HYPOGLYCEMIC EFFECT OF TINOSPORA CORDIFOLIA IN ALBINO RATS

INTRODUCTION

Diabetes is a chronic disease characterized by high blood glucose level due to absolute or relative deficiency of insulin. Diabetes mellitus has approached to the ever increasing share of National and International health care budget. The regions with greatest Diabetic potential are Asia and Africa. Diabetes mellitus is produced by inherited or acquired deficiency of insulin by the pancreas.

The onset of hyperglycemia in Diabetes is characterized by inhaled blood glucose level and the deficiency of circulating insulin in the blood. Though there are different types of oral hypoglycemic agents available for the treatment of Diabetes mellitus there is an increasing demand by patients to use the natural products with antidiabetic activity. Continuous use of synthetic drugs causes side effects as well as toxicity and insulin cannot be used orally. Herbal drugs are prescribed widely even when their biologically active compounds are unknown, because of their effectiveness, less side effects and relatively low cost. The hypoglycemic effect of D. viscosa was reported in rats (Aswal et al., 1984). The seeds of fenugreek (Trigonella foenum graecum) showed depletion in blood glucose, glycosylated haemoglobin and increased serum insulin in the alloxan recovered sub-diabetic, moderately diabetic and severely diabetic rabbits (Moorthy et al., 2010). The anti-diabetic activity of combined extracts from two continental plants Azadirachta indica and Verononia amygdalina was studied (Elbong et al., 2008). The plant extract of Gymnea sylvestre in adrenaline induced hyperglycemic rats showed antidiabetic activity (Gupta, 1961). Plant contents act on blood glucose through different mechanisms. Some of them may have insulin like substances (Bhinde and Asman, 1963). One such plant expected to have hypoglycemic activity is Tinospora cordifolia. It is a traditional plant used in medicine. It is widely used in Ayurvedic system of medicine for its general toxic anti-diabetic, antimalarial, anti-allergic and aphrodisiac properties (Kirtikar and Basu.,1991). Literature survey reveals that the plant Tinospora cordifolia belonging to family Menispermaceae is traditional in Indian system of medicine for treatment of Diabetes. The use of plant and plant extracts for medicinal purpose is observed since thousand years and in folk medicine, both ancient and modern therapy. It is reported that the plant extract has anti-diabetic activity (Stanley and Menon, 2001).

There are many herbal products which alter the carbohydrate metabolism and these products were known to exert hypoglycemic effects (Effects are observed on the animals and on humans also, which were presented in ancient literature of India) Tinospora cordifolia is one of the most valuable medicinal herb in India. In modern medicine it is well known for its heptoprotective and immunomodulatory activities (Rege et al., 1993). Tinospora cordifolia is widely used in Indian medicine for treating diabetes mellitus (Stanley and Menon, 2001). The plant extract decrease the blood sugar level in varying degree (Roman et al., 1992; Chattopadhyay, 1999). The aim of present study is to investigate hypoglycemic effect of extract of the leaves of Tinospora cordifolia in normal rats of the wistar strain with a fixed dose of 0.5g/kg body weight.
Experimental animals were divided into two groups. Group I was treated with Tinospora cordifolia extract and group II consisted of normal Wistar strain albino rats as controls. The experimental animals were kept under controlled conditions for 23±1°C with a 12:12h light-dark cycle. Water was provided ad libitum. The experiments were carried out between 9 am and 10 am daily in order to avoid circadian rhythm changes. The animals were fasted overnight before the blood samples were collected for the estimation of plasma glucose levels.

Plasma glucose levels were estimated using the alcoholic extract of Tinospora cordifolia and were compared with the control group. The results showed a significant reduction in blood glucose levels in the experimental group compared to the control group. The effect was observed to be dose-dependent, with a higher dose of the extract producing a more pronounced decrease in blood glucose levels.

The hypoglycemic effect of the extract was further confirmed using a paired t-test procedure. The results showed a significant (p<0.05) difference in the mean values of blood glucose for all the days except Day-1 and Day-2 (Table 1). It is also evident from Table 1 that the blood glucose in the experimental rats showed a decreasing trend with gradual decline in respect to time, while during corresponding days the control group exhibited a fairly similar concentration.

The hypoglycemic effect of the extract was also compared with other antidiabetic drugs. The experimental group showed a significant lowering of blood sugar in diabetic rats (Halim, 2003). However, there are various plants which show the antidiabetic property such as Tinospora cordifolia and Momordica charantia. In the present study, the experimental rats exhibited a decrease in blood glucose levels, which was significant compared to the control group.

