different doses of Hb as a function of time

In the reading of figure 13, there is a decrease in blood glucose in rats under the administration of Hildegardiabarteri compared to furosemide (0.67 ± 0.03) and control (0.67 ± 0.01). This decrease was greater at 67.5 mg / kg bw (0.29 ± 0.02).

3.3.7- Influence of the administration of the aqueous extract of the Hb leaves on the various cholesterols (total, HDL, LDL) of the wistar rats

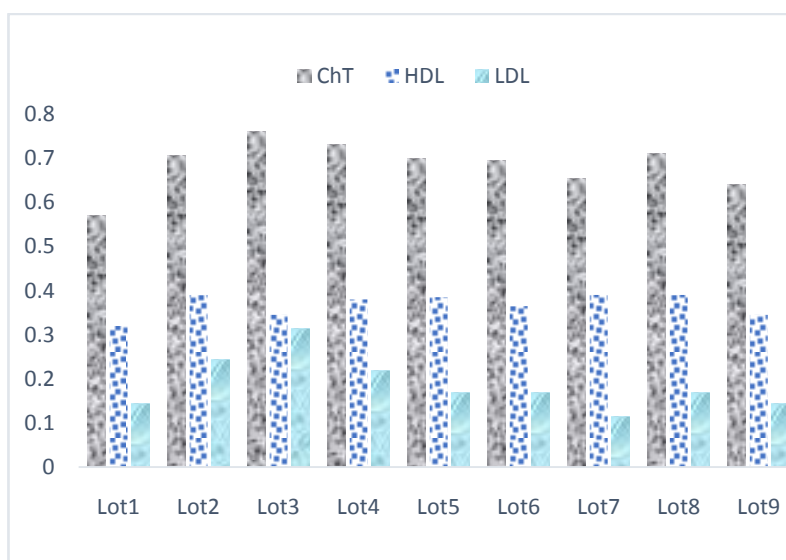


Figure 5: Cholesterol variation: total, HDL and LDL (g / l) under the influence of different doses of Hb as a function of time

Figure 5 shows that administration of the aqueous extract of Hildegardiabarteri leaves a slight variation in total cholesterol compared to furosemide and control. This variation is significant at doses of 10 mg / kg bw (0.76 ± 0.02) and 25 mg / kg body weight (0.73 ± 0.03) under the extract. However, at the dose of 67.5 mg / kg body weight (0.69 ± 0.01), almost the same values are observed with respect to furosemide (0.69 ± 0.01). In the same figure, there is a slight variation in HDL cholesterol levels at Hb doses compared to furosemide and control.

On the other hand, there is a gradual decrease in LDL cholesterol under Hildegardiabarteri extract compared to furosemide and control. This decrease is significant at a dose of 100 mg / kg bw (0.11 ± 0.005) compared to furosemide 20 mg / kg bw (0.24 ± 0.02).

3.3.8 - Influence of The Administration of The Aqueous Extract of The Hb Leaves on The Triglycerides of The Wistar Rats

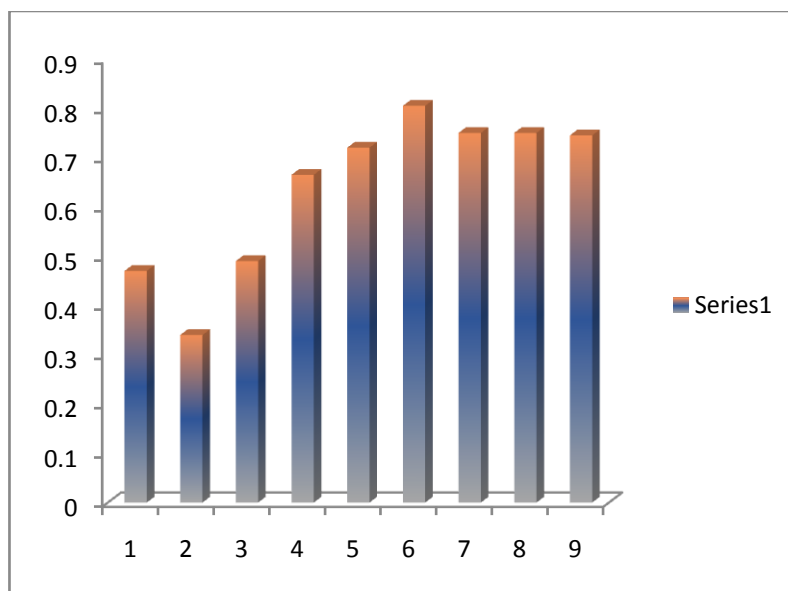


Figure 6: Variation of Triglycerides (g / l) under the influence of different doses of Hb as a function of time

