AMELIORATIVE EFFECT OF PLANT EXTRACTS OF SURUHAN (PEPEROMIA PELLUCIDA) ON BLOOD GLUCOSE AND LIBIDO OF MALE MICE INJECTED WITH ALLOXAN

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ABSTRACT
This study was conducted to determine the effect of plant extracts of suruhan (Peperomia pellucida L. Kunth) on the blood glucose level and libido of alloxan-induced male mice. By using a completely randomized design, 25 male albino mice were grouped into five with five replications each. Group 1 treated with alloxan at the dose of 150 mg/kg bw (as negative control). Group 2 was given alloxan and glibenclamide of 0.65 mg/kg bw (as positive control). Group 3, 4 and 5 were treated with alloxan and plant extracts at the dose of 56, 112 and 168 mg/kg bw respectively. Injection of alloxan was done 3 times in 6 days and the plant extract was given every day for 35 days. Results showed plant extracts of suruhan significantly lowering blood glucose levels, shortening courtship and mounting latency, as well as increasing mounting frequency of the mice. It suggests that plant extract of suruhan is potent to be used as anti-hyperglycemic and libido enhancing agents in male subjects.

KEYWORDS: suruhan, Peperomia pellucida, hyperglycaemia, diabetes, male libido.

INTRODUCTION
Patients suffering from diabetes mellitus (DM) disease, due to hyperglycemic condition, will experience oxidative stress and pathophysiological disorders that are well known as the risk factors to accelerate the onset and progression of various complication among diabetic patients.[1] In man, such the carbohydrate metabolism-related disorder can causes sexual dysfunction and infertility. Diabetes-related sexual dysfunction may closely related to lower testosterone levels and be manifested in all its forms such as reduced erection, impotence, and other libido dissociations.[2, 3]

In addition diabetes has also known to cause dysregulation of epigenetic modification during spermatogenesis leading to the decrease in sperm motility, sperm DNA integrity, and ingredients of seminal plasma.[4]

One of the standard drugs that is widely used to treat diabetes mellitus is glibenclamide. However, the use of this drug is not free from side effects.[5] Therefore, the search for safe plant-based medicines is still continues. Among traditional people of South East Asian region, one type of plants that has commonly used as anti-diabetes herbs is Peperomia pellucida L. Kunth. that in Indonesia locally called suruhan.[6] However, the effect of the plant herbs of suruhan on sexual function and fertility of male subjects is not yet known.

This study aims to determine whether the extract of Peperomia pellucida plant which was believed to be efficacious for treating diabetes can ameliorate other pathophysiological defects related to diabetes, especially those related to fertility and sexual function in male subjects.

MATERIAL AND METHODS
Plant Materials
Whole plant samples of suruhan (Peperomia pellucida L. Kunth) used in the study were collected from suburb of Bandar Lampung, Indonesia. The weeds were washed with aquadest, air dried, sliced into small pieces, and then soaked in 96% ethanol for 24 hours. After being macerated for four times, the macerate evaporated using rotary evaporator under low pressure at 50°C until brownish-viscous extract formed.

Animals and Experimental Design
In this study, male albino mice aged 3-4 months, weighing between 30-40 g, obtained from Lampung Veterinary Center, Bandar Lampung, Indonesia were used. The animals were handled according to the Ethical Clearance from Faculty of Medicine, University of Lampung, Indonesia. They were maintained under room
temperature, fed with a standard laboratory diet and water ad libitum. By using a completely randomized design, 25 male albino mice were grouped into five with five replications each. Group 1 treated with alloxan at the dose of 150 mg/kg bw (as negative control). Group 2 was given alloxan and glibenclamide of 0.65 mg/kg bw (as positive control). Group 3, 4 and 5 were treated with alloxan and plant extracts at the dose of 56, 112 and 168 mg/kg bw respectively.

Extract Administration
In this experiment test animals were conditioned to experience hyperglycemia. The hyperglycemic condition of experimental animals was made by intraperitoneally injecting 0.5 ml of alloxan monohydrate (Sigma Aldrich, Cat.No.A7413-10G) at the dose of 120 mg/kg body weight after the mice were fasted for 8 hours. Before and after alloxan injection, blood glucose levels of each animal were measured using strip glucometer (from Roche, Germany).

Sexual Behavior Tests
To assess the libido potential of the test animals, all mice that had been treated with/without plant extract of suruhan were mated with estrous virgin females. The tests were carried out in an open round plastic tray with a diameter of 40 cm and height of 25 cm, as implemented by Kanedi et al.,(2015). The tray was divided into two halves, which were separated by a removable cardboard partition. Both males and females subjected to the tests were allowed to adapt to the tray environment with the partition closed for about 5 min.

