African Journal of Biotechnology Vol. 8 (4), pp. 574-576, 18 February, 2009
Available online at http://www.academicjournals.org/AJB
ISSN 1684–5315 © 2009 Academic Journals

Short Communication

Comparative study of the hypoglycemic effects of coconut water extract of *Picralima nitida* seeds (Apocynaceae) and Daonil in alloxan-induced diabetic albino rats

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Accepted 15 January, 2009

The study was designed to compare the hypoglycemic effects of coconut water extract of *Picralima nitida* seeds to that of Daonil in alloxan-induced diabetic albino rats. Twenty five albino rats weighing between 170 - 200 g were randomly divided into five groups after allowing the rats to acclimatize for seven days and were made diabetic by intraperitoneal administration of 150 mg/kg of alloxan. The rats were giving different volumes of the extract and Daonil as per their groupings. All the substances were given for five days by oro-gastric tube. The blood glucose level were measured daily in the rats. There was an initial inactivity in the rats following administration of the extract mixture and their appetite was low except for the control group. The blood glucose levels (in mmols/dL) of the rats at the start and end of the experiment for the groups were: control (9.6 ± 0.1 to 9.2 ± 0.1), coconut water only (11.5 ± 0.3 to 6.2 ± 0.1), aqueous extract of *P. nitida* seeds (12.4 ± 0.1 to 5.8 ± 0.2), coconut water extract of *P. nitida* seeds (11.8 ± 0.2 to 4.2 ± 0.1), and Daonil (10.5 ± 0.4 to 4.3 ± 0.1). Therefore, coconut water extract of *P. nitida* seeds have a significant hypoglycemic effects in alloxan-induced diabetes comparable to that of the Daonil, hence, it could be an effective adjunct in the management of diabetes mellitus.

Key words: Albino rats, alloxan, coconut water, Daonil, diabetes mellitus, *Picralima nitida*.

INTRODUCTION

Diabetes mellitus is a serious lifelong condition that affects an estimated population of about 15 millions and a third of these goes about undiagnosed until many years after the onset (Betheside, 1995). It is a group of metabolic disorders with a common biochemical manifestation; hyperglycemia, hence, it is thus a derangement of carbohydrate metabolism (Murray, 2000). Uncontrolled diabetes mellitus causes varied histopathological changes in different organs (Harold, 1978; Thomas, 1999), and incidences of diabeticneuropathy has been on the increase (Adewole et al., 2006; Carrington and Litchfield, 1999; Clements and Bell, 1982). The underlying causes of diabetic complications have been attributed to hyperglycemia which results in oxidative stress, alterations in enzyme activities, protein glycosylation and several structural changes (Akpan et al., 2007). Alloxan induces diabetes in experimental animals through beta cells destruction (Singh and Gupta, 2007). It has been shown that beta cell apoptosis is related to alloxan-induced inhibition of pancreatic glucokinase function and there is selective beta cell loss, leading to insulinopaenic diabetes, analogous to type I diabetes (Gao et al., 2007; Fernandes et al., 2007; Kavitha et al., 2007; Wadood et al., 2007).

Daonil is an oral hypoglycemic agent of sulphonylureas group and is indicated in patients with type 2 diabetes

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Table 1. Weight changes in albino rats before and after the experiment.

Group	Before experiment (g)	After experiment (g)
Control (2 ml of normal saline)	175 ± 1.0a	176 ± 2.0
Coconut water only (2 ml)	182 ± 2.0a	180 ± 1.0
Aqueous extract of *P. nitida* seeds (2 ml)	178 ± 3.0a	167 ± 4.0b
Coconut water extract of *P. nitida* seeds (2 ml)	192 ± 5.0a	178 ± 2.0b
Daonil (0.5 - 1 mg)	185 ± 2.0a	182 ± 3.0b

n = 25; values are expressed as mean ± SD.
ab: Different superscripts on means ± SD along the same row indicate significant difference ($p<0.05$).

Table 2. Blood glucose levels (mmol/L) of the albino rats on a daily basis.

