THE COMPARATIVE EFFECTS OF SOME MEDICINAL HERBS (IN SOUTHWEST, NIGERIA) ON BLOOD GLUCOSE LEVEL IN MALE WEST AFRICAN DWARF GOATS

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Abstract

This study was conducted to investigate the comparative effects of aqueous leaves extracts of some medicinal herbs: *Jatropha curcas, Moringa oleifera, Ocimum gratissimum, Rauwolfia vomitoria and Phyllantus amarus* on blood glucose level in West African dwarf goats. Fifty five male West African dwarf goats weighing between 8-12 kg were divided into six groups (one group for each medicinal plant) of ten animals each and control group consisting of five animals. Three ml (consisting of 0.6 mg/ animal) of the various aqueous leaves extracts were administered orally for fourteen days to the groups of animals while the control group received water only. The recovery groups were treated as those in treatment groups and were allowed to recover for another fourteen days before blood collection via the jugular vein. The various herbal medicinal plants with the exception of Ocimum gratissimum caused significant ($p<0.05$) decrease in blood glucose level when test groups were compared to the control group. The Ocimum gratissimum aqueous leaves extract caused a non-significant decrease ($p > 0.05$) in mean blood glucose level from 94.20 ± 6.83 in control group to 84.40 ± 0.51 in test group. The findings in this study suggest that aqueous leaves extract of *Jatropha curcas, Moringa oleifera, Rauwolfia vomitoria and Phyllantus amarus pos*sess significant anti-hyperglycemic property.

Key words: Medicinal Plants, Aqueous Leaves Extract, Blood Glucose, Anti-Hyperglycemic, Male West African Dwarf Goats.

Introduction

Diabetes mellitus (DM) is a disease whose major feature is inability to regulate blood glucose caused by relative or absolute deficiency of insulin. The disease may occur as a result of pancreatic β-cells impairment, leading to reduction in insulin secretion. It could also occur when the insulin receptors are resistant to the functions of circulating insulin (ADA, 2010). Diabetes results from either insulin deficiency or malfunction (Modak *et al,*). Diabetes is a disease that affects many people in the 21st century and is known as the fifth leading cause to death (Kazi, 2014).

The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000, and is expected to increase to 4.4% in 2030 (Wild et al., 2004). Diabetes is one of the five leading causes of death in the world and about six deaths per minute are attributable to diabetes complications (Li *et al*., 2011). WHO (2016), estimated that globally 7.1 million deaths could be attributed to high blood pressure, 4.4 million to high cholesterol, and 2.6 million to excessive body weight. In adults, type 2 diabetes is more frequent than type 1 (Szkudelski, 2012; Islam and Wilson, 2012) and is mostly characterized by peripheral insulin resistance and inadequate functional mass of β-cells (Chen and Wang, 2005; Masiello, 2006; Islam and Wilson, 2012). In type 2, the major feature is derangement of carbohydrate, protein and fat metabolism. This eventually leads to impaired glucose tolerance leading to hyperglycemia which is thought to be one among the major contributors to oxidative stress by the direct generation of excessive reactive oxygen species (ROS), resulting from associate imbalance between antioxidants and oxidants (Wright et al., 2006; Rains and Jain 2011). Because of the side effects associated with the present anti-diabetic drugs, there is need to develop effective, safe and cheap drugs for diabetes management. Such effective, safe and cheap drugs could be obtained by using medicinal plants which have been used by humans to prevent or cure diseases including diabetes since the dawn of civilization (Surendran *et al*., 2011). Many traditional herbal medicinal practices have been used for the treatment of diabetes. *Jatropha curcas, Moringa oleifera, Ocimum gratissimum, Rauwolfia vomitoria and Phyllantus amarus* are parts of the medicinal herbs being used to treat diabetes. Base on the World Health Organization (6) report about 80% of diabetic people are using medicinal plants for the treatment. Medicinal plants contain active phytochemicals that is, Polyphenols, terpenoids, charentin, memordian, crypoxanthin these chemicals regulate metabolic activities (Ebrahimi et al., 2016**).** Some other ethno-medicinal uses of various extracts of Jatropha curcas leaves include but not limited to use as an arbotifacient, haemostatic, diuretic, purgative and antiseptic (Mishra et al., 2010). Despite the various ethno-medical uses to which various parts of *Jatropha curcas, Moringa oleifera, Ocimum gratissimum, Rauwolfia vomitoria and Phyllantus amarus have* been put, it is very important to note that some parts of the plants especially the seeds may have toxic properties hence the objectives of this study were to evaluate anti-diabetic property and compare the efficacy of aqueous leaves extracts of *Jatropha curcas, Moringa oleifera, Ocimum gratissimum, Rauwolfia vomitoria and Phyllantus amarus.*

Materials and Methods

The various herbal leaves namely; *Ocimum gratissimum, Moringa oleifera, Jatropha curcas, Phyllantus amarus and Rauwolfia vomitoria* were collected from a farm in Ikenne-Remo in Ikenne Local Government area of Ogun state in late October, 2019 and were authenticated by Federal Forest Research Institute, Ibadan and were allocated with the voucher numbers and samples were deposited at the institute herbarium.

The leaves were rinsed to remove dust, sand, contaminations and dirt. The materials were then shade dried at room temperature (27+ /- 1^0 C) for six days. The dried leaves were powdered with the use of grinding machine having stainless steel blades.

Preparation of aqueous leaves extract:

Twenty grams (20 g) of the powdered leaves of each medicinal plant was weighed and added to 200 ml of distilled water. The solution was allowed to mix together for 24 hours. The solution was thereafter filtered with the aid of filter paper.

