

## Antihyperglycaemic effect of ethanolic leaf extracts of *Venonia Amygdalina* in alloxan-induced albino rats

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**ABSTRACT:** Diabetes mellitus is an important endocrine and metabolic disease which caused considerable morbidity and mortality Worldwide. The effect of *Venonia amygdalina* extract on diabetic induced albino rat was studied at the Department of Biological Science, Bayero University Kano. The plant was collected from a vegetable garden at Nsukka, Enugu State which was washed, air-dried and grounded into powdered using pestle and mortar. The powdered material was percolated in ethanol for seven days to obtain the crude extract.

Albino rats were used in the experiment and were kept in the laboratory animal care unit of the Biological Sciences Department, Bayero University Kano, for a 2-week acclimatization period before the actual experiments. The cages were thoroughly cleaned, and the rats were weighed and fed on a standard feed and water *ad libitum* throughout the period of acclimatization and the experiments. Diabetes mellitus was induced in a batch of normoglycaemic albino rats starved for 16 h by injecting alloxan monohydrate dissolved in physiological saline intraperitoneally. Seven days after alloxan injection blood glucose level was monitored. The animals were grouped into four (Group 1, 2, 3 and 4 respectively) based on their body weight and each of the group were given separate dose of the plant extract after induction of diabetic except the last group which is the control group.

The result of the study indicated that all the dosage used in the study significantly reduced the blood glucose level (104-135mg/dl) in comparison with diabetic induced group (154mg/dl). The plant (*V. amygdalina*) reduced blood glucose level of diabetic induced albino rat. It can therefore serve as a source of bioactive compound which can substitute the chemical compound which is very expensive for low resource individuals.

**Keywords:** *Venonia amygdalina*, albino rats. Diabetes mellitus, Alloxan

### Introduction

Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion (Schoenfelder *et al.*, 2006)]. Insulin therapy and oral hypoglycemic agents offer effective glycaemic control, but Insulin therapy has shortcomings such as ineffectiveness following oral administration, short shelf life, of the need for constant refrigeration, and fatal hypoglycemia, in the event of excess dosage (Anuradha *et al.*, 2001). As a result, there is a need to search for compounds with effective anti-diabetic activity when taken orally.

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The oral hypoglycemic agents that are capable of reducing blood sugar level belong to two chemical classes - sulfonylurea and biguanides (Trejo-Gonzalez *et al* 1996) However, the use of oral anti-diabetics is limited due to their adverse side effects including hematological, cutaneous and gastrointestinal reactions, hypoglycaemic coma and disturbances of liver and kidney functions. In addition, they are not suitable for use during pregnancy (Alarcon-Aguilara *et al.*, 2000).

Plants are well known in traditional herbal medicine for their hypoglycemic activities, and available literature indicate that there are more than 800 plant species showing hypoglycemic activity( Rajagopal and Sasikala,2008) The World Health Organization has recommended the evaluation of the effectiveness of plants in conditions where safe orthodox drugs are scarce ( W.H.O.1980). Studies have shown that phytochemical isolated from plant sources have been used for the prevention and treatment of cancer, heart disease, diabetes mellitus, and high blood pressure (Waltner-Law *et al.*, 2002) Fever (Devi *et al.*, 2003). *Vernonia amygdalina* Del. (Astereaceae) popularly known as bitter leaf is a shrub of 2-5 m tall with petiolate leaves of about 6.0mm wide (Ojiako and Nwanjo, 2006). The plant is widely distributed in Nigeria especially in the southwestern part of the country. The plant specie is popular in Nigeria because of its dietary and diverse medicinal uses (Gyang *et al.*, 2004; Ojiako and Nwanjo, 2006). Considerable attention had been focused on the pharmacodynamic properties of *V. amygdalina* especially its hypoglycemic activities (Ogbuokiri and Ekpechi, 1989; Akah and Okafor, 1992). More recently, Abosi and Raseroka (2003) and Izevbigie *et al.* (2004) discussed anti-malarial, anti-helminthic and anti-tumorigenic properties of *V. amygdalina*.

The present study was undertaken to evaluate the effectiveness of the ethanolic leaf extract of *V. amygdalina* as anti-hyperglycemic agents in alloxan-induced albino rats with hope that the results of this short-term investigation will have important implications for the management of diabetes in Nigeria and other African countries.

## **Materials and Methods**

### **Collection of plant materials**

The plant, *Vernonia amygdalina* was collected from a vegetable garden at Nsukka, Enugu state of Nigeria. The plant was identified at the Biological Science, Bayero University Kano.

### **Extraction Procedure**

The plant materials was air- dried at room temperature, and grounded into powder using pestle and mortar (Lale,2002).Two hundred grams of the powdered plant materials was soaked in one liter of ethanol (96% v/v) for seven days, (Fatope and Hamisu, 1993).The mixture was filtered using filter paper and the solid residue was discarded. Filtrate was extracted by evaporation to dryness using rotary vacuum evaporator.

