



Research Article

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Antihyperglycemic activity of methanolic extract of non-boiled and boiled *Lathyrus sativus* L. seeds

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ABSTRACT

In oral glucose tolerance tests with methanolic extract of non-boiled and boiled *Lathyrus sativus* seeds, both the extract significantly and dose-dependently reduced blood glucose concentrations in glucose-loaded mice. At extract doses of 100, 200 and 400 mg/kg of non-boiled seeds (MELSNB), the reductions in blood glucose levels were, respectively, 37.7, 44.8, and 48.8%. The percent reductions in blood glucose levels with methanolic extract of boiled seeds (MELSB) were, respectively, 31.0, 45.6, and 47.3%. In comparison, a standard antihyperglycemic drug, glibenclamide, when administered at a dose of 10 mg per kg, reduced blood glucose level by 48.0%. The results suggest that seeds of *Lathyrus sativus* can serve as an effective antihyperglycemic agent and so can prove beneficial for diabetic patients with high blood glucose levels.

Key words: *Lathyrus sativus*, Fabaceae, OGTT, antihyperglycemic

INTRODUCTION

Lathyrus sativus L. is an annual plant belonging to the legume family (Fabaceae), which is cultivated in Bangladesh for its edible seeds, which are boiled in water and taken as lentil soup. The plant is known in English as grass pea and in Bengali as khesari. The plant is the cheapest form of various lentils (pulses) cultivated in Bangladesh. Extracts of fermented and cooked seeds have been shown to have antioxidant properties [1]. Seeds are known to contain high concentration of flavonoids and antioxidant activity [2]. However, the plant and plant parts are yet to be extensively studied for possible beneficial pharmacological properties.

Diabetes is a common metabolic disorder throughout Bangladesh and the rest of the world. The disorder is characterized by high levels of glucose in blood. Modern allopathic medicines cannot cure the disease. With time, more serious disorders can arise from diabetes like cardiovascular disorders and diabetic retinopathy, neuropathy and nephropathy. Possibly because of alterations in food and lifestyle, diabetes is rapidly reaching endemic proportions among the world population.

Existing antidiabetic drugs including insulin injections are costly and not always affordable or available to the rural people of Bangladesh. Since plants have always proved as excellent sources of new medicines, we had been experimenting for some time with various readily available plant species of Bangladesh for their blood glucose lowering properties as well as analgesic properties, for pain is also common among particularly the Bangladesh poor who have to undergo hard labor to earn their daily income [3-14]. The objective of the present study was to determine the glucose-lowering properties of seeds of *Lathyrus sativus*, which is grown throughout Bangladesh, and whose seeds are the cheapest pulse among the various edible pulses grown. We examined the glucose-lowering property of extracts of both non-boiled and boiled seeds, for since the seeds are consumed following boiling, it was of interest to see whether any glucose-lowering property is maintained following boiling. In the latter case, seeds need not be eaten raw or any extract need not be prepared from raw seeds, but can simply be consumed following

cooking (which necessitates boiling) and so will be more convenient to the user, pulse and rice being the favorite dishes of the Bangladesh rural people.

EXPERIMENTAL SECTION

Seed collection

Lathyrus sativus seeds were collected from a local market in Dhaka.

Preparation of methanolic extract of non-boiled and boiled seeds

For preparation of methanolic extract of non-boiled seeds, 100g of dried and powdered seeds were extracted with methanol (w:v ratio of 1:5). For preparation of methanolic extract of boiled seeds, seeds were steamed for 15 min followed by drying and powdering. The powder was extracted with methanol (w:v ratio of 1:5). Extracts were dissolved in 1% DMSO prior to use.

Chemicals and Drugs

Glibenclamide and glucose were obtained from Square Pharmaceuticals Ltd., Bangladesh. All other chemicals were of analytical grade.

