International Journal of Pharmacy and Medical Sciences 4 (1): 01-03, 2014
ISSN 2222-5854
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DOI: 10.5829/idosi.ijpms.2014.4.1.1103

The Anti-Diabetic Effect of Ethanol Leaf-Extract of *Allium sativum* on Albino Rats

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Abstract: The anti-diabetic effect of ethanol leaf-extract of *Allium sativum* was investigated on 24 albino rats. The animals were grouped into four (A, B, C and D) containing six rats each. Diabetes was induced by intraperitonial administration of alloxan solution at 100mg/kg body weights to the experimental animals. The ethanol leaf-extract of *Allium sativum* was administered to the animals in groups A, B, C and D at 200mg/kg, 400mg/kg, 600mg/kg and 0mg/kg body weights respectively for two weeks through oral intubation. Blood samples were collected after the two-week period of administration of the extract. The ethanol leaf-extract of *Allium sativum* significantly ($p<0.05$) and dose-dependently reduced blood glucose concentration in albino rats.

Key words: *Allium sativum* · Alloxan · Blood glucose · Diabetes and rats

INTRODUCTION

Diabetes is an abnormal metabolic disease state in which there is glucose intolerance due to inadequate insulin action [1]. Williams and Pickup [2] defined diabetes as a clinical syndrome characterized by hyperglycemia due to absolute deficiency of insulin. Diabetes mellitus may also develop if muscle and fat cells respond poorly to insulin. In people with diabetes, glucose level builds up in the blood and urine causing excessive urination, thirst, hunger and problems with carbohydrate, fat, protein, water and electrolyte metabolism. Death may result from acute metabolic decomposition while long standing metabolic derangement is frequently associated with permanent and irreversible functional and structural changes in the cells of the body, those of the vascular system being particularly susceptible. These changes lead, in turn, to the development of clinical complications of diabetes which most characteristically affect the eyes, kidney and nervous system [3].

However, since the advent of time, mankind has been interested in using naturally occurring compounds as drugs to treat certain abnormalities. Thus, plants have always been considered the vital sources of drugs mainly because most plants are able to synthesize large varieties of basic biochemical and organic substances such as carbohydrates, proteins, steroids, tarpenes etc. [4]. Simple extraction techniques have been employed to isolate these compounds from their naturally occurring forms. Hence, the use of plants for medicinal purposes is considered an old tradition dating back to antiquity [5]. Spices have been used since ancient days to flavour food, improve palatability and as perfumes [6]. Some examples of spices are garlic, negro pepper, guinea pepper, ginger, etc. They have also been employed in medicine especially in drugs that have been used for the treatment of coughs and some cardiac problems [7].

Furthermore, estimates made by the World Health Organization showed that 80% of the world's population relies chiefly on traditional medicine [8]. Majority of the plant-derived drugs were discovered as a result of correlation between the use of plants in traditional medicine and drugs derived from them. Many drugs were discovered as a result of chemical studies to isolate the active substance responsible for the use of the original plants in traditional medicine [9]. This work was aimed at evaluating the anti-diabetic effect of ethanol leaf-extract of *Allium sativum* on albino rats.

MATERIALS AND METHODS

Materials: The chemicals and reagents used were of analytical quality. Fresh bulbs of *Allium sativum* were gotten from Abakaliki, Ebonyi State while the albino rats were gotten from Enugu State, Nigeria.

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Methods

Administration of Alloxan to the Animals: Alloxan solution was administered intraperitonially to the animals in groups A, B, C and D at 100mg/kg body weight.

Extraction of the Plant Materials: 50g of garlic powder was weighed and wrapped in a filter paper, fixed in a soxhlet apparatus and was extracted in the presence of ethanol for two hours under a high temperature of about 92°C. The solvent in the solution was later evaporated to get the extract.

Administration of the Extract: The extract of *Allium sativum* was administered to the rats by oral intubation at varying concentrations of 200mg/kg, 400mg/kg, 600mg/kg and 0mg/kg to the animals in groups A, B, C and D respectively. The animals in group D served as the positive control.

Blood Sample Collection: The blood samples were collected through the tails of the animals after an overnight fast.

Determination of Plasma Glucose Level: The blood glucose levels of the animals were determined using a glucometer.

RESULT AND DISCUSSION AND CONCLUSION

The administration of alloxan to the animals resulted in a decrease in the physical activities of the animals, increase in water intake, while food intake was quite normal. Thus, the decrease in physical activity of the animals on alloxan administration might be as a result of the inability of the animals to utilize glucose as energy source which eventually results in asthenia [10]. Obviously, the observed increase in water intake of the animals on alloxan administration might be owing to the fact that alloxan induced hyperosmolarity resulting in depletion of intracellular water, triggering the osmoreceptors of the thirst center of the brain [11]. Moreover, the administration of the extract to the animals in groups A, B and C resulted in an increased physical activity. The animals in group D (positive control) showed further decrease in physical activity, water intake increased drastically,

The plasma glucose levels of the animals in groups A, B, C and D after the three days of alloxan administration were significantly ($p<0.05$) increased.

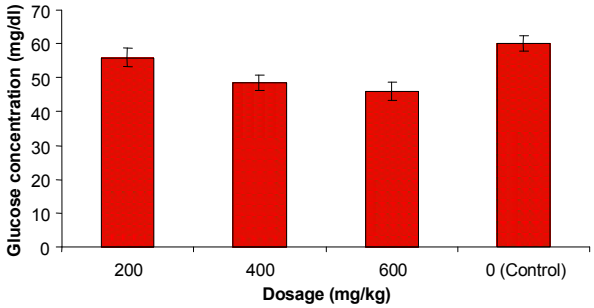

Fig. 1: Plasma glucose concentration after the two-week period of administration.

These elevated plasma glucose levels may have resulted from the effect of the alloxan on the pancreatic â–cells that give rise to impaired insulin secretion which translates into poor plasma glucose utilization. Kayabashi *et al.* (2000) [7] made a similar observation when they administered alloxan to albino rats to study the anti-diabetic effect of garlic. The plasma glucose levels significantly ($p<0.05$) and dose-dependently reduced in the groups that were administered the ethanol leaf-extract of *Allium sativum* while the animals in group D maintained high plasma glucose levels (Fig. 1).

In conclusion, the extract of *Allium sativum* significantly ($p<0.05$) reduced plasma glucose concentrations and could be beneficial in the management of diabetes mellitus.

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