Phytochemical Screening and Hypoglycemic Effect of Methanolic Extract of Gongronema Latifolium Leaf in Alloxan Induced Diabetic Rats

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Abstract
The phytochemical screening and hypoglycemic effect of methanolic extract of Gongronema latifolium leaf in alloxan induced diabetic rats were investigated. The methanolic extract of Gongronema latifolium was found to contain bioactives viz: flavonoids, saponins, alkaloids, steroids, tannins, anthraquiones, cardiac glycosides, anthranoids and terpenes. The phytoconstituents were scientifically found to have strong efficacy against diabetes. The extract significantly (P<0.05) lowered the blood glucose concentration in alloxan induced diabetic albino rats from 668.00±24.00 to 27.33±2.19 at 300mg/kg BW and 668.33±11.67 to 32.33±1.45 at 200mg/kg BW. The highest activity resides at the dose of 300mg/kg BW with percentage glycemic change of 96% while the 200mg/kg BW had percentage glycemic change of 95%. The research is aimed at probing into the traditional claim that the plant part had antidiabetic efficacy. The results have demonstrated the hypoglycemic potential of methanolic extract of Gongronema latifolium leaf. The possible involvement of flavonoids might be responsible for the outcome of the findings. Thus, this study revealed the scientific evidence that the bioactive contained in the plant part could be processed for drug development hence the methanolic extract of the G. latifolium leaf may be used locally for the management of diabetes mellitus. The findings in this study has also provided a baseline study for oral hypoglycemic agents of plant origin.

Keywords: phytochemical, hypoglycemic, diabetes, methanolic extract, alloxan

INTRODUCTION
Diabetes is a metabolic disorder in which the body is Herbs have been used for quite a long time for the treatment of various diseases and illnesses in many parts of Africa and the rest of the world. About 80 percent of Africans depends on plant medicine for health care (Okwu and Uchebgu, 2009). Gongronema latifolium commonly called “Utazi” and “Arokeke” in the South Eastern and Western parts of Nigeria respectively is a perennial edible plant with soft and pliable stem (Nwanjo et al., 2006). The leaves extract have been investigated using rats to have lethal dose of 1050mg/kg BW.

The ethanolic extract possesses hypolipidemic, hypoglycemic, antioxidative and anti-inflammatory activities. (Morebise et al., 2002). Diabetes mellitus is a metabolic disease characterized by high blood glucose. In 2000, according to World Health Organization, at least 171 million people worldwide suffer from diabetes and will double by 2030 (Wild, 2004). There have been an increasing demand for the use of plant products with hyperglycemic activity and not much traditional treatment for diabetes mellitus have been scientifically scrutinized. The high cost, low availability uncertainty of use and undesirable side effects of synthetic drugs have been factors leading to a strong preference for hypoglycemic drugs of plant origin which are believed to be suitable for chronic treatments. (Okigbo and Mmeka, 2006). Plants which have been shown to have hypoglycemic action by acting on blood glucose through different mechanisms. Some of them may inhibit endogenous glucose production (Eddouks et al., 2003) or interfere with gastrointestinal glucose absorption (Musabayana et al., 2006); some of them may have insulin like substances or may inhibit insulinase activity or increase secretion of insulin from beta cells of the pancreas i.e. pancreatotrophic action (Triedi et al., 2004; Yadav et al., 2008), while others may increase beta cells in pancreas by activating regeneration of these cells (Jelodar et al., 2007). This study revealed the phytoconstituents and hypoglycemic potency of methanolic extract of Gongronema latifolium leaf in alloxan induced diabetic albino rats.

MATERIALS AND METHODS
Sample Collection and Preparation
The leaves of Gongronema latifolium were collected from Enugu, in the eastern part of Nigeria. The leaves were washed with water, air dried for a period of seven (7) days. Then followed by grounding them into fine powder by pestle and mortar.
Sample Extraction
Fifty (50.0) grams of the leaf sample was added to 400mls of methanol in a round bottom flask and refluxed at a preset temperature of 60°C for 3hrs.

Animal Sample Collection and Preparation
Twelve (12) albino rats weighing between 137-194g of both sexes were obtained from Federal University of Technology, Minna, Research farm. The rats were housed in plastic cages to allow acclimatization to laboratory condition for a period of 2 weeks.

Grouping of Experimental Rats
Group 1: Alloxan induced diabetic rats treated with 300mg/kg BW of extract
Group 2: Alloxan induced diabetic rats treated with 200mg/kg BW of extract
Group 3: Control – rats administered normal saline and water only
Group 4: Alloxan – induced diabetic rats not treated

Induction of Animals
The rats were induced with 100mg/kg BW alloxan monohydrate intraperitoneally after they are fasted for 18hrs. They are allowed to acclimatize for a period of seven (7) days. Initial blood glucose levels of all animals in the groups were taken before and after the induction.

