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Diabetes & its Complications

The Antidiabetic Effect of *Lupine Turmos* Compared With Antidiabetic Drug (Glibenclamide)

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ABSTRACT

Statement of the Problem: *The problem of the study lied behind the fact that Sudanese diabetic patients are using some plants as a treatment, without any experimental data on their biological effects, their suitable dose and their role in diabetic treatment. Some diabetic patients are suffering from side effects of anti-diabetic drugs.*

Purpose: *To determine the biological effects of Lupine turmos which is used traditionally by diabetic Sudanese patients comparing with anti-diabetic drug Glibenclamide.*

Methodology: *The essays of the present study were conducted on albino rats which obtained from the faculty of pharmacy, University of Khartoum, Sudan. 30 albino rats of either sex weighing (135-250 g) and aged two months were used. 6 animals served as control, 6 animals were treated with anti-diabetic drug (Glibenclamide10 gm/kg-body-weight) and 18 animals (three groups N=6) were administered with three different doses (200, 400 and 800 mg/kg-b.w) respectively. Blood specimens were collected from each group and serum levels of blood glucose, lipid profile and α-amylase concentrations were estimated.*

Findings: *The results shows an insignificant difference between the means of blood glucose in the two treated groups, group (4) which was treated with (400 mg/kg-b.w) Lupine turmos aqueous extract (blood glucose-111.9 mg/dl) and group (2) with (10 mg/kg-b.w) Glibenclamide (blood glucose-98.416 mg/dl). Cholesterol and triglycerides of treated groups were the same as group (3) with (10 mg/kg-b.w) Glibenclamide, there was no significant difference between two groups and control group. The aqueous extract of the plant inhibited α-amylase enzyme activity at a dose (200 mg/kg-b.w), in group (3) versus group (2) with Glibenclamide drug there was no significant difference between two groups ($p \leq 0.05$).*

Conclusion & Significance: *It can be concluded from this study that Lupine turmos aqueous extract have a hypoglycemic effect by reducing both blood glucose and α-amylase enzyme without any side effects.*

Keywords

α-amylase, Cholesterol, Diabetes mellitus, Glibenclamide, Insulin, Lupine turmos, Pancreas, Triglycerides.

Introduction

Diabetes mellitus is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced [1]. This disease is particularly characterized by the excessive accumulation of free glucose in blood which is likely to increase the risk for developing various metabolic disorders, including Hyperlipidemia, liver-kidney dysfunctions and hypertension [2]. Herbs had been used by all cultures throughout history, it has been proven to be beneficial in the treatment of

various diseases, such as diabetes, cardiovascular disease, cancer, infection etc [3]. Medicinal plants occupied an important position in the socio-cultural, spiritual and medicinal arena of rural people in many parts of the world [4]. Some of patients with type 2 diabetes used some plants such as Trigonella foenum graecum, Solenstomma Hargel, Cinnanomum zeylenicum and Lupine turmos to avoid side effect of antidiabetic drugs. Lupines are members of legume family its rich diversity can be grouped into Mediterranean and east Africa [5]. Lupines are good source of protein and lipids and have no lectins and very low content of protease inhibitors. It also contains natural antimutagens and /or anticarcinogens [6]. Lupine is one such legume that contains high amounts of protein (40%) and oils (14%) The main alkaloid present in L. turmos is (dl)-Lupanine, but other alkaloids have been reported in lesser or trace amounts [7].

Glibenclamide is a type of medicine called a sulphonylurea. It is used to help control blood sugar levels in people with type 2 diabetes it cause hypoglycemia by stimulating release of insulin from pancreatic B-cells and by increasing the sensitivity of peripheral tissues to insulin, it is one of only two oral antidiabetic in the World Health Organization Model List of essential Medicines [8]. Glibenclamide has the potential to cause a number of other unwanted, effects. One of the most commonly experienced effects is weight gain, and gastrointestinal side effects of Glibenclamide include constipation, diarrhea, nausea, vomiting, abdominal pain and loss of appetite. Some patients also experience blurred vision when they begin taking the medication [9], Others report neurological side effects, such as dizziness, headaches, drowsiness and changes in taste. It is also possible to develop allergic skin rashes or sensitivity to the sun while taking Glibenclamide [10].

