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Diuretic and natriuretic activities from ten medicinal plants used in south Benin

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ABSTRACT

The present investigation aimed to appreciate the diuretic and natriuretic activities from south Beninese10 leaves and roots plants aqueous extracts and their extemporary infusions in normal wistar rats. After orally administration of the different aqueous extract at dose 109.6 mg/kg, and extemporary infusion at 7.6 mL/kg (body weight) to Wistar rat, the volume of urine excreted was determined in stepped up test-tube and the quantity of ions (Na^+, K^+) by ionic spectrophotometrically measuring. Sarcocephalus Latifolius, Senna siamea and furosemide (as reference drug) showed, in Wistar rat treated, an important significant diuretic activities (≥ 150% and 173.60% respectively). A weak diuretic activity was obtained with Azadirachta Indica, Coconucifera and Mangifera Indica, the step one by Dialium Guineense and Momordica Charantia when the antidiuretic activity was observed from Acanthospermum Hispidum, Crateva Adansonii and Uvaria Chamea. Potassium excretion was significantly increased by Uvaria Chamea, Azadirachta Indica and Momordica Charantia while the seven others plants produced significant increases in sodium ($[Na^+]/[K^+]$ ratio > 1) compared to that of furosemide (2.52). The results have showed that the urine of Wistar rathas a pH between 6.7 and 7.8 with an average of 7.2 ± 0.4. Sarcocephalus Latifolius and Senna siamea infusions were the best in terms of diuretic and natriuretic activities and provided quantitative basis for explaining their use in folk Beninese medicine.

Key words: *Sarcocephalus Latifolius*, *Senna siamea*, aqueous extract, infusion, diurétic activities, Wistar rat,

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INTRODUCTION

The traditional medicine is the total sum of knowledge, resting rationally or no on the theories, beliefs and experiences specific to own culture. It is used to maintain human beings in health so to prevent, to diagnose, to treat and to heal physical and mental illnesses [1]. In Africa the therapeutic power of plants was known by our forebears and parents in an empiric way [2]. In a weak economic environment characterized by the high cost of the medicine, pharmacopeia and traditional medicine become a non-negligible alternative concerning sanitary cover. Currently, more than 80% of the african population have resort to the drugs essentially made of plants that growth around their environment.

Although herbal medicine stay in Benin, traditional, popular and ancient. Scientific research in recent years has considered this area as priority. In Benin flora, several species of plants are indicated in the treatment of malaria and high blood pressure and another diseases. In Porto- Novo, the rate of frequentation of the traditional centers is superior to 80% [3]. There is a real obstruction, a personal devotion that is born, therefore intensify, accentuated of creative ideas around a medicine traditional subject to the valorization, to the perennation for the prevention and th e

treatment of some pathologies. The population of Benin and particularly the one of Porto - Novo and environment use the diuretic infusion called in goun traditional language "adɔmansin"; medicine that makes urinate, constituted of mixture of plants, to warn or to treat some affections.

Diuretic plants induce the obstinate increase of the blood pressure thanks to the alkaloids. An increase of blood pressure is a beneficial factor for the sportsman because a big number of molecules of oxygen and nutriments will be transported quickly toward the organs and the muscles requested by the movements [4]. Strong and more resistant heart thanks to the flavonoids responsible of the diuretic activity [5]. The author goes farther and found that these were especially the heart's muscles that were reinforced in their activities of blood pumping having to irrigate the organs. The protective effects and blood vessel dilatators and their capacity to return the fluid blood would be due to the flavonoids [6]. It has also been evoked that the elimination of the toxins is an incontournable condition to encourage the loss of weight [6]. According to the same authors, the diuretic plants were efficient against the retention of water (therefore against the cellulitis) and the elimination of the garbage of the organism.

Otherwise, the diuretic plants stimulate the lymphatic circulation and improve the detoxification. But unfortunately to Benin, only one study on diuretic and natriuretic activities of leaves hot water extract of *Elaeisguineensis* in Wistar rats has been experimentally confirmed [7]. In deed any scientific works were interested in this diuretic infusion and no previous pharmacological or clinical study was carried out to test the diuretic of many plants. The questions puts them self to know if, - beside *Elaeisguineensis*, plants existed to have diuretic and natriuretic effects in the beninese flora and in particular in Porto – Novo? - the medicinal plants constitute the mixture "adɔmansin", have really diuretic and natriuretic activities pretended by the population who uses them? - The plants which constitute the extemporary infusion have each the same properties as the mixture? What is then the plants, most efficient of the mixture? Hence an effort has been made to establish the diuretic and natriuretic activities of an extemporary infusion "adɔmansin" and each plant constituent this infusion.

