

# An *In vitro* Study to Assess Alpha Amylase Inhibition and Antioxidant Activities of The Ethanol and Acetone Extracts of *Anacardium occidentale* Linn (Cashew) Stem Bark

Bimbal Mborige\*

Department of Health Care, St. Martin Hospital, Ghana

## Abstract

Diabetes Mellitus (DM) is an endocrine disease due to glucose intolerance. The journey to fighting against DM is limited by the inability of some diabetic patients to have access to oral antidiabetic drugs. Alpha-amylase significantly contributes to the handling of hyperglycemia. This study investigated the DPPH free radical scavenging activity, the total phenolic content and the alpha-amylase inhibition activity of *Anacardium occidentale* Linn (cashew) stem bark *in vitro*. The total phenolic content of the extracts was found to be  $3.572 \pm 0.39$  and  $3.145 \pm 0.28$  mgg<sup>-1</sup>. The DPPH free radical scavenging potency (IC<sub>50</sub>) of acetone and ethanol extracts were  $6.743 \pm 1.16$  µgmL<sup>-1</sup> and  $9.186 \pm 1.06$  µgmL<sup>-1</sup> respectively while ascorbic acid was  $2.796 \pm 1.06$  µgmL<sup>-1</sup>.

The preliminary phytochemical screening showed that terpenes, phenols, glycosides, tannins, flavonoids, alkaloids and saponins were present in all the extracts. On the contrary, sterols were tested negative in the extracts. The alpha amylase inhibitory potency (IC<sub>50</sub>) of the acetone and ethanol extracts were  $46.07$  µgmL<sup>-1</sup> and  $51.31$  µgmL<sup>-1</sup> respectively and acarbose (the standard drug) was  $24.97$  µgmL<sup>-1</sup>. The inhibition potency on α-amylase as observed together with its potential antioxidant capacity in this study proposes an efficient function of the stem bark of *A. occidentale* in management of DM specifically the type II and its related complications associated with oxidative stress.

**Keywords:** Diabetes mellitus, IC<sub>50</sub>, α-amylase inhibition, DPPH, Antioxidant, Total phenolic content, Phytochemical screening, Acarbose, Gallic acid, Ascorbic acid

## Introduction

Diabetes Mellitus (DM) is an endocrine disease due to glucose intolerance. Diabetes can cause hyperglycemia, oxidative stress, polyuria, nephropathy, polyphagia, polydipsia, ketosis and disorders of the cardiac system [1].

The journey to fighting against DM is limited by the inability of some victims of DM to have access to oral antidiabetic drugs [2]. Reported that, over three hundred million people will be diabetic by 2025.

Currently, the treatment procedures for DM employ the application of oral hypoglycemic and antihyperglycemic drugs, insulin therapy, physical activity, life style, diet therapy, and xenotransplantation. Present antidiabetic drugs don't give significant control of blood glucose [3]. For a long time, medicinal plants have performed a significant function in the treatment of human diseases which includes diabetes too. Many reported medicinal plants show anti-diabetic effect and can serve as a supplement for synthetic drugs. Examples of such drugs for management of diabetes are acarbose, miglitol, Nateglinide, Repaglinide and voglibose [4]. However, these drugs have some gastrointestinal side effects including abdominal pain, flatulence and diarrhea and other side effects such as pharyngitis, headache and nausea. Therefore, it is the need of time to identify antidiabetic substances from natural sources having fewer side effects but more efficient pharmacological response [5].

This research seeks to assess the alpha-amylase inhibitory and the antioxidant activities of ethanol and acetone extracts of *Anacardium occidentale* stem bark *in vitro*.

## Materials and Method

### Materials

**Apparatus and equipment:** Electronic balance, water bath, stirrer, mortar and pestle were obtained from University Development Studies, Navrongo campus. Whatmann No1 filter papers were

purchased from Alpha chemical shop, Navrongo, spectrophotometer (Biotek Synergy H1 Hybrid Reader, USA), UV-Vis spectrophotometer (Genway 7B Series, USA), test tubes, 96 well microplate, micropipettes and the pipette tips were supplied by the faculty of pharmacy and pharmaceutical sciences of the Kwame Nkrumah University of Science and Technology, Ghana.

### Chemicals and reagents

3, 5-dinitrosalicylic acid (DNS), 40% 5.31 M sodium potassium Tartrate, Folin Ciocalteu phenol reagent, 2, 2-diphenyl-1-picrylhydrazyl (DPPH), alpha amylase from porcine pancreas and potato starch were supplied by Sigma-Aldrich (St. Louis, MO, USA). Acetone and 90% ethanol were also purchased from Alpha Chemical Shop, Navrongo. Distilled water was purchased from Navrongo senior high school (Upper East Region, Ghana), absolute methanol, 6.7 mM sodium chloride, 0.02 M sodium phosphate buffer (pH 6.9), 1% sodium hydroxide, 7.5% sodium carbonate, acarbose, ascorbic acid and gallic acid were also obtained from Kwame Nkrumah University of Science and Technology (Kumasi, Ghana).