Materials & Methods

According to the questionnaire constructed for the purpose of this study (26.7%) of Sudanese patients with type 2 diabetes used Lupines turmos. In this experiment thirty albino rats were used, animals were allotted randomly into five groups (N=6). All groups were loaded with (5% glucose) (2gm/kg-body weight) after eighteen hours fasting, to induce diabetes, animals with blood glucose ≥120mg/dl after two hours were considered as diabetic and included in this experiment. Group (1) was fed with normal diet and distilled water, serves as control. Group (2) was administered orally with hypoglycemic drug (Glibenclamide, 10gm/kg-body weight) groups (3, 4 and 5) were administered with Lupine turmos aqueous extract (200, 400 and 800mg/kg-body weight) respectively, 1-2 ml of blood were drawn out by capillary tubes in fluorinated test tubes from the orbital plexus of rats [11] and centrifuged at 3000 r.p.m for 5 minutes to separate plasma. The plasma prepared was transferred to Khartoum hospital central lab and used to estimate serum levels of blood glucose, lipid profile and α-amylase concentrations using (Hitachi 902) Analyzer using commercial kits (Biosystem Chemicals, Barcelona, Spain).

Statistical Analysis

Statistical Package for Social Science (SPSS) computer software was used for data analysis. Independent T-test was used [12], Significance levels were set at (P<.05).

Results and Discussion

Medicinal plants are used in a wide range in order to reduce the hyperglycemia, either to induce insulin secretion or to improve the utilization of glucose by the cells or to reduce carbohydrates absorption by inhibition of α-amylase activity [13]. Type 2 diabetes mellitus is characterized by insulin resistance, which may be combined with relatively reduced insulin secretion [14]. The defective responsiveness of body tissues to insulin is believed to involve the insulin receptor. However, the specific defects are not known. Diabetes mellitus cases due to a known defect are classified separately. Type 2 diabetes is the most common type [15]. This study revealed that Lupine turmos aqueous extract had a hypoglycemic effect, it reduced blood glucose after two hours to the normal level as presented in previous study [16], that Lupine turmos was the medicinal food plant with potential value in the management of diabetes. In this experiment the antidiabetic drug (Glibenclamide) reduced blood glucose to the normal level after two hours as in control group. Comparing with Lupine turmos aqueous extract there was mild decrease till blood glucose reach to the normal level with the dose (200 and 400mg/kg-b.w) after two hours (Table 1, 2) there were no significant difference between two groups.

Parameters	Groups	N	"Mean ± S D"	P value
Glucose/0h	Control	6	98.5± 9.09	
	Glibenclamide	6	72.20 ± 5.45	
	Lupine200mg/kg	6	121.62 ± 5.47	0.00*
Glucose/2hs	Control	6	97.40± 17.89	
	Glibenclamide	6	60.80 ± 18.32	
	Lupine200mg/kg	6	125.40 ± 4.71	0.00*

Table 1: The effect of (200mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood glucose concentration to induced diabetic rats.
Values are expressed as mean±S.D.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

Parameters	Groups	N	"Mean ± SD"	P value
Glu/0h	Control	6	98.5± 16.23	
	Glibenclamide	6	73.00 ± 5.25357	
	Lupine400mg/kg	6	73.83 ± 8.30462	0.84^{NS}
Glu/2hs	Control	6	104 ± 24.74	
	Glibenclamide	6	98.41 ± 17.02	
	Lupine400mg/kg	6	111.9 ± 43.93	0.50^{NS}

Table 2: The effect of (400mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood glucose concentration to induced diabetic rats.
Values are expressed as mean±S.D.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

On the other side of this study lipid profile had been done, Hypocholesterolemic effect of L. termus aqueous extract revealed in this study is in agreement with [17] whom found that feeding raw peas and whole blue Lupine seeds to pigs exerted a marked

hypocholesterolemic feces. This effect has been explained in other studies by the consequence of a marked decrease in the intestinal absorption of cholesterol probably modulated by bile acid reabsorption and a higher content of dietary phytosterols. Blood triglycerides was the same as the two compared groups at the dose of (200mg/kg-b.w) Lupine turmos aqueous extract but there was mild increase with increasing of the extract, in this study Glibenclamide and Lupine turmos aqueous extract had the same effect on lipid concentration (Table 4). The present results also agreed with [17], Whom suggested that addition of Lupine kernel fiber to the diet provided favorable changes to some serum lipid total cholesterol,. in this study the induced diabetic treated groups with (400 and 800mg/kg) Lupine aqueous extract, showed overall improvement in lipid profile as there was a decrease in total cholesterol, triglycerids (Tables 5 and 6). These findings were agreed with [18] who assumed that cholesterol and triglycerides decreased by Lupine turmos. This is due to the reduction in micellular solublization of cholesterol, attenuated by elevation in bile acid reabsorption and phytosterols there was no significant difference between two treated groups.