EXPERIMENTAL SECTION

2-1 – Material

2-1-1 - Plant Material

It is about aqueous hot extract and the infusion gotten from each of the ten following plants [8], which were harvested, identified and authenticated. The voucher specimens were deposited at the National Herbarium of Abomey Calavi University of Benin.

Acanthospermum Hispidum, (AA6407/HNB); *Azadirachta Indica*A. Juss. (AA 6408 / HNB); *Coco nucifera* L. (AA 6409 / HNB); *Crateva Adansonii* DC. (AA6410/HNB); *Dialium Guineense*Willd (AA 6411 / HNB); *Momordica Charantia* L. (AA 6413 / HNB); *Mangifera Indica* L. (AA 6412/HNB); *Sarcocephalus Latifolius* (Sm.) A.E. Bruce (AA6414/HNB); *Senna siamea* (Lam.) H.S. Irwin and Barneby, (AA6415/HNB); *Uvaria Chamea* P. Beauv (AA 6417/HNB).

2-1-2 - Experimental Animals

Artemia salina shrimp larvae were used to evaluate larval toxicity.

For diuretic and natriuretic activities, experimental animals were constituted of wistar rats, each in the weight range of 190 to 200 g and 12 to 14 weeks old, fed on corn bran, issues of cereals, cakes (soybean-cotton-palm), premix acids, amines, grobel toxin bind, limestone, dicalcium phosphate and rice bran and water *ad libitum*. They were divided to experimental groups of five animals having the same bodily mass roughly and kept in metal cages of standard dimensions and housed under temperature 28 ± 1 °C, humidity 75 ± 5% and dark-light cycle (12 h – 12 h). They were obtained from the Animal House of Human Biology Unity of Health Science Faculty of Abomey Calavi University, Benin.

2-2 – Method

2-2-1 – Phytochemical Analysis

Phytochemical screening which is a qualitative chemical analysis based on color and precipitation reactions of major families of chemical compounds in plants was carried out to find out the phytocomponents present in the 10 aqueous extract [9].

2-2-2 - Obtaining aqueous extracts

Aqueous extracts were prepared by decocting 100 g of each powder in 1000 mL boiling distilled water for 30 min. The resulting mixture is then filtered on Watman paper (Ø = 185 mm). Then, one part of the filtrate was subjected to evaporation in a rotary evaporator (Büchi R 400 brand) at 40° C. Thereafter, the extract thus obtained was lyophilized by first freezing at -70° C in a deep freezer for 12 h and then dried in freeze-dryer.

2-2-3 - Therapeutic doses of aqueous extracts
The extract concentrate consists essentially of aqueous extract of each of 10 plants. In the previous work [10], the mixture of the ten plants showed that the dose 109.6 mg/kg of aqueous extract and 7.6 mL/kg of the infusion are the most efficient. For it we take these different doses like therapeutics in our survey.

2-2-4- Experimental groups composition and animals preparation
The experimental protocols have been approved by Benin Institute of Applied Biomedical Science Ethical Committee.

Wistar rats weighed between 190-200 g and 12 to 14 weeks old were used for *in vivo* diuretic and natriuretic activities of aqueous extract of each of 10 plants. The groups of five animals having the same body weight were constituted: group 1 (diuresis base): 50 mL/kg of distilled water body weight; group 2 (control): 25 mL of distilled water per kg of body weight; group 3 (reference): 20 mg/kg of furosemide body weight. Groups 4 to 13 received the dose of 109.6 mg/kg body weight respectively of the hot aqueous extract of *Acanthospermum hispidum, Azadiracta indica, Coco nucifera, Cratevaadansonii, Dialiumguineenses, Mangifera indica, Momordica charantia, Sarcocephalus latifolius, Senna siamea* and *Uvaria chamae.* Groups 14 to 23 received the dose of 7.6 mL/kg body weight respectively of the infusion of each of the ten plants cited above. Before each test, wistar rats were fasted for 18 h but with free access to tap water only and then were giving an oral loading of saline water.

2-2-5- Diuresis base
Before determining the diuretic and natriuretic activities, animal's diuresis basic was measured by oral administration of distilled water at 50 mL/kg bw. Urinary excretion was measured 6 h after administration.

2-2-6- Diuretic activity
Diuretic activity was estimated using the methods according to authors [7, 11-13]. The principle is to take the measurement of urinary excretion in Wistar rats being saline overload. 50 mL/kg of a solution of NaCl 1.8% were administered to Wistar rats before the various treatments without forgetting the respective doses of aqueous extracts, furosemide 20 mg/kg and distilled water. After treatment, five Wistar rats from the same group were placed in the metabolic cages (1 per cage). For each group, the following parameters were measured: the latency (onset of the first drop of urine after the animals was placed in the metabolic cage), the volume of urine excreted and the urine pH 6 h after administration. Excreted Urinary Volume (EUV) was given by the formula [14-16]: EUV = VE /VA x 100 (VE = volume excreted, VA = volume administered).

