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Antidiabetic Effect Of Cassia Singueana Extract On Alloxan-Induced Diabetic Albino Rats

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ABSTRACT :

This study has been undertaken to investigate the effect of cassia singueana aqueous leaf extract on blood glucose level of alloxan-induced diabetic albino rats. A total of fifteen albino rats were used and assigned into three groups as follows; Groups 1, 2, and 3 of five rats each. Group 1 serves as a normal control in which the animals received only distilled water at an equivalent dose in addition to a normal diet. They were neither induced by diabetes nor were plant extract, Groups 2 and 3 made diabetic by an interperitoneal injection of alloxan (180mg/kg body weight). Group two was given 100mg kg of aqueous leaf extract of Cassia singueana, and Group 3 was given 50mg kg of aqueous leaf extract of Cassia singueana. The fasting blood sugar was determined using a glucometer. Results of the antidiabetic study indicated that the extracts significantly brought down glucose levels in the test rats ($p<0.05$) when compared with the diabetic control. The result of this study has shown that Cassia singueana leaves have an antidiabetic effect by reducing the blood glucose level in diabetic rats.

Keywords: Alloxan, cassia singueana, Diabetes mellitus

Introduction :

Diabetes mellitus is a diverse collection of conditions marked by a sustained high blood sugar level and disruption of the fuel compound's metabolism due to either a relative lack of insulin action or secretion, or an absolute disease secretion (WHO, 1999). The World Health Organization defines it as a complete disease [2] based on testing results that indicate a fasting venous plasma glucose concentration greater than 7.8 mmol (14 mg/dl) or greater than 11.1 ml (9200 mg/dl) two hours after carbohydrate and a two-hour abstinence concentration is normal. This makes it the most frequent endocrine disease. Diabetes was anticipated to affect 2.8% of the global populace in 2000, and this figure is expected to rise to 266 million (4.49%) by 2080. The worrisome increase in incidence might be attributed to lifestyle changes linked with modernization. Diabetes mellitus increases the risk of renal, vascular, and neuropathic consequences, which can cause disability and mortality (Hana et al, 2005). Many traditional medicinal herbs have been shown to have hypoglycemic characteristics, including Allium sativum (garlic), Azardirachta indica (neem), and Nordica charantia (bitter ground). Many of them proven to be quite efficient in decreasing glucose levels in severe diabetes. Diabetes mellitus is a condition characterized by elevated levels of glucose in the blood (hyperglycemia) and urine glucose excretion. Diabetes is caused by either defective insulin production or faulty insulin resistance; there are two types: type I (insulin-dependent) and type 2. The most frequent is type 2, which is commonly associated with increased levels of insulin in the blood but requires a reaction to it. It is below normal due to peripheral resistance. Insulin is either missing or impaired in type I diabetes.

1.1 Cassia singueana

Cassia singueana is tropical plant, class Cassia, family Fabaccae, subfamily Caesalpinioideae, often found in East and West Africa. In Hausa, it is referred to as Runfu. The African plant with numerous medicinal uses is found in secondary jungles of forests (Von Maydell and Hans-Jurgen, 1990). Extracts from this plant have been used to treat a wide range of illnesses throughout the continent, including skin cancer in Ethiopia, liver diseases in Egypt, malaria in Ethiopia, and pain of any kind in Malawi. Convulsions, inflammatory diseases,

Gonorrhea, constipation, heartburn, and wound healing are among the other traditional applications of the herb (*Halliwel and Gutteridge 1985*). The plant has been shown to be effective in treating common ailments and disorders, but its ability to decrease glucose levels has not received as much attention as it might. Therefore, we looked into whether Cassia singueana aqueous leaf extract might reduce blood sugar levels in albino rats who had been given alloxan-induced diabetes.

Nomenclature

Allium sativum of garlic
Azardirachta of indica neem
Nordica charantia of bitter ground

1.2 Materials

Monohydrate, glucometer, glucose strips, rat cages, beddings, feeders, syringes, needles, feeding tubes, aqueous leaf extract of Cassia singueana, weighing balance device, specimen bottles, laboratory reagents for tissue processing, microscope, glass slide cover, and alloxan injection.

1.3 Aqueous leaf extract preparation

Fresh Cassia singueana leaves were properly cleaned, shade-dried for a week, and ground into powder. 20g of the powder was soaked in 200cm of distilled water, stirred, and allowed to sit for 48 hours. The fluid was initially filtered using Whatman filter paper No. 1, followed by time filtration with cotton wool placed into a funnel. A spinning evaporator was used to further concentrate and oven-dry the filtrate. The extract was chilled until use.