Parameters	Groups	N	"Mean ± S D"	P value
Glu/0h	Control	6	98.5 ± 16.23	
	Glibenclamide	6	73.00 ± 5.25	
	Lupine800mg/kg	6	66.63 ± 1.59	0.03*
glu2/hs	Control	6	104 ± 24.74	
	Glibenclamide	6	62.67 ± 17.01	
	Lupine800mg/kg	6	144.25 ± 12.77	0.00*

Table 3: The effect of (800mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood glucose concentration to induced diabetic rats.
Values are expressed as mean± S.D.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

Parameters	groups	N	"Mean ± SD"	P value
Choles/0h	Control	6	46.28 ± 3.38	
	Glibenclamide	6	59.23 ± 28.01	
	Lupine200mg/kg	6	62.45 ± 10.24	0.820^{NS}
Choles/2hs	Control	6	46.28 ± 3.38	
	Glibenclamide	6	57.45 ± 18.94	
	Lupine200mg/kg	6	46.61 ± 8.06	0.288^{NS}
Choles/4hs	Control	6	37.52 ± 2.39	
	Glibenclamide	6	42.13 ± 13.64	
	Lupine200mg/kg	6	40.55 ± 8.79	0.834^{NS}
Tri/0h	Control	6	67.56 ± 3.01	
	Glibenclamide	6	51.88 ± 30.06	
	Lupine200mg/kg	6	49.95 ± 6.35	0.895^{NS}
Tri/2hs	Control	6	67.56 ± 3.01	
	Glibenclamide	6	60.12 ± 13.90	
	Lupine200mg/kg	6	35.46 ± 3.63	0.015*
Tri/4hs	Control	6	38.99± 4.45	
	Glibenclamide	6	43.08 ± 17.69	
	Lupine/200mg/kg	6	42.23 ± 4.26	0.921^{NS}

Table 4: The effect of (200mg/kg.b.w) lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood lipids concentration to induced diabetic rats.
Values are expressed as mean± S.D.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

Parameters	groups	N	"Mean ± SD"	P value
Choles/0h	Control		46.28 ± 3.38	
	Glibenclamide	6	63.49 ± 27.12	
	Lupine400mg/kg	6	62.81 ± 20.32	0.962^{NS}
Choles/2hs	Control	6		
	Glibenclamide		59.48 ± 17.65	
	Lupine400mg/kg	6	39.78 ± 4.79	0.040*
Choles/4hs	Control	6	46.28 ± 3.38	
	Glibenclamide	6	42.91 ± 12.35	
	Lupine400mg/kg	6	30.67 ± 3.07	0.059*
Tri/0h	Control	6	67.56 ± 3.01	
	Glibenclamide	6	57.58 ± 30.30	
	Lupine400mg/kg	6	67.51 ± 22.33	0.534^{NS}
Tri/2hs	Control	6	67.56 ± 3.01	
	Glibenclamide	6	69.10 ± 25.25	
	Lupine400mg/kg	6	75.02 ± 8.32	
Tri/4hs	Control	6	38.99 ± 42.45	0.059*
	Glibenclamide	6	40.08 ± 17.45	
	Lupine400mg/kg	6	49.09 ± 13.83	0.346^{NS}

Table 5: The effect of (400mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood lipids concentration to induced diabetic rats.
Values are expressed as mean±S.D. NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

Parameters	groups	N	"Mean ± SD"	P value
choles0h	Control	6	46.28 ± 3.38	
	Glibenclamide	6	63.49 ± 27.12	
	Lupine800mg/kg	6	38.83 ± 2.34	0.076^{NS}
choles2hs	Control	6	46.28± 3.38	
	Glibenclamide	6	59.48 ± 17.65	
	Lupine800mg/kg	6	35.61 ± 7.04	0.019*
chles4hs	Control	6	37.52± 2.39	
	Glibenclamide	6	42.91 ±12.35	
	Lupine800mg/kg	6	35.42 ± 4.35	0.209^{NS}
tri0h	Control	6	67.56± 3.01	
	Glibenclamide	6	57.58 ± 30.30	
	Lupine800mg/kg	6	68.61 ± 39.13	0.5598^{NS}
tri2hs	Control	6	67.56± 3.01	
	Glibenclamide	6	69.10 ± 25.25	
	Lupine800mg/kg	6	88.01 ± 24.41	0.216^{NS}
tri4hs	Control	6	38.99±42.45	
	Glibenclamide	6	40.08 ± 17.45	
	Lupine800mg/kg	6	58.8 ± 13.59	0.066^{NS}

Table 6: The effect of (800mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood lipids concentration to

induced diabetic rats.
Values are expressed as mean± SD.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/dl.

