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Short Communication

Aqueous extracts of African mistletoe (*Loranthus bengwensis*) leaves exert hypoglycaemic effects in normal rabbits

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ABSTRACT: The hypoglycaemic effect of aqueous extract of the leaves of African mistletoe (*Lorantus bengwensis*) growing on Kola nuts plants (*Kola acuminate*) was studied on normal rabbits. The results obtained showed that administration of 100 mg/kg aqueous extract of the plant for 21 days elicited a 49% decrease in plasma glucose, while a dose of 200 mg/kg led to a decrease of 45%. In comparison, treatment with 0.1 mg/Kg Daonil caused a 72% reduction in plasma glucose concentration. This preliminary finding provides a basis for further investigation into the mechanism through which the plant extract exerts its hypoglycaemic effect and its potential use in the management of diabetes mellitus.

KEYWORDS: Hypoglycaemia, plasma glucose, mistletoe, diabetes, rabbits.

INTRODUCTION

The medicinal value of plant products has always been recognized in the management of diseases, and alternative medicine based on the exploitation of the active components of herbal extracts is gaining increasing attention and popularity (Sofowora, 1982; Gamaneil, 2000). Historically, plants have been the source of many useful drugs, for example sulphonylurea and biguanides are used for the treatment of diabetes mellitus.

Mistletoe (*Loranthus bengwensis)* is one of such plants that have medicinal value and has been widely used in Nigeria folk medicine for the treatment of diabetes mellitus. It is an evergreen, semi-parasitic plant. It depends on the host tree for nutrients and water, and is normally found growing on a variety of trees, especially pine and apple (Becker, 1986). *Loranthus bengwensis* a member of the Loranthesceae family is specific to Africa, and is found mainly in the tropics. The chemical composition of mistletoe varies, depending on the host tree (Luczkiewics *et al*., 2001; Stein & Berg, 1997).

Mistletoe grown on an apple tree has the strongest pharmacologic effect (Hulsen *et al*., 1986). Chemical substances that have been extracted and characterized from mistletoe include flavonoids, lectins, polypeptides, polysaccharides, saponins tannins, tri-terpines and viscotoxin. The major constituents are the lectins (carbohydrate binding proteins), which include viscumin, polypeptides known as viscotoxin (with a basic chemical structure of thionins) and a number of phenolic compounds (e.g digallic acid, o-coumaric acid) found in their free states or as glycosides (Duong *et al*., 2003). Extracts from mistletoe have been found to promote insulin production by clonal pancreatic beta cells in culture (Bayazit, 2004).

While extensive studies have been carried out on the antitumour activity of mistletoe, there is limited information on its antidiabetic property. In this report, we present direct evidence that administration of aqueous extract of the African mistletoe in normal rabbits elicits a hypoglycaemic effect.

MATERIALS AND METHODS

This study was conducted at the Department of Chemical Pathology, Medical Laboratory Science, Ambrose Alli University, Ekpoma, Edo State, Nigeria. The animal subjects comprised of 20 normal rabbits purchased in Benin City. They were kept in steel cage at room temperature and allowed to acclimatize for four weeks during which they were fed with growers mash obtained from Bendel Feed and Flour Mill Limited, Ewu, Edo State, Nigeria. The animals had access to food and water *ad libidum*. At the end of acclimatization, the animals were divided into four groups of 5 each. The body weights of the animals were determined and they were subsequently assigned to different cages of 5 rabbits per cage. Mistletoe leaves were collected from plants growing on Kola nuts plants (*Kola acuminate*) at Okpara Inland, Ethiope East Local Government Area, Delta State, Nigeria. Matured leaves of mistletoe were collected at the top of the kolanut tree for analysis.

Group 1 served as the control, and the animals in this Group were not given any treatment different from the food and water available throughout the study. Groups 2, 3, 4 were treated with 100 mg/Kg extract, 200 mg/Kg extract, and 0.1 mg/Kg Daonil (a refrence hypoglycaemic drug) respectively for 21 days.

Blood samples were collected and dispensed into fluoride oxalate container and analyzed for plasma glucose that same day. Plasma glucose content of the rabbits was determined by the glucose oxidase method (Gochman & Schmitz, 1972). Data were collected and presented as mean ± standard error of the mean. Levels of statistical significance were calculated at 95% confidence limit.

RESULTS AND DISCUSSION

Figure 1 shows the results of the body weight profiles of the animals over the course of the experimental treatments. There was a general increase in body weight of the rabbits from day 1 to day 21. However, there was no statistically significant difference ($p>0.05$) between the different treatment groups. This observation could be taken as an indication that administration of the extracts of the leaves of *Loranthus Bengwensis* did not cause any noticeable gross toxicity to the animals. However, detailed toxicity studies need to be carried out to establish the safety of the extracts.

