Antidiabetic activity of a polyherbal preparation (tincture of panchparna) in normal and diabetic rats

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The present work was executed to evaluate the anti-diabetic potency of a polyherbal formulation, and its influence on derangement in the metabolism of glucose and cholesterol and changes in sodium levels in serum and urine in normal and alloxan induced diabetic rats. Serum glucose and serum cholesterol levels were found to be increased in diabetic animals. Serum sodium and urinary sodium, hepatic glycogen levels are found to be decreased in diabetic state. Treatment with the polyherbal formulation (1.0 ml/kg body wt) for 30 days in diabetic animals has shown decrease in serum glucose and serum cholesterol levels in comparison to control animals, whereas in normal treated animals, the formulation does not effect the serum glucose and serum cholesterol levels. Serum sodium and urinary sodium levels were increased in both diabetic treated and the control animals. Hepatic glycogen levels were increased in diabetic treated animals, but there was no change in the control treated animals.

Diabetes mellitus is the name given to a group of disorders characterised by absent (or) deficient insulin secretion (or) peripheral insulin resistance resulting in hyperglycemia. Impaired metabolism of a number of other biomolecules such as glucose, lipids, proteins and glycoproteins have also been reported

Plant products investigated for anti-diabetic effect have been exhaustively reviewed. Such as Phyllanthus amarus, Pterocarpus marsupium, Salacia oblonga etc. According to Ayurvedic texts, a combination of substances is used to get the enhanced desired action and eliminated unwanted side effects. These ingredients may aid absorption of active principles responsible for hypoglycemic action and protective action on organs.

The polyherbal formulation (Tincture of Panchparna) which was used in the study is a tincture contains leaves of Coccinia indica, Cocculus villosus, Catharanthus roseus, Gymnema sylvestre, Coccinia indica, Catharanthus roseus, Momordica charantia, Gymnema sylvestre have been reported to have hypoglycemic activity.

Experimental—White albino rats of either sex (80-120 g) were obtained from Ghosh Enterprises, Calcutta. All the rats were fed with normal laboratory diet.

The experimental set up consists of 4-groups.
Each group consists of 5 animals
DC-Diabetic control, DT : Diabetic, formulation treated, C-control, CT : Control, formulation treated

Induction of diabetes—Animals were allowed to fast 24 hrs, and were injected with freshly prepared aqueous solution of alloxan monohydrate in a dose of 200 mg/kg (ip.) Blood glucose was measured after 20 hrs of alloxanisation and they were maintained in diabetic state over a period of 20-days. Rats showing fasting blood glucose levels around 300mg/dl were selected for the study.

Preparation of the formulation—Leaves of Coccinia Indica, Coccus Villosus, Catharanthus Roseus, Gymnema Sylvestre, Momordica Charantia were collected, and allowed to dry. Dried leaves are powdered and mixed in equal proportions. Then the mixture was allowed to contact with 90% alcohol (about five times wt of the mixture taken, with occasional shaking) for a week (simple maceration). Then it was filtered. The filtrate was used for study.

Treatment & analysis—Group-DT & Group-CT, which are diabetic and normal rats were administered orally the formulation at a dose of 1.0 ml/kg daily for a period of 30-days. Blood samples were collected from retro-orbital plexus and analysed for serum glucose content (Glucose-oxidase method), serum cholesterol (Wybenga-Pileggi method), serum and urinary sodium levels (flame photometry) and Hepatic glycogen (acid hydrolysis) levels were measured at the end of treatment.

Statistical evaluation—All values are presented as mean ± SE, statistical comparisons were made by
Table 1—Effect of polyherbal formulation (Tincture of panchparna) on serum glucose, serum cholesterol, serum sodium & urinary sodium levels and hepatic glycogen levels in diabetic and control rats
[Values are mean ± SE of 5 animals in each group and significant at P< 0.01. Treatment period: 30 Days (1.0 ml/kg)]