In the present study the effect of L.turmos on α-amylase activity had been investigated. Many plant extracts and natural products have been investigated with respect to suppression of glucose production from carbohydrates in the gut or glucose absorption from the intestine. Our study showed that higher inhibition of the enzyme had been observed when diabetic rats treated with (200 and 400 mg/kg b.w.) of L.

Turmos comparing with Glibenclamide treated group there was no significant difference between two groups (Tables 7 and 8). But there was a significant difference between two with higher dose (800mg/kg.b.w) Lupine turmos aqueous extract (Table 9). This agreed with Therapeutic approach for treating type 2 diabetes mellitus is to decrease prandial glucose levels. This could be done by retarding the absorption of glucose through the inhibition of the carbohydrates-hydrolyzing enzymes, that exist in the small intestinal brush border that are responsible for the breakdown of oligosaccharides and disaccharides into mono saccharides suitable for absorption [19].

Parameters	groups	N	"Mean ± SD"	P value
amyl0h	control	6	1494.4 ± 405.07	
	Glibenclamide	6	1419.83 ± 259.64	
	Lupine200mg/kg	6	1233.50 ± 97.59	0.148^{NS}
amyl2hs	control	6	1566.4 ± 323.7	
	Glibenclamide	6	1445.00 ± 760.19	
	Lupine200mg/kg	6	1145.67 ± 60.09	0.380^{NS}
amyl4hs	control	6	1641.2 ± 354.16	
	Glibenclamide	6	1132.50 ± 50.96	
	Lupine200mg/kg	6	1057.67 ± 813.12	0.831^{NS}

Table 7: The effect of (200mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood α-amylase concentration to induced diabetic rats.
Values are expressed as mean± S.D.; NS: Not significant; *: Significant at (p<0.05),Concentrations mg/IU.

Parameters	groups	N	"Mean ± SD"	P value
amyl0h	control	6	1494.4± 405.07	
	Glibenclamide	6	1419.83 ± 259.64	
	Lupine400mg/kg	6	1549.50 ± 321.10	0.461^{NS}
amyl2hs	Control	6	1566.4± 323.7	
	Glibenclamide	6	1445.00 ± 760.19	
	Lupine400mg/kg	6	1827.00 ± 400.94	0.310^{NS}
amyl4hs	Control	6	1641.2± 354.16	
	Glibenclamide	6	1057.67 ± 813.12	
	Lupine400mg/kg	6	1674.00 ± 380.60	0.136^{NS}

Table 8: The effect of (400mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood α-amylase concentration to induced diabetic rats.
Values are expressed as mean± S.D.; NS: Not significant; *: Significant at (p<0.05); Concentrations mg/IU.

Parameters	groups	N	"Mean ± S D "	P value
amyl0h	control	6	1494.4 ± 405.07	
	Glibenclamide	6	1419.83 ± 259.64	
	Lupine800mg/kg	6	1673.00 ± 143.07	0.071^{NS}
amyl2hs	Control	6	1566.4 ± 323.7	
	Glibenclamide	6	1445.00 ± 760.19	
	Lupine800mg/kg	6	1976.33 ± 434.37	0.176^{NS}
amyl4hs	Control	6	1641.2 ± 354.16	
	Glibenclamide	6	1057.67 ± 813.12	
	Lupine800mg/kg	6	2043.33 ± 342.05	0.030*

Table 9: The effect of (800mg/kg.b.w) Lupine turmos aqueous extract and antidiabetic drug (Glibenclamide) on blood α-amylase concentration to induced diabetic rats.
Values are expressed as mean± S.D.; NS: Not significant; *: Significant at (p<0.05), Concentrations mg/IU.

Conclusion

In this study, it can be concluded that Lupine turmos fruit aqueous extract has hypoglycemic and Hypolipidemic effects on 5% glucose- induced diabetic albino rats with insignificant difference with antidiabetic drug Glibenclamide. So it can be used instead of the drug with suitable dose.

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