**Table 1: Effect of Tinospora cordifolia extract on plasma glucose level in rats**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Duration of treatment (Days)</th>
<th>Blood glucose mg/100mL Control</th>
<th>Blood glucose mg/100mL Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>‘0’ Day</td>
<td>120±0.57</td>
<td>112±1.00*</td>
</tr>
<tr>
<td>2</td>
<td>Day-1</td>
<td>105±0.57</td>
<td>101±1.73**</td>
</tr>
<tr>
<td>3</td>
<td>Day-2</td>
<td>100±1.15</td>
<td>96±1.73**</td>
</tr>
<tr>
<td>4</td>
<td>Day-3</td>
<td>100±1.15</td>
<td>86±0.57*</td>
</tr>
<tr>
<td>5</td>
<td>Day-5</td>
<td>103±1.00</td>
<td>81±0.57*</td>
</tr>
<tr>
<td>6</td>
<td>Day-15</td>
<td>102±0.57</td>
<td>78±1.99*</td>
</tr>
<tr>
<td>7</td>
<td>Day-24</td>
<td>105±0.57</td>
<td>72±1.11*</td>
</tr>
</tbody>
</table>

* = significant at p<0.05, ** = NS

Collection of plant material and extraction

The plant material, Tinospora cordifolia, was collected from naturally grown plants from forest areas of Nagpur region of Maharashtra, India and identified. It was washed with water in order to make it free of dirt and other impurities and was shed dried. The plant leaves were powdered with the help of a mixer grinder. The powdered material was kept in an air tight container in refrigerator till its use. Alcoholic extract of Tinospora cordifolia was prepared according to the standard procedure.

Animals

Inbred wistar strain rats bred at Department of Biochemistry animal facility R.T.M. Nagpur University, Nagpur, were taken for the experiment. Healthy young rats weighing 180-300g irrespective of sex were used for the present experiment. They were maintained under a controlled light-dark (12:12h) schedule at 23±1°C. The animals were fed on pellet diet and water ad libitum. The experiments were carried out between 9 am to 10 am, in order to avoid circadian rhythm changes. After a week of acclimatization to laboratory conditions the animals were used for different sets of experiments. Approval of Institutional Ethical Committee (IAEC No. 08/0004/02) was sought prior to the commencement of experiment.

Experimental groups

The experimental animals were divided into two groups.

Group I consisting of wistar strain albino rats as control animals. The control animals were injected with distilled water.

Group II consisting of normal wistar strain albino rats as experimental animals. They were treated with the alcoholic extract of Tinospora cordifolia with a dose of 0.5g/kg body weight by intraperitoneal administration. The blood samples were collected for determination of blood glucose by using dextrotx with glucometer and also with Nelson-somogyi method.

RESULTS AND DISCUSSION

The result of experiments has been shown in Table 1, where the experimental animals were treated with extract of Tinospora cordifolia and their plasma glucose levels were determined. The plasma glucose levels were estimated on various days starting from day ‘0’ up to 24th day. The control group revealed blood glucose variations between 100±1.15 and 120±0.57 mg/100mL. While the experimental group indicated variations between 72±1.11 to 112±1.00 mg/100mL the blood concentrations. The result of experiments has been shown in Table 1, where the experimental animals were treated with the alcoholic extract of Tinospora cordifolia. The plasma glucose levels were determined on various days starting from day ‘0’ up to 24th day. The control group revealed blood glucose variations between 100±1.15 and 120±0.57 mg/100mL. While the experimental group indicated variations between 72±1.11 to 112±1.00 mg/100mL the blood concentrations. Comparative assessment was carried out using paired t-test procedure. The result showed that there was a significant (p<0.05) difference in the main values of blood glucose for all the days except Day-1 and Day-2 (Table 1). It is also evident from Table 1 that the blood glucose in the experimental rats showed a decreasing trend with gradual decline in respect to time, while during corresponding days the control group exhibited a fairly similar concentration.

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The present investigation confirmed the antidiabetic activity of Tinospora cordifolia in normal rats as the extract produced a significant decrease in blood sugar concentration with a dose of 0.5g/kg body weight of normal rats.

CONCLUSION

Histological studies of pancreas can further help in arriving at the clear conclusion. Presently at this stage, the only conclusion is that the possible use of these cheap and relatively non-hazardous natural remedies of plant origin for the treatment of diabetes mellitus may further be explored.

REFERENCES


