



Original Research Article

## The Effect of Aqueous Leaf Extract of *Ageratum Conyzoides* on Blood Glucose, Creatinine and Calcium Ion Levels in Albino Rats

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### ABSTRACT

*Ageratum conyzoides* has been known for its utilization in the treatment and management of several disorders, such as; diabetes, inflammations, spasm, headaches, cancers, among other, with little or no documentation. This present study examined the effect of leaf extract of *Ageratum conyzoides* on blood glucose, creatinine and calcium ion concentrations in albino rats. The research was carried out with twenty five (25) adult male albino rats. The animals were grouped into five (5), (1 to 5), with five (5) animals in each group. Doses of 150, 300, 450 and 600 mg/kg body weight of aqueous extract of fresh leaves of *Ageratum conyzoides* were orally administered to rats in groups 1, 2, 3 and 4 respectively, for seven (7) consecutive days, while group 5 served as the control. There was a significant decrease in physical activities, average body weight, and the rate of feed and water intake, in the test groups when compared with the control. Glucose and creatinine concentrations of the groups administered with the aqueous extract of fresh leaves of *Ageratum conyzoides* decreased significantly ( $P < 0.05$ ), when compared with the control. On the other hand, concentrations of calcium ion in groups administered with the extract and the control did not vary significantly ( $P > 0.05$ ). This effect was found to vary among the doses. The findings of this research suggest that the leaf extract of *Ageratum conyzoides* may be useful in the management of blood sugar levels and kidney related disorders.

**Keyword:** Glucose; creatinine; calcium ion; *Ageratum conyzoides*; aqueous leaf extract

### INTRODUCTION

Extracts, syrups, infusions and concoctions prepared from different parts of plants are used to remedy different ailments. Such ailments include; typhoid, anaemia, malaria, headache,

etc [1]. The efficacy of medicinal plants against ill health is possible due to certain numerous biologically active compounds such as nutrients, phytochemicals, e.t.c., which have physiological

actions in the body of living organism [2][3]. In a diabetic state, small blood vessels in the body are usually injured. When the blood vessels in the kidneys are injured, your kidneys cannot clean your blood properly and can lead to kidney failure [4]. In such situation, more water and salt will be retained than it should, which can result in weight gain and ankle swelling. Proteins may be present in your urine while other waste materials accumulate in blood. Creatinine is the breakdown product of creatine phosphate in muscle, and it is usually produced at a fairly constant rate by the body (depending on muscle mass) [5]. Elevation of serum creatinine is indicative of under-exertion, suggesting kidney impairment. Thus, creatinine can be used as a marker to determine kidney disease [6].

Further, in a diabetic condition, kidney damage may lead to alteration of ions and electrolyte in balance. Calcium is one of such ions affected. It is another biological parameter of great importance in estimating physiological changes in the human populace. It plays a pivotal role in the physiology and biochemistry of organisms and cells [7]. It also plays an important role in signal transduction pathways, where they act as second messengers in neurotransmitters release from neurons, contraction of all muscle cell types and fertilization [7]. Decrease in calcium ion level in the body may cause damage to nerves in your body and lead to neurological disorders.

The management of diseases such as diabetes which leads to various complications has been challenging using conventional medicine or chemotherapy. They are target specific and do not take into consideration effects of emerging complications. As a result, herbal medicine has increasingly being exploited due its broad range of activities. Medicinal plants often exhibit a wide range of biological and pharmacological activities such as; anti-inflammatory, anti-hyperglycaemic, anti-bacterial, anti-fungal properties, and others [8][9].

*Ageratum conyzoides* is among the medicinal plants that are effective against diseases and may contain biologically active compounds, which are effective against ill health [10]. It is of the family *Asteraceae*, is an erect, annual herbaceous herb, native to tropical America especially Brazil, and throughout Africa except for arid areas. In Nigeria, different tribes have different names for it. For instance, Igedes of the middle belt, Yoruba's of the southwest and Igbo's of the southeast of the country call it "ufuopioko", "imiesu" and "nriewu", respectively [11]. The plant is widely employed in traditional medicine within the above mentioned geopolitical zones in Nigeria.

Various parts of the plant are used by herbal medicine practitioners in Eastern Nigeria in treatment of many diseases, such as burns and wounds, diabetes, headaches, pneumonia, inflammation, asthma, spasmodic and haemostatic diseases, stomach ailments, gynecological diseases, leprosy and other skin diseases [12]. It has been reported that *A. conyzoides* leaves are used in Reunion to treat diabetes [13][14]. The plant extracts is reported to be a cardiodepressant on isolated rabbit heart, a neuromuscular blocker, hypertensive and calcium channel blocker [15]. Hence, this study was aimed to evaluate the effect of fresh aqueous leaf extract of *Ageratum conyzoides* leaves on blood glucose, creatinine and calcium ion levels in albino rats.

