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Hypoglycemic Effect of Aqueous Extract of Cashew Plant Leaves (*Anacardium occidentale*) on Alloxan Induced Albino Rats

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ABSTRACT

Anacardium occidentale L. (*Anacardiaceae*) is used in South Cameroon as well as in other tropical countries by traditional practitioners as a folk remedy for treatment of diabetes mellitus. The antidiabetic potential of the plant extracts in alloxan induced diabetic rats was demonstrated. The aim of the current study was to investigate the antidiabetic effects of aqueous extract of the leaves of *A. occidentale* on diabetic rats. The rats were grouped into four (4) groups, the first group served as control, second group was the induced group without treatment and the other groups were induced and treated with 100 mg/kg and 200mg/kg of the plant extract respectively. At the end of the experimental period of seven days, fasting blood glucose levels were estimated in the control, induced and treated rats and was found to be 144.45±1.54, 177.1±3.07, 160.2±3.29 and 142.9±3.89 In that order. The administration of extract showed that the extract treatment has a significant effect in the decrease of glucose level ($P < 0.05$). This is in conformity to the treatment with the standard drug Pioglitazone. These results demonstrate significant antidiabetic potential of the extract of leaves of *A. occidentale*, justifying the use of plant in the indigenous system of medicine. Further studies for investigating the specific compound(s) responsible for such beneficial role in diabetes would open new outlook in the therapy of type 2 diabetes.

Keywords: *Anacardium occidentale*,
diabetes mellitus, hypoglycemia

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INTRODUCTION

Medicinal plant is any plant which one or more of its organs, contains substance that can be used for therapeutic purpose or which is a precursor for synthesis of useful drugs (Quattrocchi, 2016). It has now been established that the plants which naturally synthesize and accumulate some secondary metabolites, like alkaloids, glycosides etc possess medicinal properties (Quattrocchi, 2016).

Medicinal plants are believed to be the most efficient source of traditional way of preventive and or curative medicine being the richest bioresource of traditional medicine, modern medicine, and food supplement and as chemical entities for synthetic drug (Sumner, 2000). Many countries have little regulation on traditional medicine. But world health organization coordinates a network to ensure safe and rationale usage (Ahmad *et al.*, 2007).

Research has documented that, People in non-industrialized societies usually prepare using traditional medicine to orthodox one, mainly because they are readily available and cheaper than the orthodox medicine (Ayres *et al.*, 1983). It has been estimated by food and Agricultural organization that over 50,000 species of medicinal plant are used world over (Iwu, 1993).

Medicinal plants are rich sources of various minerals and antioxidants including various bioactive compounds which helps in improving various diseases and disorders. The extract helps in exhibiting an effects by regulating the inflammatory response and other activities (Ayuba *et al.*, 2025)

The anti-inflammatory, antibacterial, antipyretic and antioxidant activities of some plants with medicinal properties such as *Vernonia amygdalina*, *Anacardium occidentale* L. (Anacardiaceae) and *Garcinia kola* (*Kolaviron*) have been well documented (Quattrocchi, 2016).

Cashew is an evergreen perennial plant belonging to the family Anacardiaceae. This family consists of 400-600 species. Among the eight species in the genus *Anacardium*, the only cashew is valuable due to its nutritious kernel. Cashew is a tropical tree present in South America and Brazil. Plant height varies from 5 to 14 m. The trunk is usually short and irregular, starting branches close to the ground. Leaves are green that are placed in a spiral pattern towards the end of the stem. Leaves become mature after 20-25 days (Zaqr *et al.*, 2021)

Cashew (*Anacardium occidentale*) leaf has been used in traditional medicine for a very long time in many different civilizations due to their many medical properties. Among the bioactive substances that cashew leaves contain in significant concentrations that are associated with several health benefits are anacardic acids, cardanols, and other flavonoids (Zaqr *et al.*, 2021).

Furthermore, Cashew leaves contain bioactive compounds such as flavonoids, alkaloids, tannins, and anacardic acids. These compounds exhibit significant antioxidant, anti-inflammatory, and antimicrobial activities (Omara *et al.*, 2020), making cashew leaves a valuable addition to herbal medicine.