1.4 Experimental Animals:

Mature albino rats, weighing between 50 and 60 grams and of all genders, were obtained from the biology department's laboratory holdings at Kano University of Science and Technology in Wudil, Nigeria. Water and pellet feed were provided for the animals' upkeep. For a duration of 14 days. The animals were allowed to acclimatize to the current climate in the animal home prior to the administration of Alloxan monohydrate and an aqueous Cassia singueana leaf extract solution. Their average temperature was maintained at 28 ± 20 degrees Celsius in well-ventilated cages and housing.

1.6 Experimental Design

Fifteen (15) rats of all genders (50g) were used as the experimental animals. The animals were divided into three (3) groups of five rats each:
Group 1 was the control group, in which the animals received only distilled water at an equivalent dose in addition to a normal diet. They were neither induced by diabetes nor plant extract for the period of fourteen (14) days.
Group two (2) animals were treated with alloxan (180 mg/kg interperitoneal IP).The rats developed diabetes after Alloxan injection and were given 100 mg/kg of aqueous leaf extract of Cassia singueana.
Group three (3) animals were treated with alloxan (180 mg/kg interperitoneal IP). The rats developed diabetes after Alloxan injection and were given 50 mg/kg of aqueous leaf extract of Cassia singueana. Diabetes was induced using 80 mg/Kg of alloxan Monohydrate intraperitoneally following an 18-hour fasting period in which animals were only allowed access to water. Animals resumed normal feeding after the injection, and blood glucose was checked before and 48 hours after diabetes using an Accu-Chek glucometer. A glucose level above 180 mg/dL was considered hyperglycemic, and animals with values above 180 mg/dL were selected for extract administration.

1.7 Methods

The tail was nipped gently with a sterilized blade and one drop of fresh venous was squeezed out and placed on the sample well of the glucometer strip, which was already inserted into the glucose glucose monitoring meter. The reading was taken. The fasting blood glucose was determined after an 18-hour fast with a glucometer.

1.8 Statistical analysis

Statistical analysis was performed using student "*t*" test. The values are expressed as mean ± S.D. for five rats in each group. *P*-values ≤0.05 were considered as significant

1.9 Result

The results show that there was a significant difference in the blood glucose level, when values of groups 2 and 3, 24 hours after induction are compared with control group 1 two weeks after treatment. The induced treated groups were compared with the control group ($P<0.05$). The result of this study has shown that Cassia singueana leaves have an anti-diabetic effect by reducing the blood glucose level in diabetic rat when compared with the control group.

Table 1 showing a weekly blood glucose level

Week and Time	Group 1 (control)	Group 2 (100mg/kg)	Group2(100mg/kg)
Initial reading	91.4±11.6[a]	90.8±13.9[a]	90.2±8.16[a]
24 hours after induction	91.0±12.3a	255.6±109.4[b]	365.6±90.2[b]
1st week after treatment	91.5±8.50[a]	125.4±22.13b	245.4±101.5[b]
2nd week after treatment	90.9±13.1[a]	100.8±12.7b	134.4±30.8b

Discussion

An increasing body of data from both clinical as well as experimental studies suggests that oxidative damage plays a fundamental role in the aetiology of diabetes (*ldenyi et al, 2010***)**. It has been discovered that the diabetogen alloxan causes diabetes mellitus via oxidative stress induction, which ultimately leads to the destruction of B cells in the islet of Langerhans (*winterbourne, 1993)*. Research has indicated that several animal models of diabetes have elevated levels of oxidative stress and/or ROS and lipid peroxides, or both (*Anjaneyelu, 2004; Mehta, et al. 2006*)]. Furthermore, it has been proposed that the toxicity of alloxan may be related to transition metals like iron, zinc, and copper (s*zkudelki, 2001*). According to Martin et al. (2003), non-enzymatic protein glycation, glucose oxidation, and the subsequent breakdown of glycated proteins all contribute to the disproportionate formation of free radicals in diabetes. Unusual elevated concentrations of free radicals combined with a concurrent deterioration of the antioxidant defense system may result in cellular organelles and enzyme damage, elevated lipid peroxidation, and insulin resistance (*Resmi et al, 2006: El-hage et al, 1998*). The research also reported on the involvement of numerous plants including Cassia singueana have been found to be traditionally utilized in northern Nigeria to treat diabetes mellitus. This study has demonstrated scientifically that Cassia singueana aqueous leaf extract treats experimental mice who have been given diabetes. Blood glucose concentrations can be positively lowered by the plant to normal ranges.

Conclusion :

*T*he result of this study has shown that Cassia singueana leaves have influences on the management of diabetes Due to the bioactive compound present in the plant leaves. Further research will carry out in order to investigate the specific bioactive compounds responsible for reducing blood glucose level and mechanism of action of their action.

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