RESULTS
Blood Glucose Levels
Blood glucose levels of mice before alloxan inducement and after treatment with standard drug and plant extracts of suruhan were presented in Table 1. Based on the statistical analysis it is clear that ethanol extracts of suruhan significantly ameliorate blood glucose levels of mice subjected to hyperglycaemia by alloxan injection close to normal levels.

Table 2: Effects of suruhan extract on courtship latency of male mice in mating test.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Courtship Latency (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K (alloxan 150 mg)</td>
<td>31.20 ± 7.69&quot;</td>
</tr>
<tr>
<td>K (alloxan + glibenclamide 0.65 mg)</td>
<td>18.80 ± 6.01&quot;</td>
</tr>
<tr>
<td>P1 (alloxan + suruhan 56 mg)</td>
<td>14.80 ± 3.92&quot;</td>
</tr>
<tr>
<td>P2 (alloxan + suruhan 112 mg)</td>
<td>22.60 ± 4.77&quot;</td>
</tr>
<tr>
<td>P3 (alloxan + suruhan 168 mg)</td>
<td>16.60 ± 4.39&quot;</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD. Values followed by the same superscripts are not statistically different at α = 0.05 by LSD test.
Next, as shown in Table 3, all treatment groups significantly perform shorter mounting latency. Lastly, Table 4 presents riding trials performed by male on female's back. These data confirm results shown in Table 2 and 3, that plant extract of suruhan tend to show higher sexual drive in male mice compared with that of negative control group.

Table 3: Effects of plant extracts of suruhan on mount latency of male mice in mating test

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mount Latency (sec)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>K&lt;sub&gt;0&lt;/sub&gt; (alloxan 150 mg)</td>
<td>576.60 ± 52.32&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>K&lt;sub&gt;1&lt;/sub&gt; (alloxan + glibenclamide 0.65 mg)</td>
<td>185 ± 21.63&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;1&lt;/sub&gt; (alloxan + suruhan 56 mg)</td>
<td>127.40 ± 35.5&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt; (alloxan + suruhan 112 mg)</td>
<td>207.20 ± 17.45&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;3&lt;/sub&gt; (alloxan + suruhan 168 mg)</td>
<td>194.80 ± 21.32&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD. Values followed by the same superscripts are not statistically different at α = 0.05 by LSD test.

Table 4: Effects of plant extracts of suruhan on mount frequency performed by male mice in mating test.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mount Frequency</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>K&lt;sub&gt;0&lt;/sub&gt; (alloxan 150 mg)</td>
<td>0.20 ± 0.44&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>K&lt;sub&gt;1&lt;/sub&gt; (alloxan + glibenclamide 0.65 mg)</td>
<td>4.80 ± 0.83&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;1&lt;/sub&gt; (alloxan + suruhan 56 mg)</td>
<td>12.00 ± 2.12&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt; (alloxan + suruhan 112 mg)</td>
<td>3.40 ± 1.14&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>P&lt;sub&gt;3&lt;/sub&gt; (alloxan + suruhan 168 mg)</td>
<td>2.20 ± 0.44&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD. Values followed by the same superscripts are not statistically different at α = 0.05 by LSD test.

DISCUSSION

Diabetes is a metabolic disorder related to the defects of insulin secretion and impaired peripheral insulin function and characterized by an increase in blood glucose levels above the normal limit or hyperglycemia. Hyperglycaemia will interfere with the metabolism of glucose, fat, and protein leading to extensive systematic damages.[8]

This study results confirm the efficacy of the Peperomia pellucida plant as an antidiabetes as reported by Hamzah et al.,(2012),[9] and accordingly confirm traditional claims on antidiabetic use of this plant. The active ingredient of this plant that is thought to play a role in the recovery of hyperglycemia by alloxan injection is piperine[14-15] and other species of Peperomia from Peru, Lira and colleagues found β-caryophyllene, α-humulene, epi-α-bisabolol, sabinene, cryptone and caryophyllene oxide.[16] It has revealed that, alkaloid, polyphenol, glycoside, flavonoid, anthraquinone, phenolic and saponins are bioactives that showed antidiabetic effects both in test animals and human.[17]

The most important findings of this study is the recovery of the sexual dysfunction of test mice suffering from hyperglycemia by treatment of ethanol extract of Peperomia pellucida plant. The active ingredient of this plant that is thought to play a role in the recovery of libido in hyperglycemic mice is piperine.[18] It has been revealed that black pepper extracts, another type of plant belongs to Piperaceae family containing piperine, effectively increase sexual drive in male mice.[19]

CONCLUSION

Plant extracts of suruhan has revealed to be effective in ameliorating blood glucose levels and sexual drive in male mice subjected to hyperglycaemic by alloxan injection. It suggests that plant extracts of suruhan (Peperomia pellucida L. Kunth) is potential to be used as antidiabetic drugs as well as male libido enhancing herbs.

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REFERENCES