Phytochemical Screening
The extracts were screened for phytoconstituents following the methods of Culei, 1982, Trease et al., 1983 and Sofowora, 1982.

Administration of Plant Extract
Rats in group 1 were fed 300mg/kg BW extract while 200mg/kg BW was orally administered to rats in group 2. Normal saline was given to rats in group 3 as well as rats in group 4. The extract and normal saline were administered to respective groups once a day.

RESULTS

Table 1: Phytochemical Constituents of Methanolic Extract of Gongronema latifolium Leaf

<table>
<thead>
<tr>
<th>Compound</th>
<th>Inference</th>
</tr>
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<tbody>
<tr>
<td>Alkaloids</td>
<td>++</td>
</tr>
<tr>
<td>Terpenes</td>
<td>+</td>
</tr>
<tr>
<td>Anthraquinones</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>++</td>
</tr>
<tr>
<td>Saponin</td>
<td>++</td>
</tr>
<tr>
<td>Cardiac Glycosides</td>
<td>-</td>
</tr>
<tr>
<td>Steroids</td>
<td>++</td>
</tr>
<tr>
<td>Anthranoids</td>
<td>-</td>
</tr>
<tr>
<td>Tannins</td>
<td>++</td>
</tr>
</tbody>
</table>

+ (Slightly present), ++ (Moderately present), +++ (Highly present), - (Absent)

DISCUSSION
In recent times, lots of plants have been screened and used traditionally in the management of diabetes mellitus. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. It is well known that plant produce these chemicals to protect themselves but recent research findings demonstrate that they can also protect humans against diseases. There are more than thousand known phytochemicals of which some are well known e.g. lycopene in tomatoes, isoflavones in soy and flavonoids in fruits. Table 1 revealed the presence of phytoconstituents such as saponins, tannins, terpenes, flavonoid and steroids which might
be responsible for the hypoglycemic action of the extract. This is supported by the fact that methanolic extract of Cajanus cajan contains similar phytochemicals like saponins, tannins and terpenes (Adaobi et al., 2010). Similar findings in aqueous extract of Trichosanthes dioica leaf (Shalini et al., 2009) and aqueous extract of Gongronema latifolium leaf are in agreement with results obtained in this study.

The effective regulation of blood glucose concentration in a key step in preventing or reviewing diabetic complication and improving the quality of life in type 1 and 2 diabetic patient (Abaira et al., 1995). The results depicted in figure 1, revealed a slight dose related hypoglycemic effect from 668.00±24.00 to 27.33±2.0 after 216 hrs of alloxan induced diabetic rats with methanolic extract Gongronema latifolium leaf at 300mg/kg BW. A similar result was obtained for methanolic extract of Gongronema latifolium leaf at 200mg/kg BW i.e. the blood glucose reduced from 688.00±11.67 to 32.33±1.45 after 216 hrs treatment. The percentage hypoglycemic reduction for the two doses was found to be 96% and 95% for 300mg and 200mg per kg BW respectively. This indicates that the dose at 300mg/kg BW is slightly more effective than at 200mg/kg BW. The two doses administered to the diabetic rats causes a significant (P<0.05) progressive reduction in fasting blood glucose level as compared to the control group (diabetic rats not treated and non-diabetic rats).

This finding are in agreement with findings obtained for aqueous extract of Gongronema latifolium leaf (Nwanjo et al., 2006) and aqueous extract of Trichosanthes dioica leaf (Shalini et al., 2009) which showed similar hypoglycemic effect in diabetic rats. The results in figure 2 indicates a significant (P<0.05) gain in weight of diabetic rats compared to the diabetics rats not treated with the extract. The diabetic rats treated with the extract began to regain weight after 216 hrs of treatment while the diabetic rats not treated with extract had gradual reduction in weight. These results are in agreement with those obtained for aqueous extract of Trichosanthes dioica leaf which had similar effect on weight of diabetic rats (Shalini et al., 2009). The reduction in blood glucose level by bioactive compounds from this plant extract might act by several mechanisms. Some may inhibit endogenous glucose production (Eddouks et al., 2003) or interfere with gastrointestinal glucose absorption (Mwabayane et al., 2006); some may have insulin like substances (Gray and Flatt, 1999); some may inhibit insulinase activity and some may be by pancreatotrophic action (Khan et al., 1990; Trivedi et al., 2004; Yadav et al., 2008).

*Statistical Analysis: the results were analysed by one way ANOVA tests.

CONCLUSION
The findings of this study indicate that the methanolic extract of Gongronema latifolium leaf has hypoglycemic activity. Thus, it supports the traditional use of the crude leaf extract of the plant in the management of diabetes.

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LIMITATIONS OF THE STUDY
Further work is recommended which will include, isolation, purification and characterization parameters that were not covered in this study.

REFERENCES