Animals:

Fifty five male West African Dwarf goats weighing between 10-12 kg were purchased from the local market and were allowed to acclimatize for fourteen days under ideal conditions in the Animal House, Department of Physiology, Olabisi Onabanjo University, Sagamu Campus, Ogun state, Nigeria. Standard feed and water were provided throughout the experimental period.

Experimental Design:

Fifty five West African Dwarf goats were divided randomly and equally into six groups viz: Group one which is control group consisting of five animals and they were given only water throughout the experimental duration, Group two which was test group and consisting of twenty-five animals (five for each medicinal plant) were given three ml (consisting of 0.6 mg/animal) of the extracts orally for fourteen (14) days and Group three which was the recovery group consisting of twenty-five animals (five for each medicinal plant) , the animals here were treated as those in group two but they were allowed to recover for another 14 days before blood collection through the jugular vein.

A drop of the blood was dropped into the glucometer strip for evaluation of blood glucose level.

Ethical consent

Ethical consent was obtained from departmental ethical committee on the use of animals.

Statistical analysis:

Data was captured on the Microsoft Excel before transferring to Statistical Package for Social Sciences software (SPSS Version 15) for further analysis of the data. Results were expressed as Mean + SEM and $P < 0.05$ being considered statistically significant.

Results

Table 1: The effects of the aqueous leaves extract of five different medicinal plants on blood glucose level in West African dwarf goats

Values are expressed as Mean ±SEM *P < 0.05 is significant

Groups	Phyllantus amarus (mg/dl) Mean ± SEM	P-value	Ocimum gratissum (mg/dl) Mean ± SEM	P-value	Rauwolfia vomitoria (mg/dl) Mean ± SEM	P-value	Jatropha curcas (mg/dl) Mean ± SEM	P-value	Moringa oleifera (mg/dl) Mean ± SEM	P-value
Control group	95.00 ± 6.60		94.20 ± 6.83		94.40 ± 6.75		95.60 ± 6.38		94.20 ±6.28	
Test group	70.40 ± 1.81*	0.026	84.40 ± 0.51	0.126	67.40 ± 4.99*	0.002	58.20 ± 7.17*	0.001	77.40 ±3.04*	0.018
Recovery group	101.80 ± 9.64	0.494	55.00 ± 2.53*	0.000	91.00 ± 1.64	0.635	75.80 ± 5.40*	0.048	59.00 ±0.45*	0.000

From the results obtained in Table 1, the mean value of blood glucose level in *Phyllantus amarus* decreased significantly ($p< 0.05$) from 95.00 ± 6.60 in control group to 70.40 ± 1.81 in test group and there was a non-significant increase ($p> 0.05$) to 101.80 ± 9.64 in recovery group.

In *Ocimum gratissimum*, the mean value of blood glucose decreased though not significantly ($p > 0.05$) from 94.20 ± 6.83 (control group) to 84.40 ± 0.51 (test group) and there was a significant decrease ($p < 0.05$) when control group was compared to recovery group (55.00 ± 2.53).

In *Rauwolfia vomitoria* group there was a significant decrease ($p < 0.05$) from 94.00 ± 6.76 in control to 67.40 ± 4.99 in test group while there was non-significant decrease ($p> 0.05$) when recovery group (91.00 ± 1.64) was compared to control group.

In *Jatropha curcas* group there was a significant decrease ($p < 0.05$) when control group (95.60 ± 6.38) was compared to test group (58.20 ± 7.17) and there was a significant decrease when recovery group (75.80 ± 5.40) was compared to control group.

The result for *Moringa oleifera* showed that there was a significant decrease ($p < 0.05$) when test group (77.40 ± 3.04) was compared to control group (94.20 ± 6.83). There was a significant decrease when recovery group (59.00 ± 0.45) was compared to the control group.

Discussion

Diabetes is a metabolic disorder that was due to defects in either insulin secretion, insulin action, or both. Diabetes can lead to serious problems affecting human health. In the long term, effects can cause micro and macro vascular problems (Mohana *et al*., 2012). Many medicinal plant extracts have

been important anti-diabetic agents and may contain one or more active components responsible for reduction in blood glucose (Marles and Farnsworth, 1995; Grover et al., 2002). From the results obtained in this study, the mean value of blood glucose level in *Phyllantus amarus* decreased significantly ($p< 0.05$) when test group was compared to control group but in *Ocimum gratissimum*, the mean value of blood glucose decreased though not significantly ($p > 0.05$) when test group was compared to control group while in *Rauwolfia vomitoria* group there was a significant decrease ($p < 0.05$) when control group was compared to test group while there was non-significant decrease ($p> 0.05$) when recovery group was compared to control group.

In *Jatropha curcas* group there was a significant decrease ($p < 0.05$) when control group was compared to test group and also when recovery group was compared to control group. The result for *Moringa oleifera* showed that there was a significant decrease ($p < 0.05$) when test group was compared to control group and there was a significant decrease when recovery group was compared to the control group.

From the study, it is obvious that aqueous leaf extract of *Jatropha curcas* has the most hypoglycemic effect followed by *Rauwolfia vomitoria* with least being *Ocimum gratissum*. The hypoglycemic effect of the various medicinal plants in this study may be linked to the presence of flavonoids and terpenes in the extracts and these compounds have been implicated in the anti-diabetic activities of many plants (Shimizu et al., 1984; Ivorra et al., 1989; Reher et al., 1991; Okokon et al., 2006). The hypoglycemic action of the aqueous leaves extract of the medicinal plants in this study also be by potentiating the insulin effect, either by increasing the pancreatic secretion of insulin from the cells of islets of Langerhans or its release from bound insulin (Pari, and Amarnath, 2004).

Conclusion

Diabetes mellitus is a worldwide challenge and its management cum associated complication is equally challenging. The results from this study showed that aqueous leaf extract of medicinal plants under study exerted hypoglycemic action.

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