2-2-7- Natriurétic activity
The substances were orally administered. Immediately following, distilled water at a dose of 50 mL/kg was administered to wistar rats. After treatments, animals from the same group were placed in the metabolic cages (1 per cage). Urine is collected for 4 hours. The urinary concentrations of sodium and potassium ions were determined [15,16] using a Spectrophotometer SINO device 005 electrolyte analyzer Chinese origin and natriuretic activity is expressed in value of the ratio $[Na^+]/[K^+]$.

2-2-8- Statistical analysis
The results are expressed as Mean values ± Standard Error of Mean (SEM). The statistical treatments are achieved with the software STATISTICA 5.5 version, and the software microsoft Excel 2007 of Windows 2007. The middle value comparisons have been done by means of the parametric tests: T test for independent samples. The results are considered statistically at probability level of $P < 0.05$.

RESULTS AND DISCUSSION

Hot Aqueous Extraction yields
The extraction yielded between 4.74% and 21.72% (table 1), the highest was obtained with *Senna siamea*(21.72%) follow-up of *Sarcocephaluslatifolius* (20.34%), the weakest was gotten with *Coco nucifera* (4.74%). The yields of the extractions included those obtained in previous works with differences[7,13] which lies in the nature of parts and plants extracted.

Table 1: Yield of the hot aqueous extractions of each of the ten plants selected (n = 10)

Name	Familly	Extract part	Yield (%)
Senna siamea	Mimosaceae	leaves	21.72
Sarcocephaluslatifolius	Rubiaceae	roots	20.34
Cratévaadansonii	Capparidaceae	leaves	16.55
Acanthospermumhispidum	Astéraceae	leaves	15.7
Mangiferaindica	Anarcadiaceae	leaves	16.25
Azadirachtaindica	Méliaceae	leaves	16.75
Momordicacharantia	Cucurbitaceae	leaves	16.39
Dialiumguineense	Caesalpiniaceae	leaves	9.96
Uvariachamae	Annonaceae	roots	8.54
Coco nucifera	Arécaceae	roots	4.74

Phytochemical analysis

Some chemical constituents of leaves were water extractable. The phytochemical analysis(table 2)of those extracts revealed the presence of principal chemical groups.

Cyanogenic derivates were absent from the extracts of the ten plants. The cardenolids and free anthracenics were absent except in those of *Coco nucifera* and *Dialiumguineenses.*

Tableau II: **Phytochemical analysis of hot aqueous extract infusion results (n = 10)**

Chemical compound	PLANTS																			
	Sa. latifolius		*Se. siameae*		*Cr adansonii*		*Ac. hispidum*		*Ma. indica*		*Co. nucifera*		*Az. indica*		*Di. guineense*		*Mo. charantia*		*Uv. chamae*	
	AE	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**	**AE**	**Dec**
Alkaloids	+	+	+	+	-	+	+	+	+	-	-	-	+	+	+	-	+	-	+	+
Gallic Tannins	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Catechic Tannins	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-
Flavonoids	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	-	-
Anthocyanes	-	-	+	-	+	-	+	+	-	+	+	+	+	+	-	+	-	-	-	-
Leucoanthocyanes	-	-	+	+	+	+	+	+	+	+	-	-	+	+	-	+	-	+	-	-
QuinonicDerivates	+	-	+	-	-	-	+	-	+	-	+	-	+	-	+	+	+	-	+	+
Saponosids	+	+	+	+	-	+	+	-	+	-	-	-	-	-	-	+	-	+	-	+
Triterpenoids	+	-	+	+	+	+	+	-	-	+	+	+	+	+	+	-	-	+	-	-
Steroids	+	-	-	-	-	-	+	-	+	-	-	-	+	-	-	-	+	-	+	-
Mucilages	+	+	+	-	+	-	+	+	+	-	-	-	+	-	+	-	-	-	+	+
Coumarins	+	+	+	-	+	-	+	+	+	+	-	-	+	+	-	+	+	+	+	-
Reducing Compounds	+	+	+	+	-	+	-	-	+	-	-	-	+	-	-	-	-	-	-	+
Free Anthracenics	-	-	-	+	-	-	-	-	+	-	+	-	+	-	+	-	+	-	+	-
Cardenolids	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
Cyanogenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The phytochemicalanalysiswasperformed as described in Methods section. (+) : indicated the presence of the compounds in the extracts; (−) indicated the absence of compound in extract.

