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Full Proceeding Paper

ANTIDIABETIC EFFICIENCY OF *MORINGA OLEIFERA AND SOLANUM NIGRUM*

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ABSTRACT

Diabetes mellitus (DM) is a metabolic disorder throughout the world. This disorder could be treated with herbal plants. Medicinal plants are exploited for many drugs to treat various ailments. The drugs derived from the plants promote health, augmented the resistance of the body against disease. Plants such as *Moringa oleifera, Solanum nigrum* have hypoglycemic properties and other beneficial properties. The objective of the study was to analyze and compare anti diabetic and hypolipidemic effect of *Moringa oleifera* and *Solanum nigrum* on known diabetic and hyperlipidemic patients. The aqueous extract of these plants were assessed for their hypoglycemic and hypolipidemic effects. Presence of primary and secondary metabolites was also screened. Patients in the age group of 35 – 60 years were selected for the study. Only male patients were selected and the study was carried out for 90 days. The level of glucose, glycosylated haemoglobin, total cholesterol, triglyceride, LDL- cholesterol was reduced to 23, 12.5, 40, 18% and HDL- cholesterol was increased to 20% on treatment with *Moringa oleifera* and while on treatment with *Solanum nigrum* the level was reduced to 19,10,17,8% and increased to 2% respectively. Among these two extract treatment *Moringa oleifera* was found to be more effective than *Solanum nigrum.* Presence of primary and secondary metabolites played a significant role in hypoglycemic activity. The preliminary screening results indicated that the plants possessed various constituents like tannins, phenols, alkaloids, flavonoids and carotenoids.

Keywords: *Moringa oleifera, Solanum nigrum,* Antidiabetic, Antihyperlipidemic phytoconstituents.

INTRODUCTION

Diabetes mellitus is a prevalent disease affecting the population of most of the countries in the world. This disease is caused by the abnormality in carbohydrate metabolism which could be due to low insulin secretion or insensitivity of target organs to insulin [1].

Several limitations were found in existing synthetic drugs which persuaded the search for newer hypoglycemic agents of plant origin for the treatment of diabetes. The searched herbal drugs with antidiabetic activity are yet to be formulated as medicines, even though they have been used for their therapeutic properties [2]. Hypoglycemic herbs increase insulin secretion, increase glucose uptake by tissues and inhibit glucose absorption from intestine and glycogenolysis from liver [3]. The aim of this research was to compare the aqueous extract of leaves of *Moringa oleifera and Solanum nigrum* as an anti-diabetic agents.

MATERIALS AND METHOD

Plants like *Moringa oleifera* and *Solanum nigrum* were selected as nutraceutical and herbal plants for the present study. About 20 diabetic patients in the age group of 35 to 60 were selected as test groups and 10 healthy individuals of same age served as controls. 5 ml of blood was drawn, allowed to clot and centrifuged to separate serum which was used for further biochemical analysis. This work was carried out at Dr.Arunagiri Computer Diagnostics, Tiruchirappalli.

Procurement of Herbs

Greens such as *Moringa oleifera* (Murungai), *Solanum nigrum* (Manathakali) were procured from Gandhi Market, Tiruchirappalli.

Extraction of leaves

The leaves were washed under running tap water to remove dust particles and then rinsed in distilled water. 100 gms of leaves were extracted with water.

Screening of Primary and secondary metabolites

Carotenoids were estimated as described by Zakaria *et al.,* (1979) [4]. Carbohydrate was estimated by the method followed by Hodge *et al*., (1962) [5]. Phenols were estimated as depicted by Malick and Singh (1980) [6]. Cellulose was estimated by the method adapted by Updegraff (1969) [7]. Total Protein was estimated as adapted by Lowry *et al.,* (1951) [8]. Preliminary Phytochemical screening of the plants extracts was carried out as per the methods and tests given by Dey and Raman (1957) [9].