Health Benefits of cashew leaves

Antidiabetic property

Research suggests that cashew leaves help manage blood sugar levels, making them beneficial for diabetic patients. The bioactive compounds in cashew leaves enhance insulin sensitivity and regulate glucose metabolism (Aracelli *et al.*, 2015).

Antioxidant activity

Cashew leaves exhibit strong antioxidant activity, which can help protect cells from oxidative damage. These antioxidants play a crucial role in reducing the risk of

chronic diseases and promoting overall health (Zarqa *et al.*, 2021).

Antimicrobial property

Cashew leaf extracts have shown effectiveness against various pathogens, supporting their use in traditional medicine for treating infections. The antimicrobial compounds in cashew leaves inhibit the growth of bacteria and fungi (Agbaje & Adeneye, 2007).

Anti-Inflammatory Effects

The anti-inflammatory compounds in cashew leaves can help reduce inflammation and pain associated with chronic conditions these leaves modulate the inflammatory response by inhibiting pro-inflammatory cytokines and enzymes (Adams *et al.*, 2011).

Protection from cancer

This disease can likewise get destroyed from nuts. Selenium - rich cashew bits are helpful for lung, liver, skin, cerebrum, and gastrointestinal malignancy. Due to significant fiber content likewise assists with fighting malignancy. They act as an antioxidant and prevent the growth of cancer cells by removing the free radicals from the body. A class of flavonoids called Proanthocyanidins fight tumor cells and prevents them from further division. High copper content and proanthocyanidins in cashew nut fight copper content in cashew helping to prevent colon cancer (Aracelli *et al.*, 2016).

Eye protection

Today's women are selecting to work at home by using mobile phones and laptops continuously, which damage their eyes. Zeaxanthin is a pigment that is present in Cashew, by the consumption of Cashew, will protect the retina from damaging the UV rays and hence protects the eye (Zarqa *et al.*, 2021).

Helpful for ageing

Vitamin E has extra ordinary boosting power. A new investigation conducted on 65 years old people found that Vitamin E supplementation appeared to stop the decrease in insusceptibility related to aging. 100g of cashew pieces contain 46mg of Vitamin E, in this way protecting from aging as cashew contains free radicals that keep the body free from wrinkles and lines in the face. Cashew is used in skin remineralization and in the treatment of premature aging (Zarqa *et al.* 2021).

Diabetes Mellitus (DM) is one of the most common public health challenges. In the 21st century, DM is one of the most common public health challenges, characterized

by persistent hyperglycemia and metabolic disturbances caused by an absolute or relative insulin secretion or action deficiency (Bailey, 2002; Saidu *et al.*, 2010). Type 1 DM occurs when the pancreas cannot produce insulin, while type 2 DM occurs when the body cannot effectively use insulin or when there is insufficient insulin production (Hajera *et al.*, 2011). DM-related complications can significantly impact organ function, causing suffering beyond the disease (Indah, 2011). In 2010, there were approximately 285 million adults (6.4%) with diabetes worldwide, with predictions of a rise to 439 million (7.7%) by 2030 (WHO, 2016). Approximately 90-95% of these cases will be type 2 DM, with significant increases predicted in developing countries and adults between 45-64 years of age. These predictions indicate a growing burden of diabetes, particularly in developing countries (Shaw *et al.*, 2010). In Nigeria, DM prevalence was estimated at around 2.7% in 2011 and is characterized by persistent hyperglycemia and metabolic disturbances due to insufficient insulin secretion or action, either absolute or relative (WHO, 2011).

Both type I and type II diabetes mellitus are characterized by distinct causes that give rise to heightened sugar levels in the blood, leading to a range of complications (Ladan *et al.*, 2007). These complications may include damage to the small and large blood vessels, resulting in issues with the kidneys, nerves, heart, and eyes. Additionally, high blood pressure and cholesterol levels can exacerbate the risk of cardiovascular disease (Sabitha, 2011). Though diabetes has no cure, it can be effectively managed by using medications designed to lower blood sugar levels (Saidu *et al.*, 2010). The aim is to induce diabetes and study the effect of the plant (cashew leaves) in alloxan induced albino rats.