FIG. 6 shows that the administration of the aqueous extract of the leaves of Hildegardiabarteri leads to a progressive increase of the triglycerides (lots 3-9) with respect to the furosemide and to the control. This increase was greater at 67.5 mg / kg body weight (0.80 ± 0.01) compared to furosemide (0.34 ± 0.01).

IV. DISCUSSION

Results of our study, the aqueous extract of the leaves of *Hildegardiabarteri* to give a yield of 13.18% with a green color. The leaves of this plant contain bioactive molecules or active principles that would be soluble in water. This rate is lower than that of who found 10% water extract of *Elaeisguineensis* (Arecaceae). This difference may be due to the nature of the species and the ecological conditions of the two plants. From the phytochemical analysis of the leaves of Hildegardiabarteri, it appears that tannins, cathetic or condensed tannins, Triterpenes, coumarins, quinone derivatives of alkaloids, saponosides, reducing compounds, mucilages, Flavonoids (flavones). These results are close to those obtained by [13]with the exception of alkaloids and triterpenoids.

According to flavonoids are potent diuretics, more precisely those of the flavone type. But the aqueous extract of the leaves of Hildegardiabarteri reveals a strong presence of flavonoids of the flavone type. This may explain the observed diuretic activity. These results are consistent with those of who made the same remarks as we on the aqueous extract of *Elaeisguineensis* (135mg / kg bw) as a diuretic.

The diuretic activity of a biological molecule, an active ingredient or a drug is the ability of this molecule to inhibit sodium renal reabsorption and thus facilitates urinary excretion. The volume of urinary excretion increased in rats given the aqueous extract of the leaves of Hildegardiabarteri in 6 h (VEU = $90\% \pm 10$) and in 24h (VEU = 147.5 ± 17.5) relative to the batch Having received furosemide at 20 mg / kg bw (VEU = $60.5\% \pm 4.5$) in 6 h and 24 h (VEU = 92.25 ± 6.75). A modest diuretic activity of this extract is deduced at a dose of 67.5 mg / kg body weight in 6 hours and a significant diuretic activity in 24 hours according to Kau ST et al in 1984. Urinary water potential in these wistar rats remains basic at different doses of Hb compared with furosemide 20mg / kg bw and control. These results are contrary to those obtained by, where the pHs were acidic and comprised between (6.1 and 8.6) (7.35 ± 1.25). Similarly Schmitt in 2005 found acid values of urinary pH (4.6 and 7.8). These differences in pH could be due to the biological variability of the animals used and to the nutritional quality.

After administration of the aqueous extract of Hildegardiabarteri at different doses, a gradual decrease in blood glucose compared to furosemide 20 mg / kg bw. This effect could be due either to the fact that the extract of Hildegardiabarteri would have stimulated insulin secretion in the β cells of the Langerhans islands

[6] or the decrease would be due to the hypoglycaemic mechanisms (lipogenesis) All involved in the regulation of blood glucose (www. Afha.org). The high presence of flavonoids in the aqueous extract of Hildegardiabarteri leaves could justify the hypoglycemia observed in these rats. According to [7] and Sharma et al 2006, the stimulation of β cells to a hypersecretion of insulin would be due to the flavonoids thus causing a considerable drop in blood glucose. Triglyceridemia increased as a result of the different doses of the aqueous extract of the leaves of Hildegardiabarteri compared to furosemide 20 mg / kg bw. According to [8] hypertriglyceridemia are mostly secondary, and minor or moderate ones can cause a decrease in LDL cholesterol levels in the blood. The decrease in LDL cholesterol under the different doses of the aqueous extract of Hildegardiabarteri leaves would be correlated with the presence of tannins [9] Indeed, substrates of the Krebs cycle are metabolic crossroads whereby acetyl CoA can be metabolized (ketogenesis and lipogenesis) when the cycle is inhibited. This inhibition or slowing may be due to insufficient ATP. In the present study, the rats remained in a young condition and this may explain their low ATP synthesis capacity which would inhibit the Krebs cycle. Also, during glycolysis, pyruvate kinase can be inhibited by phosphorylation in the presence of cyclic AMP. Dephosphorylation promotes the supply of energy or lipogenesis (pyruvate kinase) to the detriment of gluconeogenesis (enolase) (see Chups, Jussia.fr). These observed hypoglycaemic mechanisms would underlie the decrease in blood glucose because many intermediates are responsible for lipogenesis. This may explain the increase in triglycerides observed at the administration of the aqueous extract of the leaves of Hildegardiabarteri; The biosynthesis of the triglycerides being carried out by conversion of the substrates originating from the catabolism of carbohydrates into fatty acids. These newly synthesized fatty acids can be used by tissues or stored as triglycerides [10].