Biochemical analysis

Glucose was estimated by the method of Triender (1969) [10], Glycosylated haemoglobin (GHb) by ion exchange resin method of Trivelli *et al.,*(1971) [11], Total Cholesterol by the method of Allain, (1974) [12], Triglyceride by the method of (Buccolo 1973) [13], HDL Cholesterol by the method of Gordon, (1977) [14], Estimation of LDL cholesterol as described by Friedwald *et al*., (1972) [15].

RESULT AND DISCUSSION

Herbal drugs used as nutritional agents to promote health naturally. They act as healing agents without side effects. Nowadays dietary supplements from herbal medicines are flooding the markets. The use of these supplements provides an effective treatment for various ailments.

Table 1: Levels of Primary metabolites

Description	Carbohydrate (mg/100g)	Phenol (mg/100g)	Cellulose (mg/100g)	Protein (mg/100g)	Carotenoid (mg/100g)
Moringa oleifera	24	160	1400	24	18.8
Solanum nigrum	53	90	4500	25	18.8

Table I shows the carbohydrate, phenol, cellulose, protein, and carotenoids contents of *Moringa oleifera, Solanum nigrum.* Among the two plant extracts the carbohydrate cellulose, and protein content of *Solanum nigrum* was comparatively higher than *Moringa oleifera*, while the phenolic content was higher in *Moringa oleifera.*

Table 2: Preliminary Phytochemical Screening of Aqueous Extracts

S. No.	Description	*Moringa oleifera*	*Solanum nigrum*
1.	Saponin	+ve	+ve
2.	Protein	+ve	+ve
3.	Tannin	+ve	-ve
4.	Sugar	+ve	-ve
5.	Quinone	+ve	-ve
6.	Coumarins	+ve	+ve
7.	Flavonoid	+ve	+ve
8.	Sterol	+ve	+ve
9.	Terpenes	-ve	-ve
10.	Lignin	+ve	+ve
11.	Alkaloid	+ve	+ve

Table II shows the presence of phytochemicals in the plant extract. Tannin, sugar and Quinone was absent in *Solanum nigrum.* Terpenes was absent in *Moringa oleifera* and *Solanum nigrum.* Other constituents were present in both the plant extracts.

Table 3: Changes in the level of glucose, glycosylated haemoglobin and lipid Profile on treatment with extract of *Moringa oleifera*

S. No.	Description (mg/dl)	Control	Before Treatment	Period of treatment with *Moringa oleifera* (Month)		
				I	II	III
1	Glucose	97.25 ± 2.21	151 ± 1.70	125.5 ± 1.29	117 ± 2.58	117.5 ± 1.7
2	GHb (%)	7.7 ± 0.11	10.5 ± 0.08	9.1 ± 0.11	8.25 ± 0.12	8.35 ± 0.2
3	Cholesterol	185.75 ± 8.69	273 ± 2.16	260 ± 4.54	253 ± 0.81	239 ± 2.70
4	Triglyceride	163 ± 2.16	286.75 ± 2.75	209.75 ± 3.77	183.75 ± 4.85	173.5 ± 4.3
5	HDL-C	43.75 ± 2.21	44.75 ± 3.86	52.75 ± 3.09	53 ± 1.82	53.25 ± 0.5
6	LDL – C	94.75 ± 1.70	184 ± 2.94	167.5 ± 2.38	154 ± 1.63	151.5 ± 1.2

Table III represents the levels of glucose, glycosylated haemoglobin, cholesterol, triglyceride and lipoproteins of control, before treatment, after treatment with *Moringa oleifera* extract and compared. The level of glucose, glycosylated haemoglobin was decreased to 17.2%, 13.3% after treatment with aqueous extract of *Moringa oleifera* for 30 days, 22.5%, 21.4% for 60 days and 22.1%, 20.4% for 90 days of treatment. There was decrease in total cholesterol 4.7% in 30 days, 7.3% in 60days and 14.22 % in 90 days of treatment when compared to before treatment. The level of triglycerides showed that there was decrease in its concentration by 27% in 30 days treatment, 36% in 60 days and 39.49 % in 90 days of treatment. LDL-Cholesterol level was reduced to 9 % in 30 days of treatment, 16.3% in 60 days, 17.66% in 90 days when compared with before treatment, no significant change was observed in HDL-Cholesterol.