The phytochemical survey (table 2)permitted to put in evidence alkaloids, tannins, flavonoids, saponosides, triterpenoids, and the reducing compounds in *Sarcocephaluslatifolius* and *Senna siamea*. These results are near those of authors [13,17] who have putted respectively in evidence the chemical compounds in Nitrokoudang "recipe" used in traditional medicine in Mali for the treatment of the arterial blood pressure, and in *Elaeisguineensis* leaves hot aqueous extract used by the Beninese people under the shape of “Api-Palu” phytomedicine drug in the treatment of malaria.

The phytochemical analysis revealed that the aqueous extract and the decoction of *Momordicacharantia* contained in common tannins and mucilages. The alkaloids, tannins, mucilages and quinonic derivateswhich are present can explain the activity of this plant to fight against the virus of the AIDS and cancer, when ones considers they antimicrobial potential properties [18-22].

The screening of *Acanthospermumhispidum* permitted to put in evidence alkaloids, tannins, coumarins, and reducing compounds in the decoction. In addition, in the aqueous extract, we noticed the presence of flavonoids, anthocyanins, leuco-anthocyanins, saponosides, steroids and terpenoids. These results corroborate those of pass works [4,23,24].

The screening of the herbal tea of *Cratevaadansonii* has put in evidence alkaloids, tannins, flavonoids, leuco-anthocyanins, saponosides, terpenoids and steroids. In the aqueous extract, we noticed the presence of anthocyanins, mucilages, the coumarins, the absence of the alkaloids and the reducing compounds. These observed differences could be bound to the heat effect.

The screening of *Coconuts nucifera* roots showed the presence of tannins, leuco-anthocyanins, flavonoids, saponosids, mucilages. Considering their large specter of pharmacological activities, those compounds justified probably the antibacterial potential that has possessed this plant on *Staphylococcus aureus* [25, 26]. The presence of the tannins justifies the astringent character of the root of this plant.

The aqueous extract and the herbal tea of *Mangifera indica* contain in common tannins, anthocyanins and mucilages. Alkaloids, flavonoids, leuco-anthocyanins, quinonic derivates, reducing compounds, terpenes, steroids and coumarins are present in the aqueous extract unlike the herbal tea. The presence of tannins was in agreement with the previous works [27,28]. In the same way anthocyanins recovered in this plant corroborated the work which has put in evidence the anthocyanin pigments types [29].

The presence in the aqueous extract of alkaloids, catechics and gallics tannins, flavonoids, mucilages, saponosids, leuco-anthocyanins, terpenes, steroids are in agreement with previous works [13] on the chemical composition of *Azadirachtaindica*. The results also revealed that coumarins and the reducing compounds are present in our extract and confirmed some results [30,31]. *Azadirachta indica*, rich in polyphenolics compounds endowed of a large specter of activities such as healing, anti-inflammatory, antibacterial. This wealth in polyphenolics compounds can explain its numerous uses in traditional medicine as gastric pain appeasement due to ulcer, cleaning of the wounds, cutaneous infection (acne, furunculous) and gums inflammation [32,33].

Phytochemical composition of *Dialiumguineenses* aqueous extract and infusion have corroborated authors pass results [34] with the exception of gallic tannins and leuco-anthocyanins which were absent in their studies. *Dialiumguineense* contained the saponines [35], this comes to reinforce our results for the saponosides presence in the aqueous extract. An important antioxidant activity of the same extract was affirmed [36]. This can be justified by the presence of anthocyanins in this last. The existence of alkaloids in the aqueous extract on the one hand and quinonic derivates in the decoction on the other hand would explain the use of this plant in the inhibition of the growth of *Plasmodium falciparum* [37].

In reference to the results of diuretic and natriuretic properties of the ten plants mixture which have be earlier studied have revealed alkaloids, tannins, flavonoids, leuco-anthocyanins and anthocyanins presence. The decoction of this mixture of ten plants doesn't present an anthocyanins [10]. It is bound to the effect of the heat on this chemical compound.

Diuretic Activity

The evaluation of diuretic activity of aqueous extract and the decoction of each of the ten plants, and the Furosemide in wistar rats is consigned in the table 3.

The first mictions appeared more quickly after the administration of the decoction to the animals at the dose of 7.6 mL/kg of *Sarcocephalus latifolius* (10 min) and *Senna siamea*(15 min). They appeared 18 min and 20 min after the administration of the extract at the dose 109.6 mg/kg respectively of *Sarcocephalus latifolius* and *Senna siamea* to the animals. The first mictions appeared later (1 h and 2 h) after the administration of the decoction and the extract of *Acanthospermum hispidum* and *Crateva adansonii* at the same doses to the animals.

In the present work (table 3) the treatment by furosemide gave the most important diuretic activity with an EUV of 173.6% against 169.25% for [7]. This result corroborates ones [38], who showed that the furosemide exercised diuretic effect on the loop of Henle.