### **Induction of diabetes mellitus and blood glucose measurement**

Albino rats ( males and females) were obtained from the animal room of the faculty of the pharmaceutical sciences, Ahmadu.Bello.University, Zaria, and kept safely under ambient conditions of temperature at the Department of Biological Sciences Bayero University Kano.The animals were fed on a standard feed and water *ad libitum*(.Idowu *et al*,2010) They were housed in the Laboratory Animal Care Unit of the Biological Sciences Department,Bayero University Kano, for a 2-week acclimatization period before the actual experiment. The animals remained healthy and active throughout the period of acclimatization and the experiments. The cages were thoroughly cleaned, and the rats were weighed daily. Diabetes mellitus was induced in a batch of normoglycaemic albino rats starved for 16 h by injecting alloxan monohydrate intraperitoneally which was dissolved in physiological saline. (Daisy and Rajathi, 2009). Seven days after alloxan injection blood glucose level were monitored.

### **Experimental design**

The experiment was designed with the animals been grouped(Daisy and Rajathi,2009) into four( Group1,2,3 and 4 respectively) they were grouped based on their body weight and each of the group were given separate dose of the plant extract after induction of diabetic using alloxan monohydrate except the last group which is the control group.

**Table 1: Dose of the extract given per body weight of the animals**

Treatment	Body weight (g)	Dose of the <i>Venonia amygdalina</i> extract (mg/l)
Group 1	200	10
Group 2	230 – 250	20
Group 3	280	30
Group 4 (Control group)	300	30

## Results and Discussion

Diabetes mellitus of long duration is associated with several complications such as atherosclerosis, myocardial infarction, nephropathy, etc ( Pushparaj *et al.*, 2007) These complications are usually related to chronically elevated blood glucose level. The result of this study indicated that the blood glucose level of the animals before diabetic induction was within (97-106mg/dl) (Table1). However the blood glucose level was found to increased after induction of diabetic using alloxan monohydrate (104-154mg/dl) (Table2). This conforms with the finding reported by several authors (Idowu *et al* 2010, Daisy and Rajathi 2009). Alloxan causes a massive reduction in insulin release by the destruction of cells of the islets of Langerhans, thereby inducing hyperglycaemia (Grover *et al.*, 2000). The blood glucose level of diabetic induced rat were found to reduced significantly ( $P < 0.05$ ) after treatment with ethanolic extract of *Venonia amygdalina* (120-135mg/dl) (Table2).

The findings in this study are in conformity with those reported by Daisy and Rajathi (2009) that there is a decrease in the blood glucose levels of alloxan-induced diabetic rats using the aqueous extracts of *Clitoria ternatea* (CTL and CTF). The finding in this study also corroborates with the data of (Odeigah *et al.*, 1999) where it was noted that administering some medicinal plants simultaneously with tolbutamide enhanced their hypoglycaemic effect. The observation that *V. amygdalina* reduced blood glucose level in diabetic rats implies that the hypoglycaemic principle(s) in *V. amygdalina* may have direct effect similar to that of insulin on glucose metabolism. The active hypoglycaemic principles in *V. amygdalina* are probably the bioactive constituents present in the extract. Kupcham *et al.*, (1969) had long shown that the phytochemicals in *V. amygdalina* include steroid glycosides and sesquiterpetene lactones like vernodaline.

In view of the central role of diet in diabetic management (Mann, 1980; Al-Seif *et al.*, 1993). Several attempts have been made to suggest acceptable dietary regimes for diabetics. These recommendations, though beneficial to diabetics in general, are based on foreign diets. Thus, they did not take cognizance of the specific socio-economic and Cultural attributes of African societies especially with respect to their eating habits. Thus, Dietary treatment of diabetes in Africa is still a major challenge because strict adherence to various recommended dietary regimes is often difficult (Naidu, 1992). Such problems may not arise with the use of *V. amygdalina* because the plant is widely consumed as bitter leaf soup. Thus the use in diabetic management agrees with Nigerian socio-cultural attributes. If the results of this investigation are confirmed in other animal and human experimental studies, the use of the plants in the treatment of diabetes can be justified considering the central role of diet in diabetic management.

### Conclusion and recommendation

The plant (*V. amygdalina*) reduced blood glucose level of diabetic induced albino rat. It is therefore recommended that the plant should be subjected to other phytochemical studies in order to identify and characterized the bioactive compound responsible for reducing the blood glucose level which can serve as a possible substitute of the chemical compound which are very expensive for a low resource individuals.

**Table2: Blood glucose level of laboratory reared albino rats before and after induction of animals with alloxan and the plant extract**

Treatment	Body weight (g)	Blood glucose level (mg/dl) (Before induction of diabetic using alloxan)	Blood glucose level (mg/dl) (After induction of diabetic using alloxan)	Blood glucose level (mg/dl) (after induction of extract)
Group 1	200	106	154	135
Group 2	230 – 250	97	152	132
Group 3	280	105	125	120
Group 4 (control group)	300	100	104	104

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