Group	Day 1	Day 2	Day 3	Day 4	Day 5
Control (2 ml of normal saline)	9.6 ± 0.1a	9.5 ± 0.2	9.6 ± 0.1	9.2 ± 0.3	9.3 ± 0.1
Coconut water only (2 ml)	11.5 ± 0.3 a	8.1 ± 0.1	7.7 ± 0.3	7.1 ± 0.2	6.2 ± 0.1b
Aqueous extract of *P. nitida* seeds (2 ml)	12.4 ± 0.1 a	11.9 ± 0.1	8.6 ± 0.1	8.3 ± 0.1	5.8 ± 0.2 b
Coconut water extract of *P. nitida* seeds (2 ml)	11.8 ± 0.2 a	9.6 ± 0.2	6.2 ± 0.1	4.8 ± 0.3	4.2 ± 0.1 b
Daonil (0.5 - 1 mg)	10.5 ± 0.4 a	7.2 ± 0.2	6.2 ± 0.3	5.7 ± 0.1	4.3 ± 0.1 b

n = 25; values are expressed as mean ± SD (Unit: mmol/L).
ab: Different superscripts on means ± SD along the same row indicate significant difference ($p<0.05$).
(Normal range for the blood glucose: 2.5 to 5.0 mmol/L).

mellitus as adjunct to diet to lower blood glucose (Gerich, 1989). The availability and affordable cost makes Daonil the popular choice in the management of type 2 diabetes mellitus (Rambirtch et al., 2007).

Picralima nitida is a monotypic plant exploited for it mood and equally employed as an arrow in fish poison (Omino, 2002). It belongs to the family apocynaceae in East Africa and studies have shown that it have some opioid analgesics activities (Menzies et al., 1998), some hypoglycemic effects (Inya-Agha, 1999), and antimicrobial properties (Fakeye et al., 2004). In this investigation, the hypoglycemic effect of *P. nitida* is compared to that of Daonil in alloxan-induced diabetic albino rats.

MATERIALS AND METHODS

P. nitida seeds was sun dry and messed into powdery form, thereafter, 100 g was of the powdery was soaked in 0.9% saline and another 100 g was soaked in coconut water. The mixture was left for 48 h to allow for equilibration of the mixture and stored at 4 - 8℃ throughout the experiment.

The animal procedures was carried out according to the guidelines of University of Ilorin, Ilorin, Nigeria, and Medical Ethics Committee for the use of experimental animals in research. Twenty five albino rats weighing between 170 - 200 g were randomly divided into five groups after allowing the rats to acclimatize for seven days in the animal house of the Department of Anatomy. They were given rats chow and water ad libitum. All the rats in the experimental groups were made diabetic by intraperitoneal administration of 150 mg/kg of alloxan (Katsumata et al., 1992; Katsumata et al., 1993) and 48 h later, blood glucose oxidase strip was used to confirm the diabetic levels of the rats using blood samples collected from the tails of the rats. The control group was given 2 ml of 0.9% (normal) saline daily, group II was given 2 ml of coconut water only daily, group III was given 2 ml of aqueous extract of *P. nitida* seeds daily, while group IV was given 2 ml of coconut water extract of *P. nitida* seeds daily, and group V was given 0.5 - 1 mg of Daonil daily. All the substances were given for five days by oro-gastric tube. The random blood sugar was measured daily in the rats and values recorded using the strip testing method.

For statistical data comparisons, data were evaluated by one way ANOVA, followed by least significances tests. All values are given as mean ± SD with n values indicating the number of subjects analyzed. P values < 0.05 are considered significant.

RESULTS AND DISCUSSION

There was an initial inactivity in the rats following administration of the extract mixture and their appetite was low except for the control group. There were weight changes within the experimental groups and the control (Table 1). The blood glucose levels of the rats at the start and end of the experiment for the groups are given in Table 2.

Diabetes mellitus has no cure presently; hence, the objectives of any treatment are long-life controlled of blood sugar and preventions of complications. Majority of the modalities available for it treatment are diets, exercise, use of hypoglycemic agents/drugs, and some cases, insulin therapy. The use of cobalt chloride in the treatment of diabetes mellitus in rats showed no significant reduction in the serum glucose concentration (Saker et al., 1998) but acupuncture analgesia was said to be safe and effective therapy for long term manage-ment of painful diabetic neuropathy (Abuaisa et al., 1998). The results indicate a gradual decrease in the diabetic levels of the rats for all the groups except for the control group.

The decease in the aqueous picralima seed extract group only was not sufficient enough to render the rats adiabatic within five days, but became more pronounced in the coconut water extract of the picralima seeds. The mechanism by which the aqueous extract of *P. nitida* does this may be independent of the availability of insulin from pancreatic β-cells (Inya-Agha, 1999). However, the coconut water extract of the picralima seeds produced significant hypoglycemia in the rats comparable to that of Daonil, and the mechanism of action to reduce the blood glucose may be due stimulation of influx of glucose into the cells for metabolism. The coconut water may provide an enabling medium that facilitate the extraction of the active components of *P. nitida* seeds extract and uptake in the rats. Therefore, the coconut water extract of *P. nitida* seeds have a significant hypoglycemic effects in alloxan-induced diabetes comparable to that of the Daonil, and could serve as an effective adjunct in the management of diabetes mellitus.

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