At 7.6 mL/kg dose of the herbal tea of *Sarcocephalus latifolius* peel root and *Senna siamea* leaves, an important diuretic activity with an EUV of 202.13% and 178.8% respectively was showed. These results are better than one of furosemide and significantly better than one of aqueous extract at the dose 109.6 mg/kg for the same part plants (150.96% and 171.5% respectively). *Azadiracta indica* (115.86% and 114.75%), *Coco nucifera*(117.42% and 120.37%), and *Mangifera indica*(111.52% and 118.18%) gave a weak diuretic activity of Volumetric Urinary excretion in 6 h for respectively aqueous extract and infusion. It would be able to explain this fact by the weak flavonoids quantity existence. *Momordica charantia* and *Dialium guineenses* didn't present any diuretic activity. An antidiuretic activity was revealed by *Uvariachamae*(77.08% and 72.34%), *Acanthospermum hispidum*(57.16% and 55.4%) and *Cratevaadansonii* (55.4% and 55.67%) aqueous extracts and infusions respectively. Although the phytochemical analysis of *Azadirachta indica, Coconuts nucifera, Mangifera indica, Acanthospermum hispidum, Cratévaadansonii* and *Momordica charantia* aqueous extracts and infusion revealed some polyphenolic compounds nearly identical to those of *Sarcocephalus latifolius* and *Senna siamea* which didn't mislead the same diuretic activity

Table 3: Results of diuretic activity of the aqueous extract and extemporary herbal tea of each of the ten plants in wistar rats (n = 5)

Traitements		Dose/kg	VA NaCl (mL)	VE/6h (mL)	EUV (%)	Diuretic Activity
distilled Water		25.0 mL	17.41	16.19	92.99	any
Furosémide		20.0 mg	13.18	22.88	173.60 ****	Important
Ac. hisp	A.E	109.6 mg	19.5	11.15	57.16 ****	Anti
	Dec	7.6 mL	24.0	13.29	55.4 ****	
Cr. adan	A.E	109.6 mg	24.0	13.30	55.4 ****	
	Dec	7.6 mL	16.0	8.60	55.67 ****	
Uv. chamae	A.E	109.6 mg	9.6	7.40	77.08 **	
	Dec	7.6 mL	9.4	6.80	72.34 **	
Di. guin	A.E	109.6 mg	14.0	12.68	90.57 NS	no
	Dec	7.6 mL	10.1	9.22	91.29 NS	
Mo. cha	A.E	109.6 mg	11.5	10.00	86.95 *	
	Dec	7.6 mL	12.0	10.00	83.33 *	
Az. indi	A.E	109.6 mg	14.5	16.80	115.86 **	Weak
	Dec	7.6 mL	12.2	14.00	114.75 **	
Co. nuci	A.E	109.6 mg	15.5	18.20	117.42 **	
	Dec	7.6 mL	10.8	13.00	120.37 **	
Ma. indi	A.E	109.6 mg	12.5	13.94	111.52 **	
	Dec	7.6 mL	7.7	9.10	118.18 **	
Sa. latifo	A.E	109.6 mg	13.2	19.00	150.96 ***	Important
	Dec	7.6 mL	16.0	31.00	202.13 ****	
Se. siam	A.E	109.6 mg	14.2	23.55	171.50 ****	
	Dec	7.6 mL	15.0	23.80	178.80 ****	

*NS = non-significant difference, * = significant difference, ** = fairly significant difference, *** = very significant difference, **** = high significant difference, AE: Aqueous extract, Dec: extemporary decoction or herbal tea,*
Ac. hisp: Acanthospermumhispidum, Az. indi: Azadirachtaindica, C. nuci: Coco nucifera, Cr. adan: Cratevaadansonii,Di. guin: Dialiumguineense, Ma. indi: Mangiferaindica, Mo. cha: Momordicacharantia, Sa. latifo: Sarcocephaluslatifolius, Se. siam: Senna siamea, Uv. chamae: Uvariachamae.
quality. This difference of activity can be explained by the quantity of the chemical compounds contented in the plants.

Natriuretic activity

The urinary concentrations in sodium and potassium ions as well as the value of the $[Na^+]/[K^+]$ ratio are indicated in the table 4.