Table 4: Changes in the level of glucose, glycosylated haemoglobin and lipid Profile on treatment with extract of *Solanum nigrum*

S. No.	Description (mg/dl)	Control	Before Treatment	Period of treatment with *Solanum nigrum* (Month)		
				I	II	III
1	Glucose	97.25 ± 2.21	148.75 ± 2.98	132 .75 ± 1.7	123.25 ± 1.71	120.5 ± 2.5
2	G.Hb (%)	7.65 ± 0.12	9.7 ± 0.18	9.4 ± 0.08	8.7 ± 0.37	8.55 ± 0.12
3	Cholesterol	185.75 ± 8.69	303 ±5.56	283.5 ± 1.29	278 ± 2.70	272 ± 6.07
4	Triglyceride	163 ± 2.16	211.5 ±7.76	190 ± 7.11	179.5 ± 9.5 46.5 ± 1.29	176 ± 7.3
5	HDL-C	43.75 ± 2.21	45.5 ±2.16	46.75 ± 0.95	194.75 ± 2.21	46.2 ± 2.06
6	LDL – C	94.75 ± 1.70	210 ± 2.08	196 ± 2.16		193 ± 3.5

Table IV represents the levels of glucose, glycosylated haemoglobin, cholesterol, triglyceride and lipoproteins of control, before treatment, after treatment with *Solanum nigrum* extract and compared. The level of glucose, glycosylated haemoglobin was decreased to 10.8%, 3.1% after treatment with aqueous extract of *Solanum nigrum* for 30 days, 16.8%, 10.3% for 60 days and 18.9%, 12.3% for 90 days of treatment. There was decrease in total cholesterol 6.6 % in 30 days, 8.25% in 60days and 10.3 % in 90 days of treatment when compared to before treatment. The level of triglycerides showed that there was decrease in its concentration by 9.9% in 30 days treatment, 15.1% in 60 days and 16.5% in 90 days of treatment. LDL-Cholesterol level was reduced to 6.6 % in 30 days of treatment, 7.6% in 60 days, 8.0 % in 90 days when compared with before treatment, there was no modification in HDL-Cholesterol during treatment period.

The phytochemical investigation of *Moringa oleifera* showed the presence of bio flavonoids that stimulates the glucose uptake in peripheral tissues and regulates the activity of the enzymes involved in carbohydrate metabolism was reported by Gupta R *et al*., (2011). In the present study the level of glucose and glycosylated haemoglobin was significantly (P< 0.001) decreased on treatment with aqueous extract of *Moringa oleifera* leaves. In the present study aqueous leaf extracts of *Moringa oleifera* showed the presence of phytosterols, glycosides, tannins and amino acids. The hypolipidemic, hypoglycemic effect could be due to the presence of these phytoconstituents.

The preliminary phytochemical screening of aqueous extract of *Solanum nigrum* proved the presence of alkaloids which has antidiabetic effects by possibly stimulating insulin release from pancreatic beta cells.

The efficacy of *Solanum nigrum* on antihyperlipidemic activity might be due to the presence of glycoprotein which increases the activity of antioxidant enzymes. The reason for the hypocholesterolemic effect is through phospholigation of cAMP-dependent protein kinase (PKA), which is activated by the *Solanum nigrum* glycoprotein (Lee

SJ *et al* 2005). HMG-CoA reductase activity was inhibited by glycoprotein in *Solanum nigrum* thus modulating the hyperlipidaemic condition to near normal. Our results are in conformity with the above research findings.

CONCLUSION

In the present study it was concluded that *Moringa oleifera* leaves has antidiabetic activity and *Solanum nigrum* leaves has antilipidaemic activity.

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