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Antihyperglycemic and antioxidant effects of *Talinum portulacifolium* leaf extracts in streptozotocin diabetic rats: A dose-dependent study

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ABSTRACT

Hexane, ethanolic and aqueous extracts of *Talinum portulacifolium* leaves were prepared and given individually at different doses to normal and streptozotocin (STZ) induced diabetic rats after an overnight fast. The blood glucose levels were measured at 0,1,2,3,4,5 and 6 h after the treatment. The hexane extract at a dosage of 0.5g/kg b.w has shown maximal blood glucose lowering effect (64.7%) in diabetes rats. The same dosage did not produce any hypoglycemic activity in normal rats. The antihyperglycemic activity of hexane extract of *Talinum portulacifolium* leaves was significantly higher than that of glibenclamide, an oral hypoglycemic agent. All the extracts exhibited dose dependent scavenging activities against 2,2-diphenly-1-picrylhydrazyl (DPPH) radicals, nitric oxide radicals and hydrogen peroxide. Further, all extracts had relatively lower reducing power, compared to that of ascorbic acid. The total phenolic content of hexane, ethanol and aqueous extracts were found to be 61, 100 and 114 mg/gm of the dry extract respectively. TLC of the above extracts using the DPPH as a spraying reagent revealed yellow spots against purple background indicating the presence of potent antioxidant compounds. In conclusion hexane extract of *Talinum portulacifolium* leaves possess both antihyperglycemic and antioxidant activites, while the ethanol and aqueous extracts possess only antioxidant activity.

KEYWORDS: *Antihyperglycemic, DPPH radical, Reducing power, Streptozotocin*

INTRODUCTION

Diabetes mellitus is a chronic metabolic disease caused by an absolute or relative lack of insulin and or reduced insulin activity, which results in hyperglycemia and abnormalities in carbohydrate, protein and fat metabolism. At least 171 million people worldwide have diabetes, this figure is likely to be more than double by 2030 and around 3.2 million deaths every year are attributable to complications of diabetes at the rate of six deaths every minute (1). Hyperglycemia is regarded as the primary cause of diabetic microvascular complications and contributing factor to diabetic macrovascular disease. Several major mechanisms have been proposed for hyperglycemia induced-tissue damages, including increased polyol pathway, activation of protein kinase C (PKC) isoforms, hexosamine pathway, increased superoxide release from mitochondria and advanced glycation end products (AGE) formation (2–3). All these processes form reactive oxygen species (ROS) which alter intracellular redox state and provoke oxidative stress.

Studies indicate that hyperglycemia triggers the generation of free radicals and oxidative stress in capillary endothelial cells in the retina, mesangial cells in the renal glomerulus and neuron cells in the peripheral nerves (4). Therefore, it is essential to regenerate critical cellular

antioxidant responses to manage cellular redox status for preventing these diabetic complications resulting from hyperglycemia (5-6). Recent studies indicate a decrease in the occurrence of complications such as neuropathy and nephropathy in diabetic animal models with supplementation of different antioxidants such as vitamin E and lipoic acid. These results provide evidence that oxidative stress plays a role in the development of diabetic complications (7). Therefore, treatment strategies that focus on decreasing oxidative stress as well as enhancing antioxidant defense systems might present important options for treatment of diabetic complications. Hence compounds with both antihyperglycemic and antioxidative properties would be useful antidiabetic agents (8).

There is an increasing demand by patients to use the natural products with Antidiabetic activity, due to the side effects associated with the use of insulin and oral hypoglycemic agents (9), in addition they are not suitable for use during pregnancy (10). So that the management of diabetes without any side effects is still a challenge to the medical system .The ethnobotanical information reports about 800 plants that may possess antidiabetic potentiality. Folk medicine for diabetes from Rayalaseema reports 26 plants with antidiabetic activity. For a long time the tribal people of the Rayalaseema region in Andhra Pradesh, India have used the leaves of *Talinum portulacifolium* (Forssk: Portulacaceae) to keep away from Diabetes (11). The genus *Talinum* consists of approximately 500 species across the world. The family is cosmopolitan and it has 19 genera and more centered in South Africa and America (12). It is Perennial, suffrutescent, shrubby plant distributed from Rajasthan, India south wards in to the peninsular region; also found in Nepal. It is cultivated in Africa and, like spinach, is used as a vegetable. It is also said to be used as an aphrodisiac (13). The leaf powder of this plant mixed with boiled milk is used to treat diabetes (14). Nageswara Rao et al reported that the methanolic extract of *Talinum portulacifolium* leaves contain alpha-glucosidase inhibitory activity (15). But there are no systematic scientific studies on the antidiabetic and invitro antioxidant activities of different extracts of this plant (dose dependent study). The present study was undertaken to scientifically investigate the effect of different extracts of *Talinum portulacifolium* leaves on the blood glucose levels in streptozotocin (STZ) induced diabetic rats and invitro antioxidant activities .

MATERIALS AND METHODS

Collection of plant material

Leaves of *Talinum portulacifoium* were collected from surrounding areas of Tirupati and identified by the Botanist, Department of Botany, S.V. University, Tirupati. A voucher specimen (Herbarium Accession No.176) was deposited in the herbarium, Department of Botany, S.V. University, Tirupati. These leaves were shade dried and powdered; the powder was used for the preparation of different extracts.