The [Na+]/[K+] ratio values for seven plants are superior to 1. Sodium elimination was significant while potassium was spared in animals treated ($1.11 \pm 0.1 \leq [Na+]/[K+] \leq 3.78 \pm 0.3$) except those of *Azadirachtaindica, Momordic acharantia* and *Uvariachamae* in which they have been more potassium excretion than sodium ($0.28 \pm 0.2 \leq [Na+]/[K+] \leq 0.57 \pm 0.3$). *Acanthospermum hispidum* herbal tea has the highest $[Na^+]/[K^+]$ ratio (3.78 ± 0.3) followed by *Senna siamea*'s (3.29 ± 0.2). *Uvariachamae*has the lowest $[Na^+]/[K^+]$ ratios (0.28 ± 0.2 and 0.32 ± 0.1). The natriuretic activity of *Sarcocephalus latifolius* and *Senna siamea* decoctions at 7.6 mL/kg are respectively 1.59 and 3.29, when at the dose of 109.6 mg/kg, the aqueous extracts natriuretic activity of *Sarcocephalus latifolius* and *Senna siamea* are respectively 1.44 and 1.54 against 2.52 for the furosemide at 20 mg/kg and 0.98 for witness group. The comparison of the diuretic and natriuretic activities between *Sarcocephalus latifolius* and *Senna siamea* decoctions has presented more significant difference respectively for the diuretic activity ($p = 0.0107$) and natriuretic ($p = 0.024911$)

Sarcocephalus latifolius, Senna siamea, Cratevaadansonii, Acanthospermum hipisdum, Coconuts nucifera, Mangifera indica and *Dialium guineenses* can be counseled on the one hand to maintain an electro-chemical composition of the intracellular middle and on the other hand to treat the high blood pressure. These results corroborate those of the research [39] on antihypertensive potentialities plants in Beninese biodiversity which listed *Acanthospermum hispidum* and *Crateva adansonii* as antihypertensive plants. *Sarcocephalus latifolius* and *Senna siamea* can be counseled because these two plants have an important diuretic and natriuretic activities.

Sodium and potassium ions are electrolytes in solution in the organism. They represent the main minerals in blood plasma and the extracellular liquids and potassium represents the main mineral

The comparison was made from distilled water (control group), the aqueous extracts and the herbal teas of each of the ten plants, NS: No significant difference, * significant difference, **moderate significant difference, *** very significant difference, **** high significant difference intracellular [40]. Sodium and potassium ions play a crucial role in the creation of an electric pressure gradient of part and other cellular membranes. This electric balance difference between cell inside and outside permits the transmission of the nervous impulsion, the stimulation and the muscular activity [41]. Besides, potassium ion is on all sides the major cation of the middle intracellular and its pressure gradient of the cellular membrane is mainly determinant of the transmembrane electric potential that

influences the excitability of cloths as the nerves and the muscles [42]. It encourages a better neuromuscular activity that is a main factor of the performance. A good diuretic is the one that causes a strong elimination of sodium and save potassium [43].

Table 4: Urinary electrolytes from Wistar rats after treatment (n = 5)

Treatments		Dose/kg	Concentration of ions (mmol/L)		$[Na^+]/[K^+]$ ratio
			$[Na^+]$	$[K^+]$	
Distilled water		25 mL	15.5±8.4	15.9±7.8	0.98±0.7
Furosémide		20 mg	48.5±10.2 ****	19.2 ±1.6*	2.52±0.4***
Ac. Hisp	A.E	109.6 mg	45.3±4.2 ****	17.1±3.4 NS	1.67±0.2**
	Dec	7.6 mL	45.3±8.1****	12.0±1.3****	3.78±0.3****
Cr. adan	A.E	109.6 mg	31.5±5.8****	13.8±0.6 *	2.28±0.1***
	Dec	7.6 mL	67.9±4.3 ****	31.4±2.5 ****	2.16±0.0 ***
Uv. cham	A.E	109.6 mg	9.7±1.0	30.2±5.9	0.32±0.1
	Dec	7.6 mL	7.6±2.0	27.2±5.9	0.28±0.2
Di. guin	A.E	109.6 mg	32.12±1.3	23.14±1.4	1.39±0.1*
	Dec	7.6 mL	29.42±3.3	26.64±4.4	1.11±0.1 NS
Mo. cha	A.E	109.6 mg	15.16±3.2	33.12±12.0	0.46±0.1
	Dec	7.6 mL	12.46±5.3	43.22±23.5	0.38±0.1
Az. indi	A.E	109.6 mg	12.62±0.15	22.13±10.9	0.57±0.3
	Dec	7.6 mL	7.76±0.15	30.36±10.9	0.29±0.13
Co. nuci	A.E	109.6 mg	39.18±6.4	30.30±11.6	1.29±0.1*
	Dec	7.6 mL	47.22±8.6	40.88±11.6	1.18±0.2 NS
Ma. indi	A.E	109.6 mg	50.4±11.2	44.23±3.52	1.13±0.2 NS
	Dec	7.6 mL	45.4±11.2	39.92±9.58	1.14±0.1 NS
Sa. latifo	A.E	109.6 mg	39.1±12.2 ****	27.1±12.7 *	1.44±0.1 **
	Dec	7.6 mL	62.5±7.4 ****	39.2±2.3****	1.59±0.0 **
Se. siam	A.E	109.6 mg	58.5±19.3****	37.8±25.7*	1.54±0.1**
	Dec	7.6 mL	62.9±21.1****	19.1±7.18 NS	3.29±0.2 ****

The survey of the natriuretic activity misled by some plants used by south Beninese population of which sportsmen, permits to follow the movements of the ions intervening in the nervous impulse transmission, the stimulation and the muscular activity on which base all physical activities. This justifies the interest of this survey for the sportsmen.

