The Effect of Ethanolic Extract of Guava Leaf (Psidium guajava L.) on Pancreatic B Cells of Alloxan Induced Diabetic Rats (Rattus novergicus)

Amalia Sutriana1*, Dwinna Aliza2, Henni Vanda1, Nazaruddin2

1 Laboratory of Pharmacology, Faculty of Veterinary Medicine
2 Laboratory of Pathology, Faculty of Veterinary Medicine
Syiah Kuala University, Aceh, Indonesia
*Corresponding author: e-mail: cutnajwa@yahoo.com, phone:+628116800635

Introduction

Diabetes mellitus is one of the common metabolic disorders diseases known to mankind, affecting at least 15 million people and having complications which include hypertension, atherosclerosis and microcirculatory disorders (Ogbonnia et al, 2008). In modern medicine no satisfactory effective therapy is available to cure diabetes mellitus (Ajao et al., 2005). The high cost, low availability, uncertainty of use during pregnancy and undesirable side effects of synthetic drugs such as undue weight gain, drug resistance and hypoglicæmia are several factors that leading to explore alternative medicine from natural product particularly of plant origin (Edem, 2009).

There are numerous traditional medicinal plants reported to have hypoglycaemic properties, one of them is guava (Psidium guajava L.). Psidium guajava L. (family: Myrtaceae) is a semi-deciduous tropical tree and is widely grown throughout Asia countries for its fruit called Guava. The extract of the whole plant of P. Guajava excluding roots was reported to be acted as antibacterial, antifungal, antiviral, hypoglycaemic, diuretic and antiinflammatory activities (Tripathy et al., 1981). A significant reduction in the blood sugar level were observed in diabetic rats fed with extract of fruit, stem bark and guava leaves (Mukhtar et al., 2006, Rai et al., 2007, Shen, 2008). While all research has been showed that anti-diabetic properties from guava leaf can decrease blood glucose level directly or indirectly (Oh et al., 2005, Ojowole, 2005, Shen et al., 2008), few information are available on the protection effect of extract of guava leaf on pancreatic beta cell. Thus, there is a need to evaluate the effectiveness of extract guava leaf that can lower blood glucose and increasing beta cell function by repair and regeneration of the beta cells at the same time.

Materials and Methods

Samples of guava leaves were air-dried for 5 days, then after drying, the leaves were ground into fine powder. Thirty grams (30g) of the ground leaves were extracted in 250 ml of 99.9% ethanol using soxhlet apparatus. The solutions then were dried using a vacuum rotary evaporator.

Twenty-five male Wistar albino rats weighing between 200 and 250g were used in this research work. The rats assigned into five groups K1, K2, K3, K4 and K5 of five rats each. The rats in groups K2, K3, K4 and K5 were made diabetic with injection of 75mg/kg of Alloxan after an overnight fast. Diabetes was confirmed 5 days after alloxan injection by determining the blood glucose concentration. Group K1 served as the normal control (negative control) while Group K2 served as the diabetic control (positive control). Groups K3, K4, and K5 received 0.25g/kg/day, 0.50g/kg /day, and 1g/kg /day of the guava leaf extract respectively by oral administration. The extract administration lasted for 7 days. The whole pancreas from each animal was removed after sacrificing the animal and was collected in 10% formalin solution, and immediately processed by the paraffin technique. Sections of 5µ thickness were cut and stained by Gomori staining technique for histological examination. The percentage necrosis β cells was counted use the following formula:
Percentage of necrosis β cells = \frac{\text{Number of necrosis β cells}}{\text{Number of total β cells}} \times 100 \%

Data were subjected to One Way ANOVA to compare the difference among treatment and followed by a Duncan multiple range test (DMRT).

**Results and Discussion**

The effects of ethanol extract of *Psidium guajava* L. on the reduction of number of pancreatic β cells (%) are shown in Table 1.

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>% pancreatic β cells necrosis(±sd)</th>
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<tbody>
<tr>
<td>K1 (negative control)</td>
<td>12.96 ± 0.88*</td>
</tr>
<tr>
<td>K2 (positive control)</td>
<td>46.37 ± 2.15d</td>
</tr>
<tr>
<td>K3 (0.25 g/kg bb)</td>
<td>40.04 ± 4.64c</td>
</tr>
<tr>
<td>K4 (0.50 g/kg bb)</td>
<td>37.28 ± 3.45c</td>
</tr>
<tr>
<td>K5 (1 g/kg bb)</td>
<td>29.40 ± 3.45b</td>
</tr>
</tbody>
</table>

Mean values in the same column with different superscript show significant difference (P<0.05)

The results indicated that there was a significant (P<0.05) decreases in the percentage of necrosis β cells in guava leaf extract-treated rats (K3, K4, and K5) when compared with untreated rats (K2), however, their necrosis percentage was still significantly more than that obtained for normal rats (K1). Pancreatic β cells of the K3 group which consumed 0.25 g/kg body wt extract, showed close similarity to group K3, which consumed 0.50 g/kg body wt extract.

Guava leaf extract proven to exhibit hypoglycaemic effect (Oh et al., 2005, Ojowole, 2005, Shen et al., 2008). It appears in this study that extract guava leaf may also have some chemical components that exert regenerative effects on β cells which were earlier necrosed by alloxan, stimulate these cells to produce more insulin. Signs of regeneration of β cells, potentiation of insulin secretion from surviving pancreatic β cells and decrease of blood glucose have been reported following consumption of some plant extracts (Shanmugasundaram et al, 1990; Yadav et al, 2008).

**Conclusion**

The findings of this study indicate that consumption of the ethanolic extract of *Psidium guajava* L. exert significant regeneration of pancreatic β cells in diabetic rat. A higher dose of the extract has a greater restorative effect on the β cells of diabetic rats than a lower dose of extract. Further investigation with longer period of higher doses may show clearer features of these findings.

**References**