## MATERIALS AND METHODS

### Collection of plant material

Fresh leaves of *Ageratum conyzoides* were collected from Okposi in Ohaozara L.G.A of Ebonyi State. The plant leaves were identified and authenticated by Prof. S.C Onyekwelu, a botanist in Applied Biology Department of Ebonyi State University, Abakaliki.

### Preparation of plant extract

Plant extract was prepared according to the method described by [16]. The fresh leaves of

*Ageratum conyzoides* weighing 140g was washed and homogenized with the aid of mortar and pestle to obtain paste. The paste was soaked in a beaker containing 200ml of distilled water for 30 minutes and filtered using muslin cloth. The extract was evaporated using a rotor evaporator to obtain gel-like substance (extract). Solution of the extract was made with deionized water.

#### Collection of albino rats

Twenty-five (25) adult male albino rats weighing 110-120g were obtained from Zoology Department of University of Nigeria, Nsukka (UNN) and transported in specially constructed cages to the animal house of Biochemistry Department, Ebonyi State University.

#### Ethical approval and Animal handling

Ethical approval for use of animals in research was given by Ebonyi State University Research and Ethics Committee. The albino rats were separated and kept in five (5) different groups, with five (5) rats making up a group (cage), and they were allowed free access to food and water. They were acclimatized for seven days before treatment commenced. Their physical activities and rate of feed and water were monitored.

#### Administration of leaf extract to the rats

After the separation and grouping of the animals, a daily dose of aqueous extract of fresh leaves of *Ageratum conyzoides* was administered orally to the rats for seven consecutive days as follows:

Group 1	-	150 mg/kg body weight
Group 2	-	300 mg/kg body weight
Group 3	-	450 mg/kg body weight
Group 4	-	600 mg/kg body weight
Group 5	-	Deionized water

#### Collection of blood sample from animals

After seven (7) days of administration of the leaf extract, the animals were subjected to

fasting for 24 hours, and sacrificed under mild anesthesia using chloroform, and the blood sample was collected via cardiac puncture into sterile anticoagulant free specimen bottles which were centrifuged at 3000rpm for 15 minutes to obtain serum.

#### Measurement of parameters

The method described by Tietz [17] was used to determine glucose level by enzymatic oxidation in the presence of glucose oxidase. Serum creatinine level was determined according to Jaffes, [18], while calcium ion was according to the method of Varley [19].

#### Statistical analysis

Data was presented as mean  $\pm$  standard error of the mean. Analysis of variance (ANOVA) was employed and means were compared for significance using Duncan's multiple range test. A difference was considered significant at  $P \leq 0.05$ .

#### RESULTS AND DISCUSSION

There was obvious decrease in physical activities and the rate of feed and water intake among the animals administered with the aqueous extract of *Ageratum conyzoides*, when compared with the control (data not shown). The changes in average body weight of the rats are presented in table 1 showed that the weight of the rats in the groups administered with plant extract (1, 2, 3 and 4) decreased continuously for the seven days of treatment while it was the reverse in the control group (the control gained weight). The decrease in body weight was significantly different ( $P < 0.05$ ) in groups 1, 2, 3 and 4 animals compared to the control. The biochemical mechanism underlying the observed decrease in the physical activities of the rats administered with the aqueous extract of *Ageratum conyzoides* is not full known. However, such decrease in physical activity may be as a result of the chemical constituents of the extract

administered to the animals as suggested by Agbafor [20], who observed similar effect when he treated guinea pigs with leaf extract of *Baphia nitida*. Phytochemicals such as alkaloids, tannins, saponins flavonoids, etc, have been reported to decrease the physical activity of laboratory animals [21]. More so, many more chemical constituents of *Ageratum conyzoides* according to Reid *et al*, [22] showed to decreased general body metabolism. Similarly, a study by Neiffer and Stamper [23] have reported the sedative and analgesic activities of essential oils components of *Ageratum conyzoides* on fish. Also, Fragrant compounds or essential oil of *Ageratum conyzoides* and most other plant materials have been shown to affect locomotive activity [24].

Glucose is a primary source of energy absorbed directly into the bloodstream during digestion. It is essential in the body for various cellular processes in cells and brain [25]. Blood glucose levels outside the normal range may be an indicator of a medical condition. A persistently high level of glucose in the body can lead to diabetes, a metabolic disorder which is detrimental to the body [26]. In this study, there was a significant decrease in glucose level of the rats administered with 150, 300, 450 and 600mg/kg of aqueous extracts of the leaves of

*A. conyzoides* compared to the control (Figure 1). The decrease was dose dependent; the higher the dose, the greater the decrease (Figure 2). This effect on blood glucose level is inline with the reported utilization of *A. conyzoides* in Cameroon, Nigeria and Reunion, for treatment of diabetes [13-14].