MATERIALS AND METHODS

Materials

Materials and equipment used include; weighing balance, syringes, measuring cylinder, needles, feeders, cages, specimen bottles, Glucometer microwave oven, mortar, pestle, Separating funnel, Bunsen burner, filter, evaporating dish, water bath, conical flask, stirrer, filter papers

Laboratory Reagents used include; Alloxan, normal saline, alcohol, distilled water, and EDTA sterilized bottles.

Plant collection and authentication

Fresh *Anacardium occidentale* (cashew leaves) was collected in Zamfara State, Nigeria, during the dry season (March, 2024), from a Biological garden SLT Department, a plant taxonomist with the Biology unit, SLT department verified the plant's authenticity. The leaves were washed with water and allowed to air dry for seven days under the shade.

Plant extraction

The dried cashew leaf was crushed with a mortar and pestle after drying. According to Trease and Evans (2002), Two hundred grams of the dried powder were subjected to soxhlet extraction using distilled water. The extraction was held in Biochemistry Laboratory

Experimental animals

Albino Rats were used in the experiment, where they were kept in the animal house of the Biochemistry unit SLT department Federal polytechnic Kaura Namoda after being received from Katsina State on 27 March, 2023.. They were kept in plastic cages covered with wire-mesh. The animals were kept in a well -ventilated cage in the Department of Science Laboratory Technology Federal Polytechnic Kaura Namoda, the animals were allowed free access to standard feed and water. The rats were given two weeks to adjust to the current climatic conditions. 16 mature male albino rats weighing 90–180g were used.

Experimental design

Sixteen (16) albino rats were used for the study. The animals were divided into four groups after acclimatized for 14 days. They were grouped as follows;

Group I: Positive control group which received distilled water in equivalent dose volume.

Group II: served as Negative control, they were alloxan induced non- treated group;

Group III: Alloxan induced and received 100mg/kg of the extract for 7 days

Group IV: Alloxan induced and treated with 200mg/kg of the extract.

Collection of samples

The blood of the experimental animals was obtained from the tail vein of the animals.

Measurement of blood glucose concentration

Blood glucose concentration was measured using a touch glucometer. The results for glucose concentration was displayed on the screen of the glucometer

Statistical analysis

Data obtained from this study were analyzed to determine the differences between and within groups. One-way analysis of variance (ANOVA) was conducted using statistical package for social sciences (SPSS) version 21.0

Table 1: Effect of *Anacardium occidentale* (cashew leaves) on alloxan Induced Albino Rats.

S/No	Groups	Results Mg/dl
1	Positive control(feed only)	144.45± 1.54
2	Negative control (Alloxan induced)	177.1 ± 3.07
3	Alloxan + <i>Anacardium occidentale</i> (100mg/kg)	160.2 ± 3.29
4	Alloxan + <i>Anacardium occidentale</i> (200mg/kg)	142.9±3.8

All the values were presented as Mean ± SD. Values of $p > 0.05$ were considered statistically significant.

DISCUSSION

The result of this study showed that, fasting blood glucose (FBG) concentration decreased significantly in the group that received *Anacardium occidentale*, this could probably be due to the direct effect of extract on the Insulin receptors by increasing their sensitivity, which could lead to the uptake of glucose (Table 1). This study was in line with the studies conducted by other scholars who also observed significant decrease in the blood glucose concentration when Cashew leaf extract was administered to rats (Zarqa et al., 2021)

Conclusion

The study shows a notable decrease in blood glucose levels with higher doses of the extract, especially evident in group 4. These findings validate the traditional use of *Anacardium occidentale* as a hypoglycemic agent, offering scientific support for its use in blood sugar management. Additional research is suggested to understand the mechanisms and develop standardized dosing for therapeutic applications.

Conflict of interests

Authors have declared that, there was no conflict of interest among them.

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