Preparation of extracts

Hexane and ethanol extracts were prepared by successive solvent extraction in a soxhlet extractor; and extracts were then concentrated in vacuo to yield dense residues. To prepare aqueous extract the plant leaf powder (200 gms) was soaked in distilled water in a glass jar for 2 days at room temperature and the solvent was filtered. This was repeated three to four times until the filtrate gave no coloration. The filtrate was distilled and concentrated under reduced pressure in the Buchi rotavapour R-200 and finally freeze dried. The yield of the extracts were 6.7%, 8.3% and 21% for hexane, ethanol and water respectively. All the extracts were preserved in a refrigerator till further use. Preliminary phytochemical analysis was carried out in all 3 extracts by different methods of phytochemical analysis (16).

Induction of Diabetes

Diabetes was induced in male wistar albino rats aged 4 months (body weight 180–200 gms) by intraperitoneal administration of STZ (Sigma, Detroit, USA) (single dose of 50 mg/kg b.w) dissolved in freshly prepared 0.01M citrate buffer pH 4.5. After 48 hrs rats with marked hyperglycaemia (fasting blood glucose≥250mg/dl) were selected and used for the study. All the animals were allowed free access to tap water and pellet diet and maintained at room temperature in plastic cages, as per the guidelines of Institute Animal Ethics committee.

Experimental design

The animals were divided in to 9 groups and each group consisted of 6 rats.

1 Normal untreated rats
2 Diabetic untreated rats
3 Normal rats treated with 0.25 g/kg b.w of plant extract
4 Normal rats treated with 0.5 g/ kg b.w of plant extract
5 Normal rats treated with 0.75 g/ kg b.w of plant extract
6 Diabetic rats treated with 0.25 g/kg b.w of plant extract
7 Diabetic rats treated with 0.5g/kg b.w of plant extract

8 Diabetic rats treated with 0.75g/kg b.w of plant extract
9 Diabetic rats treated with 0.02g/kg b.w of glibenclamide

After an overnight fast the normal treated and diabetic treated rat groups received the ethanolic, aqueous extracts (dissolved in 1ml of distilled water) and the hexane extract (dissolved in 1ml of 5% Tween 80) by gastric intubation using a force feeding needle. Normal untreated and diabetic untreated rats were fed distilled water alone. But the control group for hexane extract received the vehicle (1ml of 5% Tween 80) instead of water. Blood samples were collected for the measurement of blood glucose from the tail vein at 0, 1, 2, 3, 4, 5, & 6 hr after the administration of plant extract and blood glucose levels were determined by using dextrostix with Basic One Touch Accuchec Glucometer (Glucose oxidase method).

Antioxidant activity:

The following methods were used to evaluate antioxidant activity of the above 3 extracts.

DPPH radical scavenging activity

The hydrogen atom or electron donation abilities of the corresponding extracts were measured from the bleaching of the purple-colored methanol solution of 2, 2'-diphenly-1-picrylhydrazyl (DPPH). This spectrophotometric assay uses the stable radical DPPH as a reagent (17). 1ml of various concentrations of the extracts (25, 50, 75, 100 and 250μg/ml) in methanol were added to 4ml of 0.004% (w/v) methanol solution of DPPH. After a 30 min incubation period at room temperature, the absorbance was read against blank at 517nm. The ability to scavenge DPPH radical was calculated by the following equation

DPPH radical scavenging activity (%) = [(A control − A sample) / A blank] × 100

Where A control is the absorbance of the control reaction (containing all reagents except the test compound), A sample is the absorbance of the test compound and A blank is only Methanol. Tests were carried out in triplicate.

Reducing power

The reducing power was determined according to the method of Oyaizu (18). Different concentrations of plant extracts (25, 50, 250 and 500μg/ml) prepared in methanol were mixed with phosphate buffer (2.5 ml, 0.2M, pH 6.6) and potassium ferricyanide [$K_3Fe(CN)_6$] (2.5ml, 1%). The mixture was incubated at 50°C for 20 min and 2.5ml of trichloroaceticacid (10%) was added to the mixture, which was then centrifuged at 3000 rpm for 10 min. The upper layer of the solution (2.5 ml) was mixed with distilled water (2.5 ml) and $FeCl_3$ (0.5 ml. 0.1%) and the absorbance was measured at 700nm. Increased absorbance of the reaction mixture indicated increased reducing power. Ascorbic acid was used as a standard.

Determination of total phenolic compounds

Total phenols in plant extracts were determined by Folin-Ciocalteau reagent according to Singleton and Rossi (19) using Gallic acid as standard. 0.1ml (100μg) of sample solution was made up to 3 ml with distilled water. About 0.5 ml of Folin-Ciocalteau reagent was added and mixed thoroughly and incubated for 3 min at room temperature. After incubation, 3ml of 20% Na_2CO_3 was added and mixed thoroughly and incubated in boiling water bath for 1min. The absorbance was measured at 650nm.The concentration of total phenols was expressed in terms of micrograms of Gallic acid equivalents.