Animals

Swiss albino mice, which weighed between 15-18g were used in the present study. The animals were obtained from International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The animals were acclimatized for three days prior to actual experiments. The study was conducted following approval by the Institutional Animal Ethical Committee of University of Development Alternative, Dhaka, Bangladesh.

Oral glucose tolerance tests for evaluation of antihyperglycemic activity

Oral glucose tolerance tests (OGTT) were carried out as per the procedure previously described by Joy and Kuttan [15] with minor modifications. Briefly, fasted mice were grouped into eight groups of five mice each. The various groups received different treatments like Group 1 received vehicle (1% DMSO in water, 10 ml/kg body weight) and served as control, Group 2 received standard drug (glibenclamide, 10 mg/kg body weight). Groups 3-5 received methanolic extract of non-boiled seed (MELSNB) at doses of 100, 200 and 400 mg per kg body weight, respectively. Groups 6-8 were administered methanolic extract of boiled seeds (MELSB) at doses of 100, 200 and 400 mg per kg body weight, respectively. All substances were orally administered. Following a period of one hour, all mice were orally administered 2g glucose/kg of body weight. Blood samples were collected 120 minutes after the glucose administration through puncturing heart. Blood glucose levels were measured by glucose oxidase method [16]. The percent lowering of blood glucose levels were calculated according to the formula (below).

$$\text{Percent lowering of blood glucose level} = (1 - W_e/W_c) \times 100,$$

Where W_e and W_c represents the blood glucose concentration in glibenclamide or various extract administered mice (Groups 2-8), and control mice (Group 1), respectively.

Statistical analysis

Experimental values are expressed as mean \pm SEM. Independent Sample t-test was carried out for statistical comparison. Statistical significance was considered to be indicated by a p value < 0.05 in all cases [10].

RESULTS AND DISCUSSION

In oral glucose tolerance tests in glucose-loaded mice, methanolic extract of both non-boiled and boiled seeds of *Lathyrus sativus* demonstrated dose-dependent and significant antihyperglycemic effects. At extract doses of 100, 200 and 400 mg/kg of non-boiled seeds, the reductions in blood glucose levels were, respectively, 37.7, 44.8, and 48.8%. The percent reductions in blood glucose levels with methanolic extract of boiled seeds were, respectively, 31.0, 45.6, and 47.3%. In comparison, a standard antihyperglycemic drug, glibenclamide, when administered at a dose of 10 mg per kg, reduced blood glucose level by 48.0%. The results are shown in Table 1 and suggest that both extracts of non-boiled and boiled seeds are nearly equivalent in their antihyperglycemic effects.

Table 1: Effect of MELSNB and MELS on blood glucose level in hyperglycemic mice following 120 minutes of glucose loading

Treatment	Dose (mg/kg body weight)	Blood glucose level (mmol/l)	% lowering of blood glucose level
Control	10 ml	5.62 ± 0.31	-
Glibenclamide	10 mg	2.92 ± 0.29	48.0*
(MELSNB)	100 mg	3.50 ± 0.27	37.7*
(MELSNB)	200 mg	3.10 ± 0.17	44.8*
(MELSNB)	400 mg	2.88 ± 0.19	48.8*
(MELSB)	100 mg	3.88 ± 0.30	31.0*
(MELSB)	200 mg	3.06 ± 0.42	45.6*
(MELSB)	400 mg	2.96 ± 0.27	47.3*

All administrations were made orally. Values represented as mean ± SEM, (n=5);

*P < 0.05; significant compared to hyperglycemic control animals.

Although the exact component(s) present in *Lathyrus sativus* seeds were not identified in the present study, seeds are known to contain flavonoids [2], which may account for the observed antihyperglycemic effects [17,18]. The antioxidative action of the seeds [1,2] can also prove beneficial to diabetic patients for it is recognized that diabetes increases oxidative stress [19].

CONCLUSION

The experimental results suggest that the methanolic extract of both non-boiled and boiled seeds of *Lathyrus sativus* possess antihyperglycemic potential and may be used for lowering blood glucose.

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