The pH values of urines are between 6.7 and 7.8 with an average of 7.2 ± 0.45 for the animals treated with aqueous extracts and decoction of different plants. Previous works [7,10,44], found the pH values respectively between (4.6 and 7.8, 6.9 and 7.4, 6.1 and 8.6). The differences between pH levels which are not very significant may be due to the nature of animals used for testing or animal diet.

CONCLUSION

The studied plants are very often used in combination with other under shape of decoction, brewing by the Beninese population in the treatment and the prevention of the malaria and other affections in traditional medicine.

The phytochemical screening revealed the active principles presence which conferred by their pharmacological properties their use by south Beninese population to take care of themselves.

Volumetric urinary excretion determination has proved that *Senna siamea* and *Sarcocephalus latifolius* have an important diuretic activity on contrary to *Dialium guineenses* and *Momordica charantia*. *Azadirachta indica*, *Coco nucifera* and *Mangifera indica* have a weak diuretic activity, while *Acanthospermum hispidum*, *Cratevaadansonii* and *Uvariachamae* are anti diuretics.

Most studied plants permitted the excretion of Na^+ and the retention of K^+ from their natriuretic activity. According to the result obtained, it would be preferable to use the preparations of *Sarcocephalus latifolius* or *Senna siamea*, which showed an acceleration and an increase of the elimination of the hydric overcharge, accompanied by a sodium elimination, while saving potassium.

However, it will be necessary to pay attention to a prolonged use of the plants revealed diuretics considering the presence of steroids, alkaloids and terpenes which are substances which can be poisonous on this side of the physiological and bio pharmacological doses.

REFERENCES

[1] WHO. *World Health Organisation* Observatory of health in Africa. Traditional medicine, our culture, our future. *Regional Magazine Office of the WHO*, **2003**, 4(1), 4.