Nitric oxide scavenging activity

Nitric oxide scavenging activity was measured by slightly modified methods of Green et al (20) and Marcocci et al (21). Nitric oxide radicals (N0) were generated from sodium nitroprusside. 1ml of sodium nitroprusside (10mM), 1.5 ml of phosphate buffer saline (0.2M, pH7.4) was added to the different concentrations (25, 50, 75 and 100 μg/ml) of the plant extracts and incubated for 150 min at 25°C. After incubation 1ml of the reaction mixture was treated with 1ml of Griess reagent (1% sulfanilamide, 2% H_3PO_4 and 0.1% napthalenediaminedihydrochloride). The absorbance of the chromatophore was measured at 546nm. Butylated hydroxyl toluene (BHT) was used as a standard. The nitric oxide scavenging activity (%) was calculated by the fallowing equation.

Nitric oxide scavenging activity (%) = [(A control − A sample) / A blank] × 100

Where A control is the absorbance of the control reaction (containing all reagents except the test compound), A sample is the absorbance of the test compound and A blank is only the phosphate buffer saline. Tests were carried out in triplicate.

H_2O_2 scavenging activity

The H_2O_2 scavenging ability of the plant extracts was determined according to the method of Ruch et al (22). A solution of H_2O_2 (40 mM) was prepared in phosphate buffer (pH 7.4). 10, 25, 50, 75 & 100 μg/ml concentrations of the plant extracts in 3.4 ml phosphate buffer were added to a H_2O_2 solution (0.6mL, 40 mM). The absorbance value of the reaction mixture was recorded at 230 nm.

The H_2O_2 scavenging activity (%) was calculated by using the following equation

H_2O_2 scavenging activity (%) = [(A control − A sample) / A blank] × 100

Where A control is the absorbance of the control reaction (containing all reagents except the test compound), and A sample is the absorbance of the test compound. Tests were carried out in triplicate.

TLC-DPPH antioxidant screening

This method is generally used for the screening of potential antioxidant activity in crude extracts. It involves the chromatographic separation of the crude plant extract, after which the developed chromatogram is sprayed with a colored radical solution and the presence of antioxidant compounds indicated by the disappearance of radical color. 10µl of each extracts was loaded as a 1cm band on the origin of TLC (Merck, Silica gel 60 F_{254} plates). Plates were developed using the hexane: ethyl acetate (5:5), methanol (100%) and methanol: acetonitrile (7:3) for hexane, ethanol and aqueous extracts respectively. To detect antioxidant activity, chromatograms were sprayed with 0.2 %(w/v) DPPH in methanol (23). The presence of antioxidant compounds were detected as yellow spots against a purple background on TLC plates sprayed with 0.2% DPPH in methanol.

Statistical analysis

All values are expressed as mean + S.D. The data were statistically analyzed by student's t-test.

RESULTS AND DISCUSSION

The effect of different doses of hexane, ethanolic and aqueous extracts of *Talinum portulacifolium* leaves on the fasting blood glucose levels of normal and diabetic rats are given in Tables 1-3 respectively. The fasting blood glucose levels of diabetic untreated rats were significantly higher than those of normal untreated rats. The hexane extract at a dosage of 0.5 g/ kg b.w produced the maximum fall of 67.4% in the blood glucose levels of diabetic rats after 6 hrs of treatment (Table 1). The ethanolic and aqueous extracts also produced antihyperglycemic activity (a maximum of 13.8% and 26.8% respectively) at the dose of 0.5 g/kg b.w. in diabetic treated rats after 4th h of the treatment (Table 2–3). All extracts of *Talinum portulacifolium* leaves did not produce any hypoglycemic activity in normal treated rats. Treatment with Glibenclamide at a dosage of 0.02 g/kg b.w to the diabetic rats resulted in 30.9 % fall of blood glucose after 5 hrs of treatment.

Among all the doses of different extracts of TP leaves, the hexane extract at a dose of 0.5 g/kg b.w. produced maximum antihyperglycemic activity bringing down the blood glucose levels to almost normal. The efficacy of hexane extract (0.5 g/kg b.w.) in reducing blood glucose levels in diabetic rats is much higher than that of ethanol, aqueous extracts (0.5g/kg.b.w) and glibenclamide (0.02 g/ kg b.w). The onset of antidiabetic action was observed from 1st hour after the treatment of the hexane extract and it was continued till the end of the 6th hour. But no hypoglycemic condition was observed in the treated diabetic rats during the treatment period. Drugs that normalize function, without causing hypoglycemia, would make attractive targets for diabetes (24). The antihyperglycemic effect of hexane extract was dose dependent upto 500 mg/kg b.w. However, the response decreased at the dose of 750 mg/kg b.w. Such a phenomenon of less antihyperglycemic response at higher dose is common with indigenous plants and has been observed with *Vinca rosea, Cinnamomum tamala, Aegle marmelose, Syzygium alternifoliuim, Momordica cymbalaria, Pterocarpus santalinus (25-26)*. The decreased antihyperglycemic activity at doses higher than 0.5 g/kg b.w. could be due to reduced or

Table 1: Effect of hexane extract of *Talinum portulacifolium* leaves on fasting blood glucose levels (mg/dl) of Normal and Diabetic rats (Mean ± S.D).