According to [11] pyruvate derived from glycolysis and the catabolism of amino acids is converted into the mitochondria by the enzymes of the Krebs cycle into citrate which is exported from the mitochondria to be supported in the cytoplasm by ATP citrate Lyase which cleaves it to acetyl CoA and oxaloacetate. Malonyl CoA, the main enzyme of lipogenesis, acts on acetyl coA and thus begins the elongation of triglyceride synthesis.

The aqueous extract of the leaves of Hildegardiabarteri is therefore responsible for the observed hypertriglyceridemia. Since administration was made just for 24 hours an allosteric or hormonal regulation of triglycerides would bring the rate back to normal. Finally, the strong presence of coumarins with a coronary vasodilator biological effect, abundance of saponosides recognized as anti-edematous biological molecules, strongly represented flavonoids with diuretic activity may explain the use of Hildegardiabarteri in Traditional medicine as an antihypertensive plant by analyzing the mechanism by which flavonoids act, find that the protective and dilating effects of blood vessels and their ability to make fluid blood would be due to flavonoids. These diuretic effects of Hildegardiabarteri may be beneficial in the management of certain cases of hypertension insofar as they act by urinary elimination of part of the water and sodium contained in the blood. In the pharmacological treatment of hypertension, diuretics act on the renin angiotensin system by preventing urinary sodium retention or by inhibiting aldosterone secretion in the distal circumferential tube [12]. This will result, according to [13] in a decrease in blood volume and thus a decrease in blood pressure. The antihypertensive dose of Hildegardiabarteri may be less than or equal to the dose of 10 mg / kg of body weight because at this dose there is already a diuretic activity of the extract. So it would be very beneficial to lower the blood pressure values above normal.

V. CONCLUSION

The present study made it possible to observe the presence of large groups of bioactive molecules: alkaloids, tannins, cathetic or condensed tannins, Triterpenes, coumarins, quinone derivatives, saponosides, reducing compounds, mucilages, Flavonoides (flavones) in the aqueous extract of the leaves of Hildegardiabarteri and to measure the effects of the extract on certain biochemical parameters in wistar rats. The high presence of flavonoids would result in significant diuretic activity at a dose of 67.5 mg / kg body weight with an average VEU of 147.5 ± 17.5 . This activity is greater than the furosemide activity administered at (20mg / kg bw) (VEU of 90 ± 10). Urinary pH remained basic and did not vary significantly. The hypoglycemia observed under the different doses of Hildegardiabarteri is due to an insulin secretion by the β cells of the Langerhans islets or to the hypoglycemic mechanisms (lipogenesis) all involved in the regulation of the glycemia. The hypertriglyceridemia observed under the different doses of the aqueous extract of the leaves of Hildegardiabarteri is due to lipogenesis (hypoglycaemic mechanisms) or side effects of diuretics.

The decrease in LDL cholesterol, the vasodilator effect and the high diuretic activity of the aqueous extract of the leaves of Hildegardiabarteri would justify its traditional use in the treatment of hypertension. Finally, it could be said that the long-term use of the aqueous extract of the leaves of Hildegardiabarteri as diuretic or antihypertensive substance would cause overweight in patients. The normal physiology of the rats does not permit a remarkable action of the aqueous extract on the various parameters studied. Further studies are needed to better understand the mechanism of action of these leaves.

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