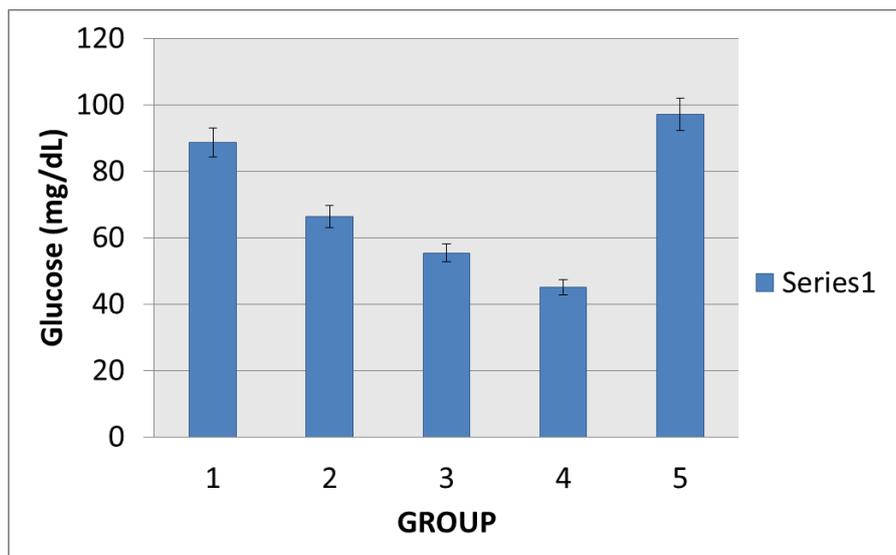
Diabetes is a major cause of chronic kidney disease (CKD). Diabetes can damage the kidney filters, leading to diabetic kidney disease, or diabetic nephropathy. This is a serious disease and may worsen other diabetic complications such as nerve and eye damage, as well as increasing the risk of cardiovascular (heart) disease. Serum creatinine is an indicator of renal health, because it is an easily measured by product of muscle metabolism that is excreted uncharged by the kidneys. If the kidney is deficient in its filtration ability, creatinine blood level rises. The creatinine levels of the rats administered with aqueous extract of fresh leaves of *Ageratum conyzoides* was observed to significantly decrease ( $P < 0.05$ ) in the administered groups ( 2, 3 and 4) compared the control, except for the group 1 administered with 150mg/kg of the plant extract. The creatinine level decreased with increasing dose (Figure 2).

**Table 1: Changes in body weight (g) of animals after treatment with aqueous extract of *Ageratum conyzoides***

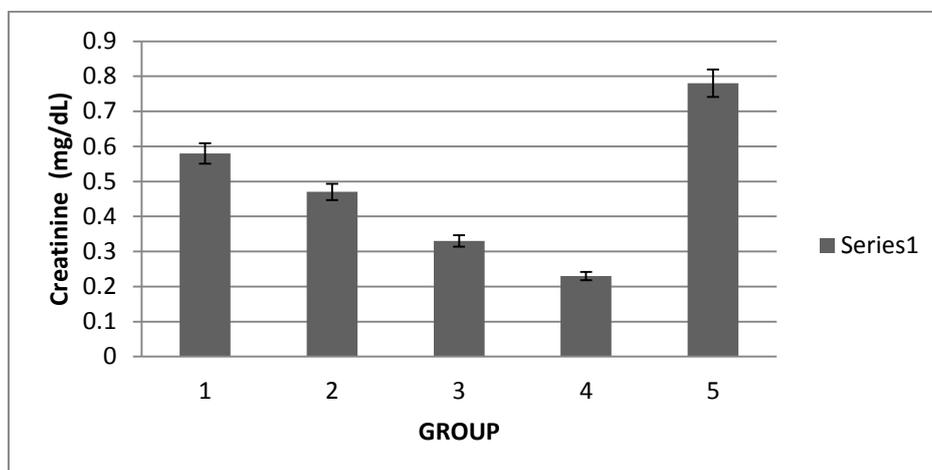
Days/Group	1	2	3	4	5
1	105.00 ± 5.17	132.00 ± 7.01	130.00 ± 6.89	160.50 ± 8.00	105.00 ± 3.09
2	102.50 ± 4.13	130.50 ± 6.89	130.00 ± 6.89	160.00 ± 7.80	115.00 ± 3.75
3	99.00 ± 4.00	130.00 ± 6.50	127.00 ± 4.73	157.00 ± 7.62	122.50 ± 3.87
4	98.50 ± 3.58	127.50 ± 4.73	125.00 ± 4.00	156.00 ± 7.14	127.00 ± 4.91
5	95.00 ± 3.32	126.00 ± 4.03	122.50 ± 2.15	154.50 ± 5.58	127.50 ± 4.91
6	92.00 ± 2.89	124.00 ± 3.00	122.00 ± 2.15	153.00 ± 4.55	128.50 ± 6.02
7	89.50 ± 2.00	123.00 ± 2.21	118.50 ± 1.89	150.50 ± 2.57	130.00 ± 6.89