Group	Blood Glucose at different hours after the treatment						
	0h	1h	2h	3h	4h	5h	6h
1	80±5.2	86±10.6	69±14.9	81±13.3	76±14.9	71±12.8	68±10.2
2	287±29.4[a]	289±32	292±57	292±63	289±30.5	288±47	287±30.5
3	78±1.41	83±4.9	79±4.2	78±0.7	74±2.8	76±2.8	78±2.8
4	75±1.41	75±8.48	85±16.2	81±14.1	73±1.41	75±5.6	81±4.2
5	78±2.8	83±9.19	80±5.6	81±5.6	78±2.1	78±9.2	78±2.8
6	281±17.7[a]	267±19.5(5%)	250±15.3(11%)	226±15.1c(19.6%)	207±19.3b(26.3%)	147±13.6b(47.7%)	127±8.3b(54.8%)
7	332±55.6[a]	307±50.3(7.5%)	260±21(21.7%)	247±24.7(25.6%)	221±8.5c(33.4%)	168±11b(49.4%)	108±5.5b(67.4%)
8	259±38.4[a]	254±33	239±35(7.7%)	223±27.9(13.9%)	204±24.8(21.2%)	182±27.1(29.7%)	148±20.4b(42.8%)
9	250.5±9.3[a]	227.6±14(9.1%)	218.5±13c(12.7%)	208.6±14b(16.7%)	190.3±14.7b(24%)	173±13.6b(30.9%)	190±12b(24.15%)

[a]$p<0.0001$ compared with the initial level of blood glucose (0h) of normal rats.

[b]$p<0.0001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

[c]$p<0.001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

Table 2: Effect of ethanol extract of *Talinum portulacifolium* leaves on fasting blood glucose levels (mg/dl) of Normal and Diabetic rats (Mean ± S.D).

Group	Blood Glucose at different hours after the treatment						
	0h	1h	2h	3h	4h	5h	6h
1	79±6.9	91±6.5	87±9.9	81±8.7	79±10.3	76±4	83±8.3
2	279±29.4[a]	278±35	281±66	283±79	280±35	276±27.5	278±30.5
3	78±1.41	77±6.3	76±9.9	80±1.4	83±2.8	79±2.8	80±2.1
4	74±11.9	78±0.4	81±12	88±6.3	75±10.6	92±0.7	72±5.6
5	76±0.7	77±0.4	78±7	79±2.8	76±4.2	74±2.8	79±0.7
6	278±14.7[a]	307±23.5	276±29.1	265±24.1(4.6%)	252±20(9.3%)	291±50.3	308±39.3
7	289±7.3[a]	345±11.5[b]	300±7	274±11.1(5.1%)	249±15.5c(13.8%)	275±12.8(4.8%)	294±7
8	288±8.8[a]	318±9[c]	287±16.5	275±12(4.5%)	260±7.8c(9.7%)	310±26.6	330±32
9	250.5±9.3[a]	227.6±14(9.1%)	218.5±13c(12.7%)	208.6±14b(16.7%)	190.3±14.7b(24%)	173±13.6b(30.9%)	190±12b(24.15%)

[a]$p<0.0001$ compared with the initial level of blood glucose (0h) of normal rats.

[b]$p<0.0001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

[c]$p<0.001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

Table 3: Effect of aqueous extract of *Talinum portulacifolium* leaves on fasting blood glucose levels (mg/dl) of Normal and Diabetic rats (Mean ± S.D).

Group	Blood Glucose at different hours after the treatment						
	0h	1h	2h	3h	4h	5h	6h
1	69±3.7	71±4.1	83±9.6	76±5.5	63±7	76±10	85±6.4
2	317±35[a]	326±27.5	332±56	318±69	323±35	329±33.5	315±35.5
3	96±4.2	80±1.4	78±2.1	85±2.1	82±2.8	69±1.4	82±2.8
4	78±9.8	78±2.8	74±8.4	69±1.4	68±2.8	74±2.1	82±6.3
5	75±2.8	87±4.9	75±1.4	81±0.7	70±2.1	81±1.4	75±2.8
6	347±78[a]	378±86.9	341±70.8	328±64.3(5.4%)	309±74.1(10.95%)	341±65.1(1.7%)	374±73.7
7	264±19[a]	291±17.2	222±23.4	205±10.8[b](22.3%)	193±7.2[b](26.8%)	221±5.5[c](16.3%)	245±10.1
8	295±41.6[a]	317±36.8	287±45.3	276±38.3(6.4%)	264±33.6(10.5%)	297±56.3	312±44.2
9	250.5±9.3[a]	227.6±14(9.1%)	218.5±13[c](12.7%)	208.6±14[b](16.7%)	190.3±14.7[b](24%)	173±13.6[b](30.9%)	190±12[b](24.15%)

[a]$p<0.0001$ compared with the initial level of blood glucose (0h) of normal rats.

[b]$p<0.0001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

[c]$p<0.001$ compared with the initial level of blood glucose of the rats (0h) in the respective group.

no effect of the components present in the extracts at higher doses (26). The phytochemical analysis revealed the presence of carbohydrates in ethanol and aqueous extracts. Due to that the blood glucose levels in treated rats were higher after 1h of treatment than FBG (0h) levels. The antihyperglycemic activity of *Talinum portulacifolium* may be due to its stimulating effect on the remnant beta cells or improvement in insulin action at cellular level or it could also be due to its insulin like effect.

Phytochemical analysis revealed the presence of steroids, triterpenoids, phenols, flavonoids and carbohydrates in hexane extract, phenols, and carbohydrates in ethanol extract, phenols, carbohydrates and saponins in aqueous extract. The antihyperglycemic and antioxidant activities of the extracts could be due to the presence of active principles phenols or flavonoids.

