Hypoglycaemic Potential of Aqueous Leaf Extract of *Vernonia amygdalina*: An Animal Model

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The leaves of *Vernonia amygdalina* (VA) had been of medicinal importance due to their reported uses. 0.5gKg\textsuperscript{-1} daily of aqueous leaf extracts of VA was orally administered to a test group of normal adult rabbits fed *ad libitum* for 28 days. The control group was given only 2mLkg\textsuperscript{-1} of normal saline daily under the same suitable conditions. Fasting blood glucose concentrations were evaluated before and after 1\textsuperscript{st}, 3\textsuperscript{rd} and 28\textsuperscript{th} day of treatment using a standard digital glucometer. SPSS (version 15) multivariate-analyzed results (p= 0.05) showed that VA lowered fasting blood glucose during the first three days of treatment with a percentage difference of 17.56 – 27.78 but became euglycaemic after 28-day ingestion, perhaps due to physiologic tolerance. This study indicated that consumption of VA could safely be used for the delay or prevention of diabetes. Further studies are required to assess the extent of safety compared with bioequivalent synthetic pharmaceuticals.

Keywords: *Vernonia amygdalina*; Antidiabetic; hypoglycaemic Rabbits

1. Introduction

Some wild herbs and spices have been shown to be most effective, relatively non-toxic and have substantial scientific documentation to attest to their efficacy in diabetes management [1]. However, the value of current chemotherapies is unequivocal, yet inadequate [2].

*Vernonia amygdalina* (VA), identified as ‘bitter leaf’, is called *onugbo* in Igbo; *Chusar doki* or *fatefate mayemaye* in Hausa and *ewuro* in Yoruba [3]. Major phytochemicals in the leaves of VA include sesquiterpene lactones and steroid glucosides [4]. The leaves of VA had been used to treat diabetes locally in Nigerian folk medicine [5] for their anti-hyperglycaemic effect [6].

The fact that more than 10 million ‘normal’ Africans may become diabetic between 2000 and 2030, according to predictions[7], called for further research on its prophylactic nutritional therapy. This work was designed to evaluate the hypoglycaemic potential of VA using animal studies.

2. Materials and Methods

2.1 Source and Identification of the plant materials

The *Vernonia amygdalina* (VA) leaves were bought from local markets within Owerri capital territory, Imo State Nigeria at about 8 am at a prevailing temperature of about 28+ 2°C in April, 2009. To obtain...
potent plant extracts, some factors were considered [8,9]. The plant leaves were identified and authenticated at the Department of Crop Science Technology, School of Agriculture and Agricultural Technology, Federal University of Technology Owerri, Nigeria.

2.2 Preparation and Storage of Leaf Extracts
Fresh leaves of VA were thoroughly washed using tap water and rinsed with distilled water. The leaves were dried for 5 minutes in an oven at 60°C to stop enzyme activity[10]. They were then air dried to a constant weight, milled with sterile manual grinder (Corona, China) and further milled to a fine powder using Binatone blender (Model BLG-401). The powdered material was stocked in a plastic container with water absorbent. The solvent used for the preparation of the extracts was deionised water and the technique was adapted[11,12].

The aqueous extracts were prepared by weighing out (25 g) of the milled powdered leaves of VA and added to 250 ml of distilled deionised water in 500 ml beaker and stirred vigorously with a glass rod. The mixture was kept on the laboratory bench for 24 hours before filtering. The extracts were filtered using Whatman no.1 filter paper. Dark-green filtrate of VA was obtained. The filtrate was oven-dried at low temperature and the extract was stored in airtight bottles at 4°C in a refrigerator until ready for use. The stored extract was allowed to reach room temperature before administration.

2.3 Source and Maintenance of Rabbits
The albino rabbits of both sexes were bought from the Rabbitry in School of Agriculture and Agricultural Technology, Federal University of Technology Owerri, Nigeria. Ten 6-8 month old rabbits were acclimatized for two weeks in nearby cages within the premises of JONGRES Biomedical Laboratories, Owerri. The rabbits were grouped into two by weight (Table 1). Group 1 was untreated control while Groups 2 and 3 were test-groups. The animals were kept under adequate sanitary conditions with natural day-light cycle with through ventilation.