Values are in mean ± standard deviation, n = 5

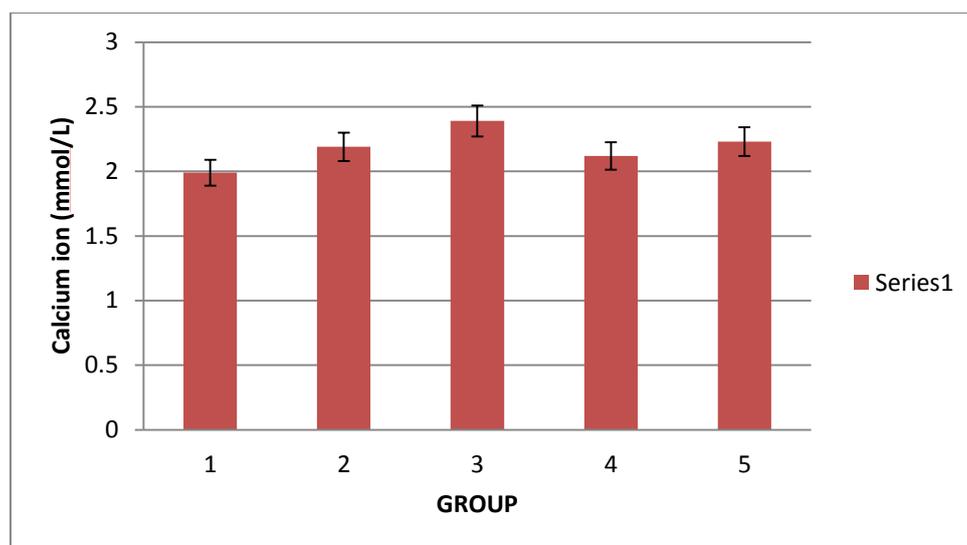
Group 1: 150 mg/kg body weight, Group 2: 300 mg/kg body weight, Group 3: 450 mg/kg body weight, Group 4: 600 mg/kg body weight, Group 5: deionized water (control)



**Fig. 1: Glucose level of the animals after treatment with aqueous extract of *Ageratum conyzoides***  
Group 1: 150 mg/kg body weight, Group 2: 300 mg/kg body weight, Group 3: 450 mg/kg body weight, Group 4: 600 mg/kg body weight, Group 5: deionized water (control)



**Fig. 2: Creatinine level of animals after treatment with aqueous extract of *Ageratum conyzoides***  
Group 1: 150 mg/kg body weight, Group 2: 300 mg/kg body weight, Group 3: 450 mg/kg body weight, Group 4: 600 mg/kg body weight, Group 5: deionized water (control)



**Fig.3: Calcium ion level of the animals after treatment with aqueous extract of *Ageratum conyzoides***

Group 1: 150 mg/kg body weight, Group 2: 300 mg/kg body weight, Group 3: 450 mg/kg body weight, Group 4: 600 mg/kg body weight, Group 5: deionized water (control)

Furthermore, the diabetic complications may include nerve damage which may be related to the calcium ions present in the body. Recent evidence suggests that calcium homeostasis may also be important for a variety of non-skeletal outcomes including neuromuscular function and falls, [27][28]. Based on basic and animal studies, vitamin D and calcium have also been suspected as modifiers of diabetes risk [29]. Calcium ions, like many other ions, are of vital importance to many physiological processes such as transmission of nervous impulse or signal transduction such that its concentration is maintained within specific limits to ensure adequate homeostasis. The results showed that calcium ion level of albino rats administered with aqueous extract of fresh leaves of *Ageratum conyzoides* and the controls did not vary significantly ( $P > 0.05$ ) (Figure 3). This may suggest the plant extract does not have an effect on calcium ion concentration in the body.

## CONCLUSION

The results of this study suggest that *Ageratum conyzoides* aqueous leaf extract possess hypoglycaemic or anti-diabetic and kidney protecting effects due to its ability to lower both serum glucose and creatinine levels in animals administered with the extract. This combined effect of *Ageratum conyzoides* extract may be of therapeutic importance in the management of diabetic kidney disease, or diabetic nephropathy. However, further studies need to be carried out to specifically ascertain this antidiabetic property, identify the chemical constituents of the plant responsible for the effect, and their underlying mechanism of actions.

## CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests.

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