Figure 2 shows the level of plasma glucose in the different groups over the 21 day period of the treatment. There was a general reduction in the level of plasma glucose in animals that were fed aqueous extracts of the leaves of *Loranthus Bengwensis* both at 100 mg/kg and 200 mg/kg at 21 day ($p<0.05$). In comparison, the reference group that was treated with Daonil showed consistent reduction in plasma glucose across all days tested.

These results suggest that the aqueous extract of the leaves of *Loranthus Bengwensis* contain active substances that have hypoglycaemic activities. Administration of 100 mg/kg and 200 mg/kg doses of the aqueous extract of the leaves of *Loranthus Bengwensis* administered to normal rabbits decreased plasma glucose form 86±6.34 mg/dl to 44±2.74 mg/dl and 47±1.47 mg/dl, respectively. These values translate to a reduction in plasma glucose concentration by 49% and 45% as a result of daily administration of 100 mg/Kg and 200 mg/Kg respectively on day 21.

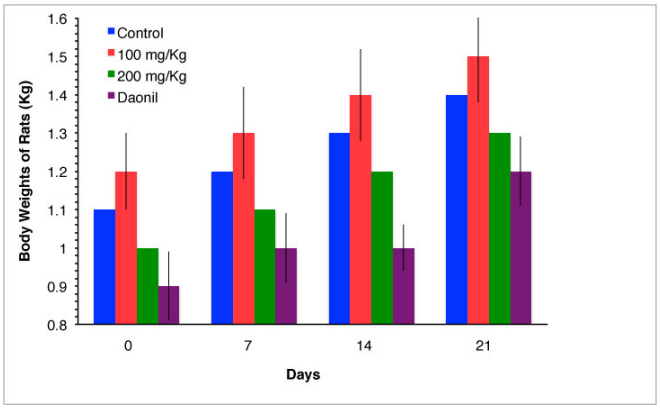

Figure 1: Body weight profiles of the animals in the four experimental treatment groups. Values are shown as mean ± SEM for five subjects per group.

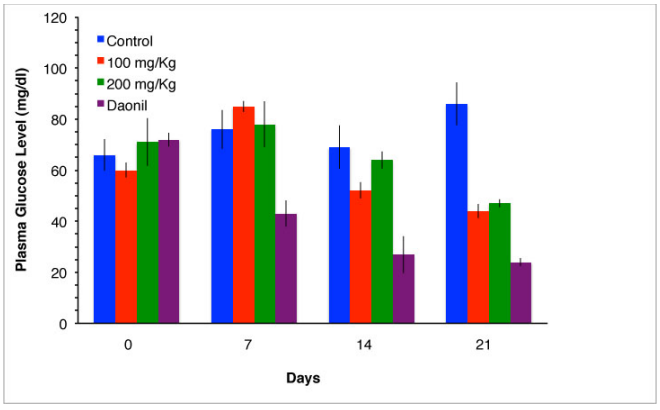

Figure 2: Plasma Glucose level (mg/dl) profiles of the animals in the four experimental treatment groups. Values are shown as mean ± SEM for five subjects per group.

In contrast to the steady decrease in plasma glucose caused by Daonil, the extracts exerted their overall hypoglycaemic effect over the 21 day period. With continuous feeding of the rabbits with the extract there was a reduction in plasma glucose on the 14th day ($p>0.05$) and subsequently on the

21st day ($p<0.05$). It is possible that the quantity of the extract consumed by the rabbits determined the extent of reduction. Hence, the effect of the extract may involve a secondary mechanism that gets activated or switched on after several days of administering the active substance to the animals.

Our findings are consistent with those reported by Obatomi *et al.* (1994) that another species of African mistletoe (*Loranthus bengwensis*) elicited gypoglycaemia in streptozotoch induced diabetic rabbits. They however, did not include in their work a conventional antidiabetic agent for comparism. Daonil a reference hypoglycaemic drug may be used for the treatment of acute diabetes while mistletoe may be used for the treatment of chronic diabetes since it effect takes a longer time.

Plants contain a wide range of active pharmacologic agents. Among these, plant alkaloids are the main products that have received the greater attention with regard to possible medicinal application (Fanberg & Brulin, 1979). Plants have a very high ability to synthesize a wide spectrum of chemicals starting with simple elements to very complex compounds. An example is quercetin, a constituent of flavonoids which increase secretion from the beta cells of pancreas in animal model (Hi *et al*., 1995). While the mechanism of action of this plant remains to be determined, the findings here suggest that its hypoglycaemic action could involve the release of insulin from pancreatic beta cells.

Conclusion

The hypoglycaemic effect of the leaves of mistletoe has been revealed by this study and it could hold promise as a future source of a hypoglycaemic dug of clinical relevance. This preliminary finding provides a basis for further investigation into the mechanism through which the plant extract exerts its hypoglycaemic effect and its potential use in the management of diabetes mellitus.

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