<table>
<thead>
<tr>
<th>Groups</th>
<th>Serum glucose (mg/dL)</th>
<th>Serum cholesterol (mg/dL)</th>
<th>Serum sodium (meq/L)</th>
<th>Urinary sodium (meq/L)</th>
<th>Hepatic glycogen (µg/g of tissue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-DC</td>
<td>319.75 ± 26.55</td>
<td>116.92 ± 17.01</td>
<td>85</td>
<td>25</td>
<td>93.73 ± 14.5</td>
</tr>
<tr>
<td>Group-DT</td>
<td>90.33 ± 17.76</td>
<td>79.52 ± 9.90</td>
<td>103</td>
<td>38</td>
<td>143.33 ± 8.82</td>
</tr>
<tr>
<td>Group-C</td>
<td>100.25 ± 4.66</td>
<td>97.75 ± 4.66</td>
<td>120</td>
<td>50</td>
<td>130 ± 10.02</td>
</tr>
<tr>
<td>Group-CT</td>
<td>91.5 ± 6.68</td>
<td>91.5 ± 6.68</td>
<td>150</td>
<td>70</td>
<td>130.5 ± 7.41</td>
</tr>
</tbody>
</table>

using students 't' test, statistical significance was considered at P≤0.01. Pooled urine and serum were taken for urine sodium and serum sodium estimation, mean values are represented in the table.

**Serum glucose**—After 30-days of treatment, the serum glucose levels in diabetic treated animals were significantly decreased in comparison with diabetic control animals. Where as there is no significant change in glucose levels of normal animals treated with the formulation.

**Serum cholesterol**—Serum cholesterol levels in both diabetic treated and control treated animals were decreased, but this is not statistically significant.

**Serum sodium-urinary sodium**—Serum sodium and urinary sodium levels of diabetic treated and normal treated animals were increased in comparison to diabetic control and normal control animals.

**Hepatic glycogen**—Hepatic glycogen levels of diabetic treated animals were raised to normal values in comparison to diabetic control animals. Where as in normal treated animals there was no change of glycogen.

The anti hyperglycemic effect and improved hepatic glycogen levels, in diabetic treated rats with the tincture of panchparna may be due to the multiple effects of chemical constituents of different plants in the tincture, viz. Pectins from *Coccinia indica* were reported to have effect on liver glycogen synthesis\(^2\), *Vinblastine sulphate* from *Vinca rosea* decreased rate of glucose absorption, from small intestine\(^3\), Chromium content of *Gymnema sylvestre* was found to have relationship with its hypoglycemic activity\(^4\), Charantin and β sitosterol glucoside from *Momordica charantia* were found to have hypoglycemic effects\(^5\). Interestingly the tincture have shown no effect on blood glucose levels in control rats. Though not significant, the antihyperlipidemic activity shown by the tincture in the present limited time period study, may be due to the antihyperlipidemic activities of pectin from *Coccinia indica*\(^6\), vincristine from *Vinca rosea*\(^8\), unidentified chemical constituents from *Gymnema sylvestre*\(^9\).

The decrease in urinary sodium levels in diabetic rats compared to control is in conformation with the previous reports, which shows that pathologically sustained hyperglycemia results in hypoperfusion, tubular necrosis and structural and functional decrease of glomerular filtration. This may lead to high extracellular fluid concentration of sodium which due to concentration gradient, enter the internal environmental of cell and may have deleterious effects on number of enzyme systems\(^10\). Such as glycogen synthase, yeast aldehyde dehydrogenese, choline acetylase\(^11\). Also K\(^+\) bound to phosphate and is required for conversion of glucose to glycogen. This potassium is released during glycogenolysis. Carbohydrate intake in general causes movement of K\(^+\) into the cell and formation of glycogen, but in hyperglycemic conditions, excess extracellular sodium shifts into the cells and displaces K\(^+\) (ref. 22), hence glycogen synthesis may be hampered. In the current study decrease in serum and urinary sodium levels in diabetic control rats were improved in diabetic rats treated with panchparna tincture. The improvement in sodium level is in turn reflected in terms of improvement of hepatic glycogen levels in diabetic treated rats with panchparna tincture and this would further be confirmed by estimation of activity of liver glycogen synthase and serum and urine potassium levels.

**References**
4. Manickam M, Ramanathan M & Jahnomi M A, Antihyperglycemic activity of phenolics from *Pterocarpus marsupium*.\(^11\)


