Effects of methanolic extract of *Pausinystalia yohimbe* bark on blood glucose level in normal fasting rats

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ABSTRACT

Background: *Pausinystalia yohimbe* (L.) is a member of the family Rubiaceae. It is a valuable medicinal tree, distributed in evergreen closed-canopy forests in West Africa. It is traditionally used for treatment of erectile dysfunction and diabetes. Objective: This was an attempt to evaluate the effects of methanolic extract of *P. yohimbe* bark on blood glucose level in normal fasting rats. Methods: Different doses of methanolic extract of *P. yohimbe* bark (5, 10, 20, 40 and 80 mg/kg/mL) were orally administered to normal fasting rats to assess their effects on blood glucose levels. Results: The methanolic extract of *P. yohimbe* bark in different concentrations (5, 10, 20, 40 and 80 mg/kg/mL) when administered to normal fasting rats, only a considerable reduction (26.57 mg/dL) was produced by the dose of 20 mg/kg/mL. Conclusion and Recommendation: Although *P. yohimbe* has long been reported to regulate blood glucose levels; such effect is unclear and remains requiring further studies.

Keywords: *Pausinystalia yohimbe* Bark; Yohimbine; Fasting Blood Glucose Level; Hypoglycemia

1. INTRODUCTION

Scattered experimental studies have been undertaken worldwide to study the hypoglycemic effects of plant extracts in animal species with normal glucose levels, animals under induced states of increased blood sugar as well as in pancreatectomized animals [1,2]. Type 2 diabetes mellitus is characterized by hyperglycemia which results from defects in insulin secretion, insulin action or both coupled with resistance to the effects of insulin [3].

The use of natural products with therapeutic properties is as ancient as human civilization and, for a long time, mineral, plant and animal products were the main sources of drugs [4]. Medicinal plants have played a key role in the world health care with about 80% of Africans depending on phyto medicine, which has shown a wide range of uses in the treatment of diseases especially priority diseases of Africa such as malaria, anemia, diabetes and hypertension. Research data on medicinal plants established that they are known to have more beneficial effects than their synthetic counterparts as being safer, convenient, affordable, culturally compatible and suitable for chronic treatments [5]. This has caused an increase in the number of experimental and clinical investigations towards the validation of the antidiabetic properties which empirically attributed to these remedies. Over 400 traditional plant treatments for diabetes have been reported, although a small number of these have received scientific and medical evaluation to assess their efficacy and safety. Of these, ginseng species, *Momordica charantia* (Bitter Melon), cloves, cinnamon, *Trigonella foenum graecum* (Fenugreek), *Allium cepa* (Onion) and *Pausinystalia yohimbe* bark have been investigated [6-11].

Yohimbine is the principal indole alkaloid extracted from the bark of the *Pausinystalia yohimbe* tree and found in a variety of botanical sources such as Rauwolfia root. Several potential therapeutic applications have been proposed for yohimbine, as being used in the treatment of erectile dysfunction, noninsulin-dependent diabetes mellitus, patients with orthostatic hypotension, Alzheimer’s disease and depression, generalized anxiety, panic disorder and narcolepsy. Yohimbine is a potent selective
Alpha 2 ($\alpha_2$)-adrenoceptor antagonist which may enhance insulin release [12-19]. It was mentioned that, pre-treatment with yohimbine potentiates glucose-induced insulin release in normal control rats and produces an improvement of the oral glucose tolerance in diabetic rats [20].

The present study was an attempt to evaluate the effects of methanolic extract of $P$. yohimbe bark on blood glucose level in normal fasting rats.

2. MATERIALS AND METHODS

2.1. Plants Material

The dried chopped small pieces of $Pausinystalia yohimbe$ bark had been collected from South West Cameroon in May 25th, 2008. The plant material was authenticated by the Provincial Service for Forestry, Ministry of Forestry and Wildlife, Republic of Cameroon (Certificate No. 004/CO/MINFOF/PDFOF/PSF/SW/ 230).

2.2. Extraction of Plant Material

The coarsely powdered barks (500 grams) of $P$. yohimbe were extracted by maceration using pure methanol in a conical flask with continuous shaking for 72 hours, filtered and evaporated by a rotary evaporator at 60°C. The dried extract powder was kept in an amber glass container until used for biological testing. The tested material was prepared as a water suspension to be administered to the experimental animals by intragastric feeding tubes.

