Anti-Diabetic Activity of Herbal Extract Mixture

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ABSTRACT

Indian system of medicine, Siddha has mentioned numerous plants for the treatment of diabetes. In folk medicine they are effective either single (or) combinational therapy. Based on ethnopharmacological sources, the potent hypoglycemic herbs of Indian origin *Solanum xanthocarpum* and *Terminalia belerica* were selected for the present work. The plants were extracted with solvents of increasing polarity. Further all the extracts were screened for antioxidant property by in vitro nitric oxide assay to determine its potential to scavenging the free radical. From that aqueous extract of the both plants was selected and prepared in different combination ratio from 10:90, 20:80 30:70, 40:60, 50:50,60:40,70:30,80:20,90:10 (*Terminalia belerica*: *Solanum xanthocarpum*). The safety profile of the herbal extract mixture was studied by acute toxicity. The selected bio active herbal extract was subjected into antidiabetic activity by STZ induced method. Antidiabetic activity of herbal extract mixture showed that blood glucose level was significantly decreased in diabetic rats at both the tested dose levels. Herbal extract mixture significantly lower the biochemical parameter SGOT, SGPT, Total cholesterol and Serum triglyceride as compared to diabetic rat. Extract mixture has shown significant reduction of SOD and GPX in diabetic rats.


1. INTRODUCTION:

Herbs are a prime medicinal agents in traditional and holistic therapies. The herbal medicines plays a major role in the treatment of chronic disease, because herbal medicine have less side effects easy availability and low cost. Diabetes mellitus is incurable condition due to insulin deficiency and is not a single disease entity, but rather a group of metabolic disorders sharing the common underlying feature of hyperglycemia[1]. Though there are various approaches to reduce the ill effects of diabetes and its secondary complications, herbal formulations are preferred due to lesser side effects and low cost and also polyherbal extracts can be made as it can produce more efficiency due to synergistic effect.

1.1. ETHNOBOTANICAL PREFACE

1.1.1. *Solanum xanthocarpum Schrad. & Wendl.* : It consists of mature, dried whole plant of *Solanum xanthocarpum* Schrad. & Wendl belong to the Family Solanaceae[2]. The whole plant is mainly used in chronic diseases (jaundice, diabetes mellitus). It is also used in the treatment of asthma, bronchitis, cough, constipation and in dropsy.


2. Extraction:
The plant specimens for the proposed study were collected from R.R.Herbal, Chennai, Tamilnadu. It was identified and authenticated by Dr. P. Jayaraman, Director, Plant Anatomy Research Centre, (PARC) Tambaram, Chennai. About 500 gm of the powdered materials
were extracted separately by cold maceration procedure successively with solvents of increasing polarity (Petroleum ether (60-80°C), Ethanol and Water)[4].

2.1. Preparation of herbal extract mixture:
Petroleum ether, ethanol and water extract of both the selected plants (Terminalia belerica and Solanum xanthocarpum) were subjected to preliminary phytochemical test. Antioxidant activity results of various extracts of both the plants indicated that aqueous extract of the plants was found to exhibit maximum percentage of inhibition[5]. The combination of aqueous herbal extract mixture was selected which showed high percentage of inhibition about 84.61%.

2.3. Pharmacological studies[6]

2.3.1. Experimental animals
Adult male wistar rats weighing 150-175 gms and wistar mice 20-25 gms were used in the pharmacological and toxicological studies.

2.3.2. Induction of Diabetes
Method: Streptozotocin induced model
Animals: wistar albino rats (180-200gm)
Inducing agent: Streptozotocin
Test drug: Herbal extract mixture (two dose level)
Standard drug: Metformin (20mg/kg body weight)

GROUP I : Normal (vehicle, 10ml/kg orally)
GROUP II : Diabetic control (CMC in 2% w/v, 2ml/kg bw orally)
GROUP III: Standard (Metformin 20 mg/kg in CMC in 2% w/v orally)
GROUP IV: Herbal extract mixture 250 mg/kg CMC in 2% w/v (orally)
GROUP V: Herbal extract mixture 500 mg/kg CMC in 2% w/v (orally)

2.3.3. Biochemical estimation
Serum was analysed for the following biochemical parameters: Total protein, Serum albumin, Serum globulin, Serum glutamate oxaloacetate transaminase (SGOT), Serum glutamate pyruvate transaminase (SGPT), Total cholesterol, Serum Triglyceride[7]. The results were tabulated in Table 1.