There are many reports that support the use of antioxidant supplementation in reducing the level of oxidative stress and in slowing or preventing the development of complications associated with diabetes and other diseases (27). Many synthetic antioxidant components have shown toxic and/or mutagenic effects, which have shifted the attention towards the naturally occurring antioxidants. Numerous plant constituents have proven to show free radical scavenging or antioxidants activity (28). Flavonoids and other phenolic compounds (hydroxyl cinnamic derivatives, catechines etc) of plant origin have been reported as scavengers and inhibitors of lipid peroxidation (29). In the present study 6 different experiments were carried out to evaluate the antioxidant ativity of extracts of TP leaves.

The antioxidants react with DPPH, a purple colored stable free radical, and convert it into a colorless α- α-diphenyl- β- picryl hydrazine. The amount of reduced DPPH could be quantified by measuring the decrease in absorbance at 517 nm. Substances that perform this above reaction can be considered as antioxidants and therefore radical scavengers (30). The DPPH radical scavenging activity was known to correlate well with the inhibitory capacity of lipid peroxidation of a test compound (31). As shown in Figure 1, all of these *Talinum portulacifolium* extracts showed appreciable free radical scavenging activities. The

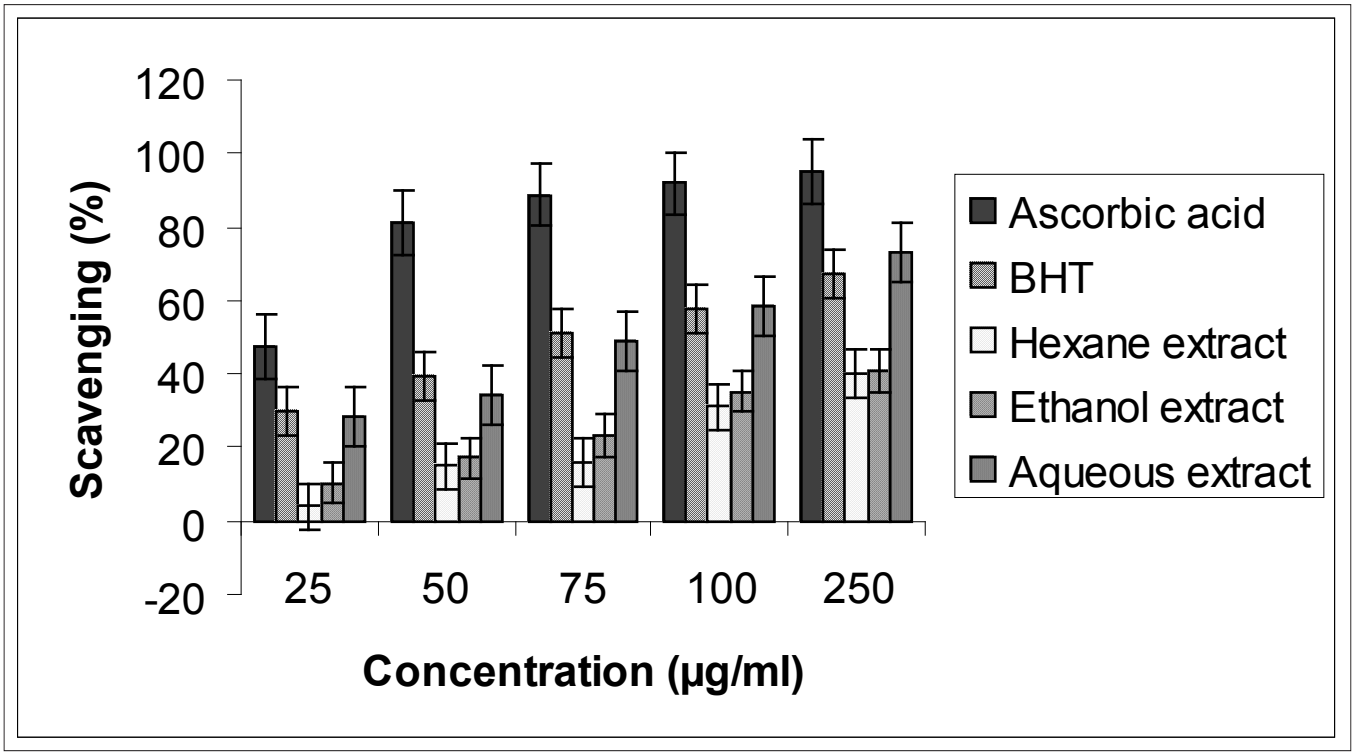

Figure 1. Scavenging effect of *Talinum portulacifolium* different extracts, standards BHT and ascorbic acid on 2, 2'-Diphenyl-1-picryl hydrazyl (DPPH) radical. Results are mean ± S.E of three parallel measurements.

best free radical (DPPH) scavenging activity was exerted by aqueous extract (73%) and it was greater than hexane (40%) and ethanol (41%) extracts. The standards BHT and ascorbic acid has shown 67% and 95% free radical (DPPH) scavenging activity respectively.

The reducing power has been used as one of the important antioxidant capability for medicinal herbs (32). In the reducing power assay, the presence of antioxidants in the all three extracts would result in the reduction of Fe3+ to Fe2+ by donating an electron. Amount of Fe2+ complex can then be monitored by measuring the formation of Perl's Prussian blue at 700 nm. Increasing absorbance at 700 nm indicates an increase in the reductive ability. The reducing power of these *Talinum portulacifolium* extracts was dose-dependent (Figure 2). The highest activity exerted by aqueous extract followed by hexane and ethanolic extracts at a dose of 500 µg/ml. These extracts activities were compared with the ascorbic acid, which showed highest activity than that of all three extracts at the same dose.