2.3. Experimental Animals

Albino rats weighing 150 - 200 grams were purchased from National Centre of Research (NCR), Khartoum, Sudan. They were housed in a clean animal house in Faculty of Pharmacy, University of Gezira and subjected to an intensive nutritional program. Rats were acclimatized for a period of 14 days under standard environmental conditions. The animals submitted to fasting for about 42.6 mg/dL was observed, as glibenclamide acts about 42.6 mg/dL was observed, as glibenclamide acts by direct induction of insulin release from the pancreatic beta cells, such a significant reduction in blood glucose levels was evident [22].

When methanolic extract of $P$. yohimbe bark in a dose of 20 mg/kg/mL was used, a remarkable reduction (26.57 mg/dL) on the blood glucose level was produced (Table 1). This reduction may be attributed to the selective blocking activity of yohimbine at $\alpha_2$-adrenoceptors in the pancreas, which may enhance the rate of insulin secretion [23]. The obtained results agreed with that mentioned by Ahmed et al., (2001), who used the same dose of yohimbine (20 mg/kg/mL), that potentiated glucose-induced insulin released in normal control rats and produced an improvement of the oral glucose tolerance [14].

When the methanolic extract of $P$. yohimbe bark was given in higher doses (40 and 80 mg/kg/mL) separately to the experimental animals, it exhibited lesser reduc-
tions on the blood glucose levels in normal fasting rats as 13.86 and 14 mg/dL respectively.

In this study, it was clearly evident that the highest (40 and 80 mg/kg/mL) doses of methanolic extract of *P. yohimbe* bark, caused slight lowering on the blood glucose level in normal fasting rats, whereas a considerable reduction (26.57 mg/dL) was produced by the intermediate dose (20 mg/kg/mL).

The most prominent effect of α₂-adrenoceptor activation is an inhibition of the release of neurotransmitters, in particular noradrenaline [12]. In line with this, antagonism at the α₂-adrenergic receptor results in an enhancement of noradrenaline release. This effect was first demonstrated for yohimbine and thereafter been shown with other antagonists too in addition. Blockade of α₂-adrenoceptor by α₂-adrenoceptor antagonists increases adrenergic activity centrally and peripherally [13-17].

Elevation of noradrenaline, adrenaline and other more selective α₂-adrenoceptor agonists inhibit insulin release and may enhance glucagon secretion. This effect is mediated mainly via the post-synaptic α₂-adrenoceptors on the pancreatic beta-cells [25-27]. According to this effect, the higher doses of methanolic extract of *P. yohimbe* bark (40 and 80 mg/kg/mL) may facilitate glucagon secretion and thus lesser reduction in blood glucose level was obtained. It was reported that, yohimbine may cause gradual increases in glucagon secretion [28-31].

It can be concluded that methanolic extract of *P. yohimbe* bark decreased the blood glucose level in normal fasting rats but without significant hypoglycemic effects, therefore, further studies are required to explain this effect.

### REFERENCES


### Table 1. Effect of gastric administration of water (5 mL), glibenclamide (5 mg/kg) and *P. yohimbe* methanolic extract (20 mg/kg/mL) on blood glucose levels in normal fasting rats.

<table>
<thead>
<tr>
<th>Preparations</th>
<th>Blood glucose levels (mg/dL, mean ± SEM) (Normal value 80 - 120 mg/dL)</th>
<th>Reduction of glycaemia (mg/dL)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 h</td>
<td>1 h</td>
<td>2 h</td>
</tr>
<tr>
<td>Water</td>
<td>86 ± 2.25</td>
<td>84.33 ± 3.67</td>
<td>79.83 ± 1.52</td>
</tr>
<tr>
<td>Glibenclamide</td>
<td>87.8 ± 4.03</td>
<td>62 ± 6.15</td>
<td>50.17 ± 3.17</td>
</tr>
<tr>
<td><em>P. yohimbe</em> (20 mg/kg/mL)</td>
<td>96.43 ± 5.53</td>
<td>83 ± 6.05</td>
<td>72.29 ± 4.69</td>
</tr>
</tbody>
</table>

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