GLOBAL JOURNAL OF PURE AND APPLIED SCIENCES VOL. 9, NO. 1, JANUARY 2003 35-38
COPYRIGHT(C) BACHUDO SCIENCE CO. LTD. PRINTED IN NIGERIA. ISSN 1118-05/9

ANTIDIABETIC EFFECT OF CRUDE GLYCOSIDE OF *ABRUS PRECATORIUS* IN ALLOXAN DIABETIC RABBITS

C. C. MONAGO and V. AKHIDUE

(Received 18 October 2001; Revision accepted 29 December 2001).

ABSTRACT

The antidiabetic effect of crude a glycoside from *Abrus precatorius* seed was studied in alloxan diabetic rabbits. Three groups of male alloxan diabetic rabbits were used. The three groups (n = 3) received oral injection of 50mg/kg body of crude glycoside (CG), chlorpropamide (CP)-a known synthetic antidiabetic drug and 5mls of normal saline for CG, CP and CO respectively. Blood glucose levels were reduced in CG and CP groups of diabetic rabbits but not in CO. The percentage reduction of blood glucose for CG after 5,10,20,30,40,60, and 168 hours of oral injection were 34.1, 43.4,71.8,73.2,70.6,63.7 and 62.9% respectively while for CP we have 13.8,32.3,61.3,33.5,46.3 and 46.2% respectively. The peak reduction for CG was 73.2% after 30 hours and 61.3% for CP after 20 hrs of oral injection. Both CG and CP did not return back to hyperglycaemic level of 207.60 ± 0.21- 247.20 ± 0.50.

There is a high significant difference between the blood glucose reduction pattern of CG and CP with that of CO at $P < 0.001$. There is no significant difference in the blood glucose reduction patterns of CG and CP ($P < 0.001$).

Key words: Diabetes mellitus, Legumes, *Abrus precatorius*, Sulfonylurea, Crude glycoside.

INTRODUCTION

Diabetes *mellitus* is a disease of ancient origin. Prevalence of diabetes in some countries has reached up to 1-2% of the population and Barnett (1991), showed that in Africa it is on the increase. The World Health Organization predicted that the number of diabetic patients will double from 143 million in 1997 to about 300million in 2025, largely because of dietary and other lifestyle factors (Seidell, 2000).

The incidence of type II diabetes is closely linked to choice of diet leading to overweight or obesity (Wannamethee and Shaper, 1999). The Sensitivity to develop diabetes based on the type of diet is on is the increase. About 75% of diabetes is type II or non-insulin dependent diabetes (NIDD) (Barnett,1991).

Diabetes mellitus is usually accompanied by other disease conditions like obesity (Wolf and Colditz, 1998), coronary heart, eye, renal, vascular and neurological problems (Miller, 1991). A growing concern has therefore, led the International Federation of Diabetes Association and WHO to jointly ask the whole world to put hands together in fighting this deadly disease. Thus the proclamation of June 27th 1991, as the first World Diabetes Day (WHO, 1991).

The use of most synthetic antidiabetics like sulfonylurea, biguanides and intravenous insulin injections have their own disadvantages. Most sufonylurea are highly hypoglycaemic and can reduce blood sugar to an abnormally low level, leading to severe hypoglycaemic, coma and death (Kolterman, et. al.1984). Insulin injection takes place intravenously, which is painstaking and does not improve type 11 diabetes (WHO, 1980). Insulin also is frequently destroyed in the gastrointestinal tract. Insulin degradation by insulinase have been reported by several authors (Kitabchi, and Stenz, 1972; Kahn, et. al. (1976). There is need therefore for oral substitutes for both insulin and severe hypoglycaemic antidiabetics, where insulin therapy does not improve the disease condition.

Many plant extracts have been used in folk medicine to treat diabetes. The use of legumes for this effect has been reported by many

C. C. MONAGO, Department of Biochemistry, University of Port Harcourt, Nigeria
V. AKHIDUE, Department of Pharamacology, University of Port Harcourt, Port Harcourtd Nigeria

authors. Among this group is *Phaseolus Vulgaris* (Sachner, 1961), *Vigna unquiculata* (Tella and Ojihoman, 1980), *Macuna pruriens* (Ghosal and Dutta, 1971) and *Trigonella foenum graecum* (Shani, 1974). Jenkins et. al., (1981) showed that leguminous whole seeds or extracts could be helpful in reducing the high blood sugars in diabetes. He proved that legumes have low glycaemic index and thus have been utilized in diabetic diets.