The amounts of total phenolics varied widely in the different analyzed extracts and ranged from 61 to 114 mg/g of extract. This variation can be expected for plant extracts due to the presence of other constituents and/or the presence of different types of phenols. Among plant extracts, the aqueous extract contained the highest amount of phenolics (114 mg/g) followed by ethanol (100 mg/g) and hexane (61mg/g) extracts. Recent studies have shown that many flavonoids and related polyphenols contribute significantly to the total antioxidant activity of many fruits and vegetables (33). But, in general, we have found correlation between antioxidant activity and total phenolic content.

Sodium nitroprusside in aqueous solution at physiological pH spontaneously generates nitric oxide which interacts with oxygen to produce nitrite ions that can be estimated using griess reagent. Scavengers of nitric oxide compete with oxygen, leading to reduced production of nitrite ions. Overall, the aqueous extract of *Talinum portulacifolium* showed the highest nitric oxide scavenging ability compared to the hexane and ethanol extracts (Figure 3). At 100 µg/ml concentration the aqueous extract showed highest nitric oxide scavenging activity than hexane (16%), ethanol (13%) extracts and standard BHT (14%). The nitric oxide scavenging abilities of above three extracts and standard BHT was shown below

Aqueous extract > Ethanolic extract > BHT > Hexane extract

Hydrogen peroxide is a weak oxidizing agent and can inactivate a few enzymes directly, usually by oxidation

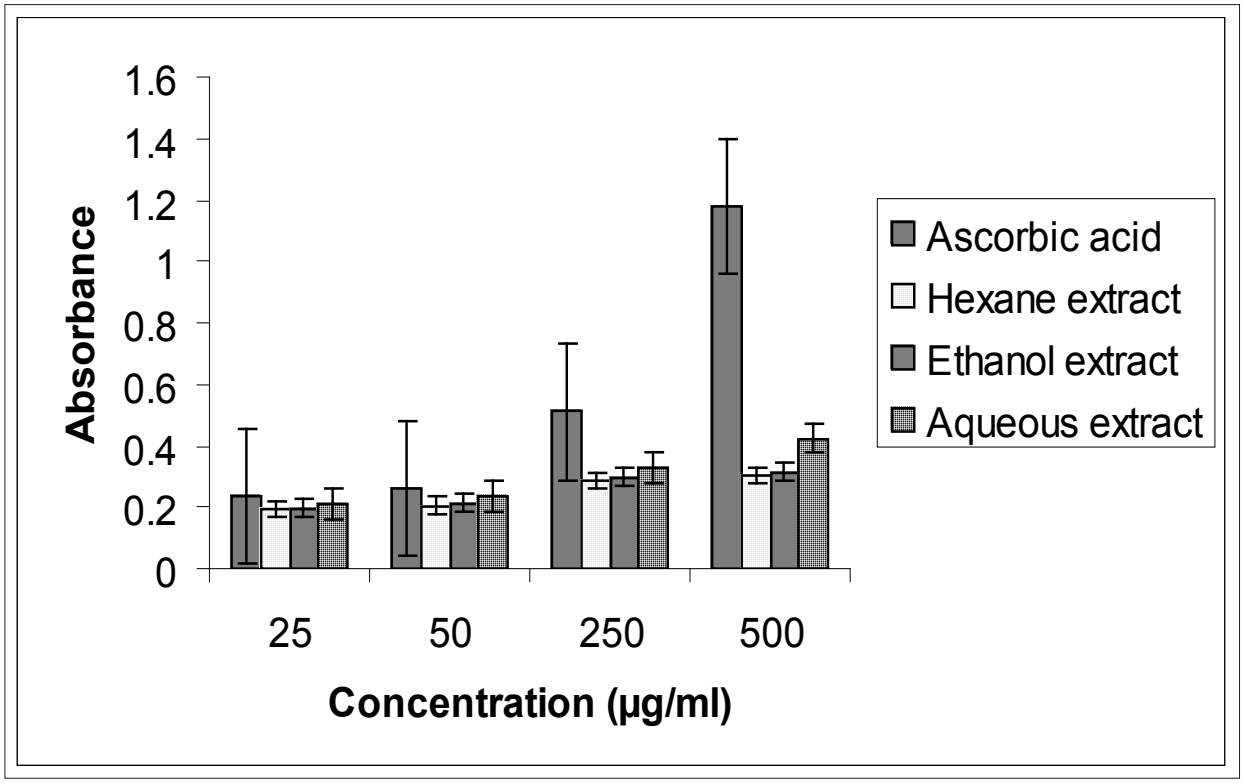

Figure 2. The reductive ability of *Talinum portulacifolium* different extracts and standard BHT. Results are mean ± S.E of three parallel measurements.