### Method

#### Sample collection

Matured stem bark of *A. occidentale* was harvested from Nyoja Jembo Cashew Farm at Kpassa Jumbo No1 in the Volta region of Ghana in the month of January 2018. It was then authenticated by

\*Corresponding author: Mborige B, Department of Health Care, St. Martin Hospital, Ghana, Tel: 0549856637; E-mail: [bimbalmborige37@gmail.com](mailto:bimbalmborige37@gmail.com)

Received December 18, 2020; Accepted January 10, 2021; Published January 10, 2021

**Citation:** Mborige B (2021) An *In vitro* Study to Assess Alpha Amylase Inhibition and Antioxidant Activities of The Ethanol and Acetone Extracts of *Anacardium occidentale* Linn (Cashew) Stem Bark. *Biochem Physiol* 10: 296.

**Copyright:** © 2021 Mborige B. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Dr. Imoro Wahab, a botanist in the Department of Applied Biology, Faculty of Applied Sciences, Navrongo campus of the University for Development Studies, Ghana.

### **Sample preparation**

The matured stem bark of *A. occidentale* was chopped into pieces, washed under running water to remove any contaminant and then shade dried. The dried pieces were pounded using mortar and pestle. It was then sieved and the uniform powdered sample obtained.

### **Extraction**

The extraction was carried out by maceration using a protocol previously used by Sahira & Cathrine (2015).

### **Phytochemical screening**

The phytochemical screening was carried out using a method previously used [6].

### **Total phenolic content**

The gallic acid solution was prepared by dissolving 10 mg (0.01g) of Gallic in 50 mL of distilled water in volumetric flask (200 µg mL<sup>-1</sup>). The total phenolic contents present in the stem bark extracts of *A. occidentale* L. were determined using the Folin Ciocalteu phenol reagent colorimetric method based on redox reaction described by Waterhouse (2002) and Rodolfo et al.

1. To 100 µL of the extract in a test tube, 0.5 mL of Folin Ciocalteu phenol reagent and 1 mL of 7.5% sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>) were added.
  2. The content was mixed and allowed to stand for 30 min at room temperature in the dark and the absorbance measured at 700 nm in 0.6 gram TDM (using 0.5 (added ext in). Ted an 0.6 gram TDM 0.5% acid s
-

### **Total phenolic content**

The content of phenols present in the extracts were estimated as gallic acid equivalents in milligram per gram of extract (m/g)

---

$\alpha$ -amylase enzyme catalyzes the hydrolysis of  $\alpha$ -1, 4 glycosidic linkages of polysaccharides to yield maltose units which are in turn acted upon by other glucosidases down the GIT to produce glucose residues [28]. In the  $\alpha$ -amylase inhibition assay, acetone extract ( $IC_{50}$  of  $46.07 \mu\text{g mL}^{-1}$ ) was more potent compared to that of ethanolic extract ( $IC_{50}$  of  $51.31 \mu\text{g mL}^{-1}$ ). Percentage alpha amylase inhibition of the two plant extracts was plotted as function of concentration in comparison with acarbose as shown in Figure 3. For the two extracts of *A. occidentale* stem bark, it was found that acetone extract shows a better  $\alpha$ -amylase inhibition compared to the ethanolic extract. A previous study by Dineshkumar et al., proposed that, the inhibition of  $\alpha$ -amylase activity by plant extracts may be due to the presence of potential  $\alpha$ -amylase inhibitors such as flavonoids, alkaloids, terpenes and glycosides.

## Conclusion

The study shows that extracts obtained from the stem bark of *A. occidentale* are rich in bioactive secondary metabolites, exerting

prevention of  $\alpha$ -amylase activity. The acetone extract showed a better  $\alpha$ -amylase inhibition compared to the ethanolic extract. The inhibition of  $\alpha$ -amylase activity by plant extracts may be due to the presence of potential  $\alpha$ -amylase inhibitors such as flavonoids, alkaloids, terpenes and glycosides.

---

**Citation:** Mborige B (2021) An In vitro Study to Assess Alpha Amylase Inhibition and Antioxidant Activities of The Ethanol and Acetone Extracts of *Anacardium occidentale* Linn (Cashew) Stem Bark. *Biochem Physiol* 10: 296.

---

27. Shahidi F, McDonald J, Chandrasekara A, Zhong Y (1994) Phytochemicals of foods, beverages and fruit vinegars: Chemistry and health effects. *Asia Pacific J Clin Nutri* 17: 380-382.

28. Kamtekar S, Vrushali K, Vijaya P (2014) Estimation of phenolic content, flavonoid content, antioxidant and  $\alpha$ -amylase inhibitory activity of Marketed Polyherbal Formulation. *J App Pharma Sci* 4: 61-65.

---