3. Results:
Table : 1 Biochemical estimation of Adult male wistar rats

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Glucose (mg/dL)</th>
<th>Hemoglobin (mg/dL)</th>
<th>Total cholesterol (mg/dL)</th>
<th>Triglycerides (mg/dL)</th>
<th>HDL (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Group I)</td>
<td>96.1 ± 0.28</td>
<td>13.5 ± 0.43</td>
<td>110.6 ± 5.77</td>
<td>74.4 ± 0.40</td>
<td>22.3 ± 0.28</td>
</tr>
<tr>
<td>Diabetic control (Group II)</td>
<td>221.6 ± 2.28</td>
<td>6.7 ± 0.05</td>
<td>227.3 ± 2.88</td>
<td>178.5 ± 0.46</td>
<td>15.2 ± 0.21</td>
</tr>
<tr>
<td>Diabetic + glibenclamide (Group III)</td>
<td>121.6 ± 0.57</td>
<td>13.1 ± 0.04</td>
<td>135.6 ± 1.15</td>
<td>102.6 ± 2.88</td>
<td>22.9 ± 0.04</td>
</tr>
<tr>
<td>Diabetic + Herbal Extract (Group IV)</td>
<td>115.1 ± 0.28</td>
<td>11.7 ± 0.12</td>
<td>13.6 ± 2.88</td>
<td>76.8 ± 0.11</td>
<td>24.8 ± 0.28</td>
</tr>
<tr>
<td>Herbal Extract alone (Group V)</td>
<td>95.1 ± 0.28</td>
<td>13.5 ± 0.01</td>
<td>101.6 ± 2.88</td>
<td>77.8 ± 0.28</td>
<td>21.3 ± 0.28</td>
</tr>
</tbody>
</table>

Values are mean ± SEM (n=6). The difference in body weight were not significant (P>0.05),One Way Anova – followed by Dunnet’s test.

The histological investigation of pancreas. (Normal) A, B, C: Pancreas sections of Normal showing acinar cells and a light-staining islet of Langerhans just right of the center of the field; (Std) D: Diabetic rat showing the acinar cells around the islets is shrunken and associated with intra islet hemorrhage (arrow). (Control) E: Diabetic rat showing degenerative islet of Langerhans (asterisk) associated with different size of vacuoles (long arrow) and hemorrhage (short arrow); (HM -1 ) F: Rat showing the exocrine pancreas appearing more or less as control. Few degenerative cells are seen in the islet. (HM -2 ) G: Rat showing islet of Langerhanst that appeared relatively larger than the control one. Exocrine pancreas appeared more or less as control.
4. SUMMARY
In folk medicine they are effective either single (or) combinational therapy. Based on ethnopharmacological sources, the potent herbal extract was selected and screened for its anti diabetic activity\(^8\). Animals were diabetized by induction with STZ, the herbal extract mixture showed significantly reduction in SGOT, SGPT, total cholesterol and serum triglyceride test treated group as compared to control group\(^9\).

5. CONCLUSION
This present work supports the earlier claims of plant for the treatment of diabetes. This study also provides evidence that aqueous extract of plants *Terminalia belerica :Solanum xanthocarpum* (70:30) have significant antioxidant activity both in vitro and in vivo assay. These combination may have great relevance in the prevention and treatment of diabetes in which oxidant (or) free radicals are implicate\(^{10}\). In addition, this combination ratio of plants can be good for the development of herbal formulation, and the presented physical and Phytochemical data are proof for standardization of herbal extract mixture\(^{11}\). In conclusion, this present work supports, these combination may have great relevance in the prevention and treatment of diabetes in which oxidant (or) free radicals are implicate\(^{12}\).

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