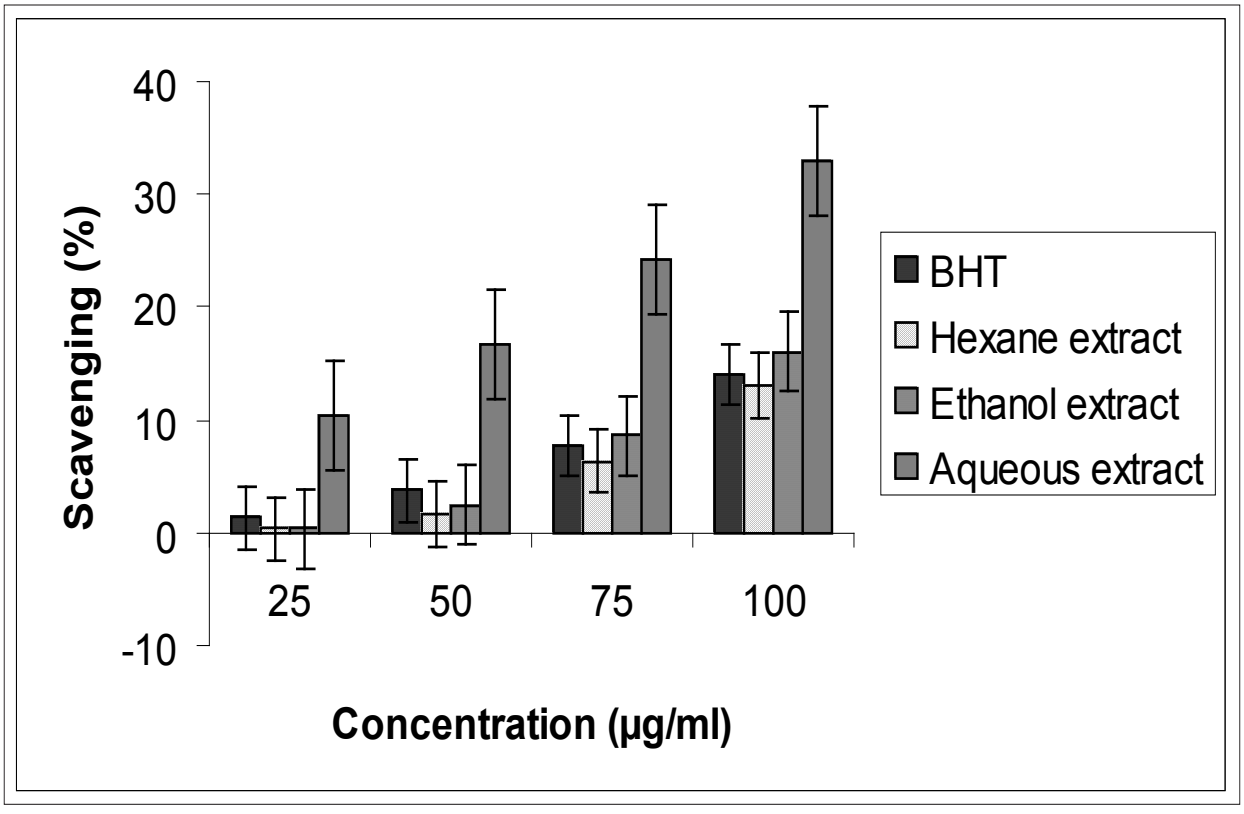

Figure 3. Scavenging effect of *Talinum portulacifolium* different extracts and standard BHT on nitric oxide radical. Results are mean ± S.E of three parallel measurements.