[2] O Nacoulma. Plantes médicinales et pratiques médicales traditionnelles au Burkina- Faso : cas du plateau central, Thèse de Doctorat en Science Naturelle, Université de Ouagadougou, (Burkina faso), **1996**, 605p.
[3] M Gandonou. Monographie de la ville de Porto-Novo, *Africa Advice*, **2006**, 66.
[4] J Adam Kerharo, JG Adam. La pharmacopéetraditionnelleSénégalaise. Les plantes médicinales et poisons, Vigot Brothers Paris, **1974**, 1011.
[5] MC Toufektsian. Chronic Dietary Intake of Plantation - Derived Anthocyanins Protects the Rat Heart against Ischemia-Reperfusion Injury. *Newspaper of nutrition*, **2008**, 138, 747-752.
[6] C Rémésy, C Manach, C Demigne, O Texier, F Regerat. *Med and Nutrit*, **1996**, 32, 17-27.
[7] FM Assogba, C Aderomou, W Agbodjogbe, M Moudachirou, JD Gbenou**.***J ChemPharm Res*, **2015**, 7(3), 2457-2462
[8] A Akoègninou, WJ van der Burg, LJG van der Maesen, V Adjakidjè, JP Essou, B Sinsin, H Yédomonhan. Flore Analytique du Bénin. Backhuys Publisher: CotonouetWagenigen, **2006**, 1034p.
[9] PJ Houghton, A Raman. Laboratory handbook for the fractionation of natural extracts. New York: Chapman and Hall, **1998**, 244.
[10] AA Daouda, Memor for graduation professional master in teaching physical education and sports, INJEPS UAC, Benin, **2010**, 55.
[11] WL Lipschitz, Z Haddian, A kerpscar. *J. Pharmacolo. Exp. Ther*., **1943**, 79: 91-110.
[12] T Murugesan, L Manikandan, KB Suresh, M Pal, BP Saha. *Indian J. Pharm. Sci*., **2000**, 62(2), 150-151.
[13] R Sanogo, HA Karadji, O Dembele, D Diallo.*Mali Medical*, **2009**, 24(4), 1-6.
[14] ST Kau, JR Andrews, DA Kaddie. *Journal of Pharmacological Methods*, **1984**, 11, 67-75.
[15] R Meera, P Devi, P Muthumani, B Kameswari, B Eswaraptiya. *J. Pharm. Sci& Res*., **2009**, 1(3), 112-116
[16] U Patel, M Kulkani, V Udale, ABhosale. *Trop. J. Pharm. Res*., **2099**, 8(3), 215-21
[17] D Drissa, P Guissou, M Haidara, C Tall, M Kasilo. *Hypertension*, **2010**, 59-63.
[18] JK Grover, V Vats. *J. Ethnopharmacol*, **2001**, 76(3), 233-238.
[19] S Pongnikorn, D Fongmoon. *J. Med. Assoc. Thai*., **2003**, 86(1), 61-68.
[20] S Lee-Huang, PL Huang. *Anticancer Res.*,**2000**, 20(2A), 653-659.
[21] INS Bourinbaiar, S Lee-Huang. *Biochem. Biophys. Common Res*., **1996**, 219(3), 923-929.
[22] JE Cunnick, K Sakamoto. *Cell. Immunol*.,**1990**, 126(2), 278-289.
[23] Y Diarra. Survey of phytochimical and biological activities of *Acanthospermumhispidum*D C. (Asteraceae) and *Curculigopilosa*Schum. andThonn. (Hypoxidaceae), two plants Used in the traditional treatment of the benign hypertrophy of prostate (HBP), Doctorate Thesis of Mali University, **2006**, 143 p.
[24] MH Burkill. The Useful plants of West tropical Africa. Families A-D. *Royal Botanic Gardens*, **1985**, 1, 596p.
[25] D Esquenazi, MD Wigg, MMF Miranda. *Cocos. Res. Microbio*.,**2002**, 153(10), 647-652.
[26] Y Srivastava, H Venkatakrishna-Bhatt, Y Verma. *Pharmacol. Res. Commun*. **1988**, 20(3), 201-209.
[27] Tanaka Takashi, Sueyasu Tokiko, Nonaka Genichiro, NishiokaItsuo. *Chem. Pharm. Bull*. **1984**, 32(7), 2676-2686.
[28] Li Zonghyi, H Mao, M Hey, S Read. *Zhongcaoyao*, **1982**, 13(3), 3-6.
[29] H Jacquemin. *Med. Pl. and Phytotherapie*, **1970**, 4, 230-259 and 306-341.
[30] K Guessan, B Kadja, GN Zirihi, D Traoré, TOL Aké. *Sciences & Nature*, **2009**, 6(1), 1-15.
[31] A Bouquet, M Debray. Medicinal Plants of Ivory Coast. Louis Jean Printing Paris (France) **1974,** 232p.
[32] J Bruneton. Pharmacognosie - Phytochimie, plantes médicinales, 4e éd., revue et augmentée, Paris, Tec & Doc - Éditions médicales internationales, **2009**, 1288p.
[33] EJ Middleton, JB Kardasnami. The flavonoids, advances in research since 1986, ed. J.B. Harborne, Chapman and Hall, London, **1988,** 1-20.
[34] SS Arogba, AA Ajiboro, IJ Odukwe. *J. Sci. Food Agric*., **2006**, 66, 533-534.
[35] ET Okwu, OF EkékéOkwu, O Ekeke. *Global Newspaper of Pure and Appl. Sci.*, **2003**, 9, 235-238.
[36] TO Lamien-Meda, TH Coulidiati, HS Millogo-Kone, M Yougbare-Ziebrou, J Millogo-Rasolodimby, OG Nacoulma. *Newspaper Res. Med. Plants*, **2008**, 5, 42-53.
[37] M Herman, TO Akpovi, MLGJ Vander. *Eco. Club*,**2010**, 56, 239-252.
[38] PL Toutain. Diuretics and pathophysiology of UMR 181, Experimental Toxicology, Toulouse-France, **2007.**
[39] JM Tokoudagba, P Chabert, C Auger, S Gom, J Gbenou, M Moudachirou, Schini-Kerth V, A Lobstein. *Ethnopharmacologia* **2009**, 44, 32-41.
[40] C Alais, G Linden, L Miclo. Biochimie Alimentaires, 5ème éd de l'abrégé. Dunod,**2003**, 96-111.
[41] WD Ardle, FI Mc Katch, VL Katch. Nutrition and sporty performances. ed. De Boeck, **2004**, 72-78.
[42] T Hannedouche. *Néphrohus*, **2007**, 75, 1-5
[43] AH Karadji. Etude de la phytochimie et des activités biologiques de deux recettes utilisées dans le traitement traditionnel de l'Hypertension artérielle au Mali. Thèse de Pharmacie, FMPOS, Bamako, **2006**, 97p.
[44] F Schmitt. *Bio-Chem.*,**2005**, 1-16.