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Antidiabetic effect of *Chenopodium ambrosioides*

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Abstract

Chenopodium ambrosioides is an important medicinal plant widely used in the traditional medicine all over the word. Its folk medicinal uses include its antidiabetic profile. A study was designed to determine its hypoglycemic effect. mice used in experiment were fed with high-fat diet for two weeks before induction of Diabetes mellitus by injection of streptozocine (STZ). Animals treated with crude extract (100, 200 and 300 mg/kg) showed significant ($p<0.05$) hypoglycemic effect in comparison to control. This preliminary but significant study highlighted profound potential of *Chenopodium ambrosioides* to be investigated further for bioactive compounds responsible for antidiabetic effect.

Keywords: *Chenopodiumambrosioides*; streptozocine; antidiabetic activity; hypoglycemic effect

Introduction

Diabetes mellitus (DM) is classified into two major categories: type 1 diabetes and type 2 diabetes (Skyler, 2004). As a devastating disease, diabetes is affecting approximately 3% of the population worldwide, 90% of which suffer from type 2 diabetes (Skyler, 2004). Altho-ugh the two types of diabetes have distinct pathogeneses, hyperglycemia and various life-threatening complications resulting from long-term hyperglycemia are common to both (Abraira et al., 1995) Natural products showed a good bright future in the therapy of diabetes and its related complications. *Chenopodium ambrosioides* (CA) is an important medicinal plant widely used in the traditional medicine system in Europe, Asia, North and South America. It is a member of family, *Chenopodiaceae*. Extract of this plant is locally used for

treatments of various diseases including pain, inflammation, diabetes .In the current study, we have reported antidiabetic activity of crude extract of CA,

Materials & Methods

Extraction

Leaves of the plant were air-dried under shade at room temperature. The dried plant material was chopped and finely ground and stored under refrigeration for further processing. Dried and powdered leaves were extracted via maceration in methanol at room temperature for a period of 48 h. After filtration, the process was repeated 4 times using additional methanol each time. The filtrates were evaporation under low pressure at 40°C with the help of rotary evaporator. Concentrated methanol extracts of leaves was obtained.

Animals

Six-week-old healthy KM mice were raised in a temperature and humidity-controlled animal room with 12 h light/dark cycles. All procedures were carried out in accordance with the legislation on the use and care of laboratory animals. The high-fat diets contained 18.8% crude protein, 16.2% crude fat, 3.98% crude fiber, 5.2% crude ash, 1.24% calcium, 0.83% phosphorous and 45.2% nitrogen free extract, 1.38% lysine, 0.78% methionine and cystine.

Effects of crude extract on STZ-induced diabetic mice

The mice were fed with high-fat diet for two weeks before induction of DM by intraperitoneal (ip) injection of STZ freshly dissolved in citrate buffer (0.01 mol/l, pH 4.5) at a dose of 35 mg/kg body wt as outlined by Milani et al. (2005). This diabetic model was associated with insulin resistance (Reed et al., 2000). One week later, mice with marked hyperglycemia were selected for the study. Diabetic mice were equally randomized to 5 groups: one group was treated with distilled water as control; three groups were treated with

Table 1. Effect of crude extract on blood glucose levels in diabetic rats induced by STZ and high fat diets.

Treatment group	Dosage (mg/kg)	Blood glucose level (mmol)
Negative control		29.68±2.91*s
CE	100	25.81±3.12*
CE	200	24.57±1.93*
CE	400	23.64±2.32*
Metformin	500	22.67±3.04**

Values were expressed as mean±SD (n = 6). * $p < 0.05$, the significance of difference compared blood glucose levels between the treatment groups and the control group. ** $p < 0.01$, the significance of difference compared blood glucose levels between the treatment groups and the control group.

crude extract at 100, 200 and 400 mg/kg body weight; and the remaining group was administered with metformin at a dose of 500 mg/kg body weight, all for 14 days. There was no significant difference in blood and weight between these animals. Blood samples were obtained by the orbital plexus, and not fasting blood glucose levels were determined with a blood glucose diagnosis kit.

Statistical analysis

All values were presented as mean ± SD. Data were statistically analyzed by analysis of variance (ANOVA). Dunnett's multiple comparisons were made to analyze the significant differences between the groups, and p-values <0.05 were considered statistically significant.

Results

Effects of crude extract on blood glucose in diabetic mice

We studied effects on blood glucose after administration of crude extract for 14 days in diabetes mice. Results showed that there was a reduction in blood glucose in case of crude extracts (100, 200 and 300 mg/kg) treatment groups, as compared with that of the control group (Table 1). Crude exhibited a significant hypoglycemic activity as compared to the control group ($p < 0.05$). However, there was no significant difference between the crude extract groups. As metformin is believed to alleviate insulin resistance in the presence of insulin (Bailey, 1993), it was selected as the positive control to evaluate the effectiveness of the model in our study.

Discussion

Streptozotocin or alloxan is often used to induce hyperglycemia in rats and mimic diabetic patients to valuate hypoglycemic and related effects of anti-diabetic compounds and extracts (Kordowiak et al., 2000). The results of our study showed that crude extracts (100, 200 and 300 mg/kg) significantly reduced blood glucose levels in low-dose STZ-treated and high-fat diet-fed mice after 2-week treatment, with a significantly high glucose disposal rate as compared with the control group. As metformin is believed to alleviate insulin resistance in the presence of insulin (Bailey, 1993), it was selected as the positive control to evaluate the effectiveness of the model in our study. This study highlighted scope of further phytochemical and detailed pharmacological studies to probe molecular and cellular mechanism underlying hypoglycemic effect of *Chenopodium ambrosioides*

References

Abraira C, Colwell JA, Nuttall FQ, Sawin CT, Nagel NJ, Comstock JP. (1995). Veterans Affairs Cooperative Study on glycemic control and complications in type II diabetes (VA CSDM). Results of the feasibility trial. Veterans Affairs Cooperative Study in type II diabetes. *Diabetes Care* 18, 1113–1123.

Kordowiak AM, Dudek, B., Grybos, R., 2000. Influence of sodium bisoxalatooxovanadate (IV) on phospholipids in liver Golgi fractions from control and streptozotocin-diabetic rats. *Comparative Biochemistry & Physiology*. C 125, 11–16.

Lu Z, Jia Q, Wang R, Wu X, Wu Y, Huang C, Li Y. (2011). Hypoglycemic activities of A- and B-type procyanidin oligomer-rich extracts from different Cinnamon barks. *Phytomedicine*. 18, 298-302.

Milani E, Nikfar S, Khorasani R, Zamani MJ, Abdollahi M. (2005). Reduction of diabetes-induced oxidative stress by phosphodiesterase inhibitors in rats. *Comparative Biochemistry & Physiology*. C 140, 251–255.

Reed MJ, Meszaros K, Entes LJ, Claypool MD, Pinkett JG, Gadbois TM, Reaven GM, (2000). A new rat model of type 2 diabetes: the fat-fed, streptozotocin-treated rat. *Metabolism* 49, 1390–1394.

Skyler JS. (2004). Diabetes mellitus: pathogenesis and treatment strategies. *Journal of Medicinal Chemistry* 47, 4113–4117.