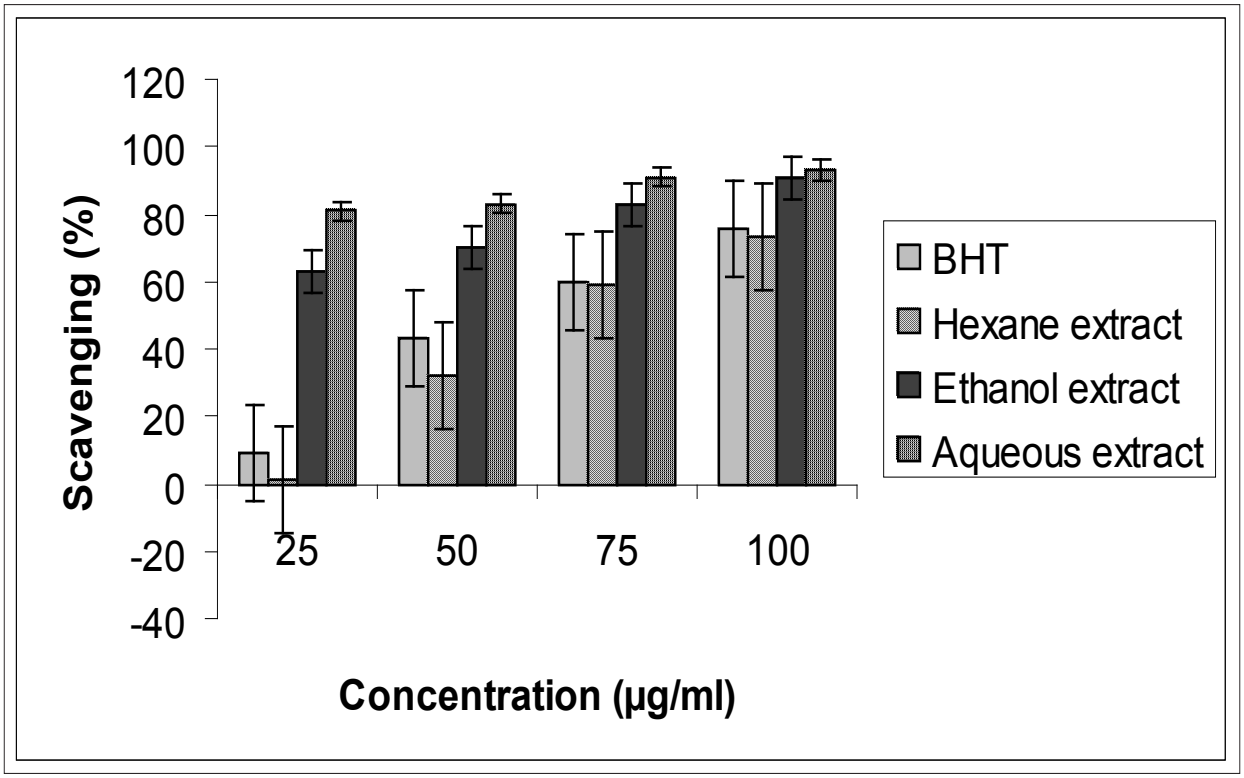

Figure 4. Scavenging effect of *Talinum portulacifolium* extracts and standard BHT on hydrogen peroxide. Results are mean ± S.E of three parallel measurements.

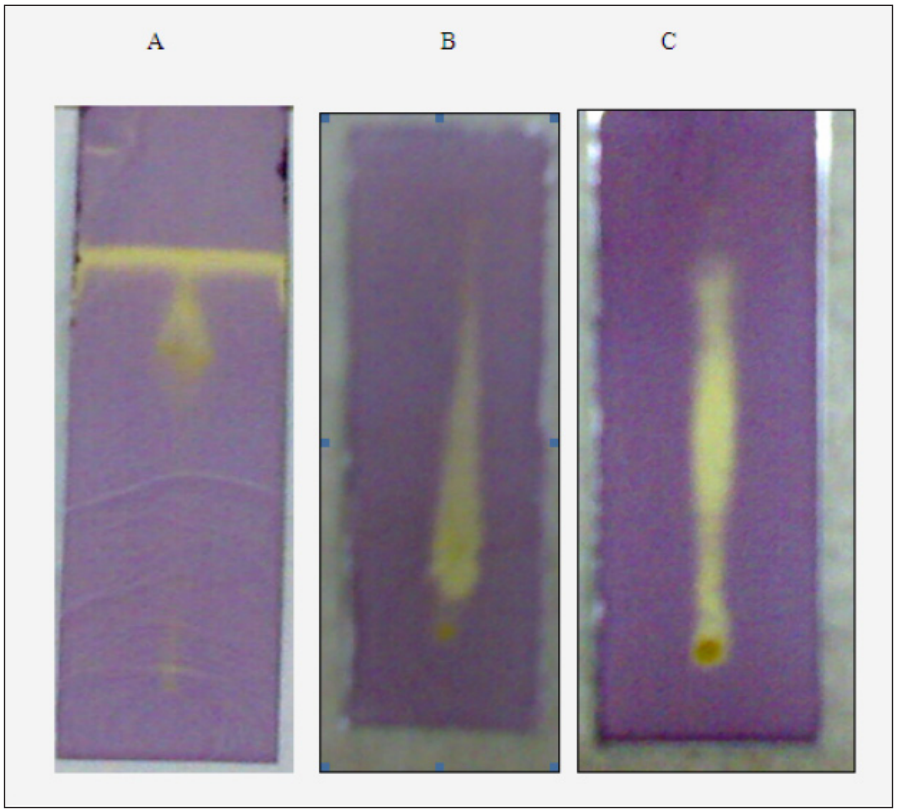

Figure 5. TLC-DPPH Chromatograms of hexane (A), ethanol (B) and aqueous(C) extracts.

of essential thiol (-SH) groups. Hydrogen peroxide can cross cell membranes rapidly, once inside the cell, H_2O_2 can probably react with Fe2+, and possibly Cu2+ ions to form hydroxyl radical and this may be the origin of many of its toxic effects (34). It is therefore biologically advantageous for cells to control the amount of hydrogen peroxide that is allowed to accumulate. Hydroxyl radical is the most reactive among reactive oxygen species (ROS) induces severe damage to adjacent biomolecules (35). The scavenging abilities of *Talinum portulacifolium* extracts on hydrogen peroxide were shown in Figure 4, each extract hydrogen peroxide scavenging activity was increased with increasing concentration of the extract (25-100ug). Aqueous extract (93%) had higher activity than hexane (73.5%) and ethanolic (91%) extracts .The standard BHT has shown 75.7% scavenging activity.

The TLC-DPPH chromatograms (Figure 5) reveals the presence of antioxidant compounds in all 3 extracts, which were detected as yellow spots against a purple background on TLC plate sprayed with 0.2% DPPH in methanol. From the chromatograms it was clear that aqueous extract having more potent antioxidant compounds than hexane and ethanolic extracts.

CONCLUSIONS

The present study showed that the hexane extract *of Talinum portulacifolium* not only possess antihyperglycemic activity but also antioxidant activity. This antioxidant property may reduce oxidative stress in diabetic patients which prevent diabetic complications. The antihyperglycemic activity of hexane extract of *Talinum portulacifolium* leaves may be due to its stimulating effect on the remnant beta cells or improvement in insulin action at cellular level or it could also be due to its insulin like effect. Further studies are under progress to identify the active antihyperglycemic compound(s) in hexane extract.

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