The rabbits were fed on a Nigerian livestock grower mash (feed) containing crude protein, carbohydrate, oil, methionine, fibre, calcium, phosphorus and lysine. Feeding and drinking were ad libitum. The cages were cleaned on daily basis. The weights of the animals were taken using weighing machine before and after study (as shown in Table 1).

2.4 Administration of the Leaf Extracts
The control Group 1 received orally 2.0 ml/kg body weight of physiological saline daily. 0.50g/kg body weight of extract (at room temperature of 22 - 26°C) was orally administered daily with oral cannula (2ml syringe) to Group 2 and 3. The dosage and duration of treatment were chosen based on earlier studies [11,14,15].

2.5 Monitoring of 12-hour Fasting Blood Glucose
‘Ultra easy’ one touch meter (Johnson and Johnson Company, UK), a blood glucose monitoring system was used as specified (www.lifeScan.co.uk). The strip code used was No. 9. The estimation was made immediately after an ear venepuncture with a sterile needle. Blood glucose level was assayed by allowing a single drop of fresh plasma from the ear vein to drop on the strip properly fixed with the glucose monitor. Pretreatment samples were used to estimate the physiologic baseline values of fasting blood glucose. Mean Fasting and postprandial blood glucose concentrations were monitored on the 1st, 3rd and 28th day of therapy.

3. Results

In the tables below, Group 1 was the control group administered with only normal saline; Group 2 was a test group administered with Vernonia amygdalina extract (VA).

The mean values of blood glucose concentrations were recorded and analyzed with the Statistical Package for Social Sciences (SPSS) (Version 15). Significant differences were accepted at P<0.05.

Table 1 shows the mean weight of the animals before and after treatment to monitor the growth effect of the study. There is a slight decline in total mean weight, as shown in Figure 1, probably caused by the daily 12-hour fasting and bleeding.
In Table 2, the mean value of FBG of Group 2 decreased after the 1\textsuperscript{st} and 3\textsuperscript{rd} day. The percentage difference (PD) is greatest in Group 2 after Days 1 and 3. However, the mean value of FBG increased after the 28\textsuperscript{th} day.

4. Discussion and Conclusion

*Vernonia amygdalina* (VA) leaves are used in the preparation of many delicacies in Nigeria. Reports indicated VA as antihyperglycaemic [6,7].
Consequently, it became imperative to evaluate its hypoglycaemic potential in normal rabbits which could contribute to the use of the extract for prophylaxis or delay of diabetes mellitus in normoglycaemics.

From the SPSS (version 15) analyzed results, the mean difference is significant at the 0.05 level: the VA significantly lowered normal fasting blood glucose during the 1st and 3rd day. The animals were healthy and the growth rate was same in all the groups during the period of study. The normal mean fasting blood glucose concentrations obtained was 5.98 mMol/L.

Diabetes is a pandemic problem, for instance in UK, diabetes accounts for 30% reduction in life expectancy [16]. Evidence-based nutritional approaches to the treatment and prevention of diabetes mellitus (DM) had been considered [17]. This study confirmed the reported antihyperglycaemic effects of VA in diabetes. It has been reported that a sesquiterpene lactone isolated from the extract of *Ambrósia maritima* is an effective hypoglycaemic agent. It has also been suggested that the hypoglycaemic effect of aloes and its bitter principle may be mediated through stimulating synthesis and/or release of insulin from the beta-cells of Langerhans [17].

Consumption of VA, most probably, is prophylactic for the highly prevalent primary diabetes mellitus. Consumption of the extract may also be beneficial to secondary diabetes mellitus like pregnancy-induced (gestational) diabetes mellitus since dietary factors have been implicated for the rising incidence of diabetes and most NIDDM occur commonly in obesity and insulin disorder [16]. Apart from weight-reduction and weight maintenance diets used in diabetic therapy, hypoglycaemic VA could be recommended for the delay or prophylaxis of DM. Consequently, clinical studies are necessary.

References