Abrus precatorius is a tropical legume found in the forests of Nigeria. The seed extracts of *Abrus precatorius* was reported by Nwodo and Alumanah (1991), as an antidiarrhoeal agent in mice. Uterotonic activity of the seed in rats was reported by Nwodo and Botting (1983). The chemical composition was done by Duke and Ayenus (1985).

MATERIALS AND MATHODS

Sample preparation: Fresh seeds of *Abrus precatorius* were collected from the pods from a local source. The seeds were cleansed and ground coarsely with a high speed blender (Mill size 8). The ground seeds were stored dry and used throughout the work.

A known weight of the sample was soaked in chloroform-methanol (2:1) and extracted for 18 hours in a container on a flash shaker (Gallenkamp). The mixture was filtered and the filtrate was re-extracted with equal volume of water and evaporated to dryness.

A known weight of this extract was subjected to column and thin layer chromatography using sephadex LH_{20} and silica gel, respectively. Elution was done with 95% methanol at a flow rate of 2ml/5mins. Test for glycosides was done using Fehlings solution. All the fractions with positive Fehlings test were pooled together and taken as the crude glycoside (CG). Chlorpropamide (CP), a known sulfonylurea, was bought from the market and used as a control for antidiabetes drugs.

Treatment of Animals

Three groups of male health rabbits (n=3) with average weight of 1.6kg were used. Food, water, ambient temperature and proper ventilation were allowed throughout the work. Alloxan (180mg/kg body weight) was injected intrapenitonally to all the rabbits. They were allowed for 72 hours for full development of diabetes. After 72 hours, glucose levels were determined. Then oral injection of 50mg/kg body weight of the crude glycoside (CG), chlorpropamide (CP) and 5mls of normal saline as control (CO) were given.

Collection and Determination of Blood Glucose levels

Blood was drawn after 5,10,20,30,40,60 and 168hours of oral injection of CG, CP and CO. The blood was drawn from the vein and transferred to NaF/oxalate bottle. The blood was centrifuged at 2000g for 10minutes. Blood glucose level were determined using O-toluidine method of Frings et. al. (1970).

Statistical analysis was done using students t-test. Data obtained were presented as mean ± standard error of the mean. Values were considered significant at $P < 0.001$.

RESULTS

The glucose levels for the three groups-CG,CP and CO after 72 hours of alloxan injection were 282.07 ± 0.05, 234.03 ± 0.80 and 207.60 ± 0.21, respectively.

From Table 1, there is significant deference between the blood glucose reduction patterns of CG and CP, CP and CO at $p < 0.00.1$.The percentage glucose reduction in CG was 34.1,43.4,71.8,73.2,70.6,63.7 and 62.9% while that of the control varied from 0.01 to 2.0%. The percentage reduction of CP was 13.8,32.3,61.3,33,5.46.8, 46.3 and 46.2% after 5,10,20,30,40,60 and 168 hours respectively. The peak glucose reduction level was found to be 75.60 ± 0.50 and 92.90 ± 1.29mg/100ml for CG and CP respectively while the peak percentage reductions were 73.2 and 61.3% respectively. The effect of CG lasted for 168 hours with 62.9% reduction while that of CP was 46.2% after the same time.

DISCUSSION

The crude glycoside of *Abrus precatorius* was able to reduce alloxan induced hyperglycaemia. The extract was seen to be slightly more potent than CP-a known antidiabetic drug in the class of sulfonylurea. The potency was measured in terms of time of

action and percentage reduction in blood glucose levels.

Many glycosides have been reported to be used as oral glycaemic drugs. These include the thioglycosides of *Brassica oleranceae* (cabbage), (Vohora, et. al. 1973) and glycosides –Quercetin and Kaemepferol of *Anacardium occidentale* (Dhar, et. al. 1968). The extracts of these two plants were able to reduce and normalize glycaemia in alloxan diabetes by 42% in rabbits. These glycosides showed pancreatic and extra-pancreatic effects. Their combined concentration was 50mg/kg body weight. This compares well with the present crude glycoside of *Abrus precatorius* which was found to reduce alloxan diabetes in rabbits at 50mg/kg body weight but by 73% after 30 hours of oral injection.

Patients with type II or maturity onset diabetes have been advised to use only sulfonylurea (Roger, 1987). Unfortunately these sulfonylureas have adverse effects of severe hypoglycaemia that can lead to death. The approved hypoglycaemic value by WHO is 50mg/dl in man (WHO,1980; Naghui, 1991). This calls for need of oral agents that can replace these sulfonylureas either as active principles or in diets.

The chlorpropamide CP (sulfonylurea) used in this work, showed a similar severe hypoglyceamia of 32.43 ± 1.01 (mg/dl) after 5 minutes of oral injection, which rose up to 75.63 ± 0.73 (mg/dl) after 10 minutes. This adverse hypoglycaemia was not seen in those rabbits receiving the crude glycoside (CG). After 5 minutes of oral injection, the blood glucose reduction was 76.71 ± 0.44 mg/dl which rose up to 123.11 ± 1.22 mg/dl after 10 minutes.

The crude glycoside of *Abrus precatorius* therefore has proved to be antidiabetic in alloxan diabetes, which is similar to type II non-insulin dependent diabetes or maturity onset diabetes. The extract showed a more potent action than chlorpropamide - a known sulfonylurea and did not show the general severe hypoglycaemia of most sulfonylureas.

Further studies is therefore require to know whether the active principle can be identified and quantified

REFERENCES

Barnet, A.H., 1991. Diabetes mellitus in the tropics. Trans. R. Soc. Trop. Med. Hyg. 85, 324-335.

Dhar, M.L., Bhawan, B.A. and Ray, C., 1968. Screening of Indian Plants for biological activity part I. India J. of Pharmacy. 23: 128-129.

Duke, J.A. and Ayensu, E. S., 1985. Medicinal plants of China. ISE Ed. Ref Publications. Algonac Mich.

Frings C.S. Tatliff, A.N. and Dunn, B.T., 1970. Glucose determination by O-toluidine method using acetic acid in: Clinical chem. By Toro, C. and Ackerman, P.G. Little Browing and Company. Boston 115 Clin Chem. 16: 282.

Ghosal, S. and Dutta, S.K., 1971. Alkaloids of *Abrus precatorius*. Phytochemistry, 10: 195-198.

Jenkins, D.J. Nolever, T.M. and Taylor, I.H., 1981. Glycaemic index of foods: a physiologic basis for Carbohydrate exchange. Am. J. Clin. Nutri: 34:362-366.

Kahn, C.T., Megyesi, K and Roth, J., 1976. Non-Suppressible insulin-like activity of human serum; a potent inhibitor of insulin degradation. J. Clin. Invest. 57: 526-530.

Kolterman,O.G. Gray, R.S. and Shapiro, G., 1984. The acute and chronic effects of sulfonylureas therapy in type 11 diabetic subjects. Diabetes, 33(4):346-354.

Miller, G.T., 1991. Coronary heart disease and associated characteristics in tropical developing community. Trans. R. Soc. Trop. Med. Hyg. 85: 324-335.

Naghui, R., 1991. Hypoglycaemic in diabete. Medicine (a): 3 – 8.

Nwodo, O.F. and Botting J.H., 1983. Uterotonic activity of extract of the seeds of *Abrus precaterius*. Planta Medicus 47 :230-233.

Nwodo, O.F. and Alumanah, E.O., 1991.Studies on *Abrus precatorius* seeds II. Antidiarrhoeal activity. Journal of Ethnopharmacology, 31: 395-398.

Roger, L.N., 1987. Non- insulin-depedent diabetes mellitus- current status of oral hypoglycaemic therapy. Post Graduate Medicine, 81 (6): 177-181.

Sachner, J.A. , 1961. An IAA oxidase inhibitor system in bean pods. Am. J. of Bot. 48: 820.

Seidell, J.C. , 2000. Obesity, insulin resistance and diabetes – a worldwide epidemic. British J. of Nutrition, 83 (1): S5-S8.

Shani, J.A., Goldschmied, A. Joseph, B., Ahronson, Z. and Sulman, G., 1974. Hyglycaemic effect of *Trigonella foenum graecum* and *Lupinus* in alloxan diabetic and normal rats. Arch. Int. Pharmacodyn. Ther. 210; 27-37.

Tella, A.F. and Ojihomon, O.O., 1980. An extraction method for evaluating the seed proteins of Cowpea (*Vigna unquiculata*). Journal of Sci., Food and Agric. 31: 1268-1274.

Vohora, S.B. Rizwan, M. and Khan, A.J., 1973. Medicinal uses of common Indian Vegetables. Planta Medicus, 23 : 381-393.

Wannamethee, S.G. and Shaper, A.G., 1999. Weight change and duration of overweight and obesity in the incidence of type II diabetes. Diabetes care, 22: 1266-1272.

WHO, 1980. Expert Committee on Diabetes mellitus, Second Report. WHO Technical Report series, No 646. Geneva WHO.

WHO, 1991. Press Release. WHO/36 21. June.

Wolf, M.A. and Colditz, G.A., 1998. Current estimates of the economic Çost of Obesity in United States. Obesity Research, 6: 97-106.