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ANTIHYPERGLYCEMIC ACTIVITY OF METHANOLIC EXTRACTS OF CORMS OF *COLOCASIA ESCULENTA* VAR *ESCULENTA*

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ABSTRACT

The objective of the present study was to determine the antihyperglycemic effects of methanol extract of *Colocasia esculenta* var *esculenta* (Bengali: Panchamukhi kochu) corms in glucose-loaded mice. Antihyperglycemic activity was determined through oral glucose tolerance test (OGTT) in mice. Oral administration of methanol extract of *Colocasia esculenta* var *esculenta* corm (MECEE) at doses of 50, 100, 200, and 400 mg per kg body weight each to glucose-loaded mice dose-dependently reduced blood glucose levels by 15.1, 24.4, 32.1, and 35.8%, respectively compared to control (untreated) mice. By comparison, a standard antihyperglycemic drug, glibenclamide, when administered at a dose of 10 mg per kg body weight, reduced blood glucose level by 41.8%. Methanolic extract of corms of *Colocasia esculenta* var *esculenta* can improve oral glucose tolerance and thus is effective in lowering elevated blood glucose levels, which can prove beneficial for diabetic patients.

KEYWORDS: Antihyperglycemic, *Colocasia esculenta* var *esculenta*, glibenclamide, OGTT.

INTRODUCTION

Colocasia esculenta var *esculenta* (L.) Schott (Bengali: Panchamukhi kochu) belongs to the Araceae family and is cultivated in Bangladesh for its edible corms. The corm usually grows to a large oval somewhat irregular size and has attached five cormels to the main corm, leading to the name 'panchamukhi' or 'five-mouthed'. Only one pharmacological activity study has been reported thus far on the corms of this plant, namely analgesic effect of methanol extract of the corms.[1]

For the last few years, we had been concentrating on screening medicinal plants of Bangladesh for easily available and affordable treatment of diabetes and pain, two serious disorders affecting large segments of the population in Bangladesh.[2-29] The screening test for anti-diabetic plants employed was the oral glucose tolerance test (OGTT), which is considered a reliable test for impaired glucose metabolism and which happens during pre-diabetic and diabetic conditions.[30] It was the objective of the present study to determine the antihyperglycemic effect of methanolic extract of *Colocasia esculenta* var *esculenta* corms (MECEE), because the corms are cultivated and available in Bangladesh at affordable prices to the poorer segments of the population.

MATERIALS AND METHODS

Plant material collection and extraction

Colocasia esculenta var *esculenta* corms were collected from a local vegetable market in Dhaka city in August 2016. Plant part was taxonomically identified at the Bangladesh National Herbarium, and given an Accession Number of 43736. The sliced and air-dried *Colocasia esculenta* var *esculenta* corms (including cormels) were grounded into a fine powder and 100g of the powder was extracted with methanol (1:5, w/v) for 48 hours in late November 2016. The extract (MECEE) was evaporated to dryness at 50^{o}C and stored at -20^{o}C in small aliquots till use. The final weight of MECEE was 8g.

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 14-18g 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. During this period, they were kept in a temperature controlled room (25^{o}C) and given standard mice chow and water *ad libitum*. The study was conducted following approval by the Institutional Animal Ethical Committee of University of Development Alternative, Dhaka,

Bangladesh. Every care was taken that the mice did not suffer from any sort of discomfort during the length of the study period.

Preliminary phytochemical screening

Preliminary phytochemical analysis of MECEE for presence of saponins, tannins, alkaloids, and flavonoids were conducted as described before.[31]

Oral glucose tolerance tests (OGTT) for evaluation of antihyperglycemic activity

Oral glucose tolerance tests were carried out as per the procedure previously described by Joy and Kuttan (1999)[32] with minor modifications. Briefly, fasted mice were grouped into six groups of five mice each. The various groups received different treatments like Group 1 received vehicle and served as control, Group 2 received standard drug (glibenclamide, 10 mg/kg body weight). Groups 3-6 received MECEE at doses of 50, 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 with a glucometer. The percent lowering of blood glucose levels were calculated according to the formula described below.

Percent lowering of blood glucose level = $(1 - W_e/W_c)$ X 100,

where W_e and W_c represents the blood glucose concentration in glibenclamide or various extracts administered mice (Groups 2-6), and control mice (Group 1), respectively.[24]

Statistical analysis

Experimental values are expressed as mean ± 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.[25]

RESULTS

Preliminary phytochemical screening

Preliminary phytochemical screening of MECEE revealed the presence of alkaloids, flavonoids, and steroids.

Oral glucose tolerance test (OGTT) results

Administration of MECEE at doses of 50, 100, 200, and 400 mg per kg body weight each to glucose-loaded mice reduced blood glucose levels by 15.1, 24.4, 32.1, and 35.8%, respectively, compared to control (untreated) mice. By comparison, a standard antihyperglycemic drug, glibenclamide, when administered at a dose of 10 mg per kg body weight, reduced blood glucose level by 41.8%. Thus at the highest dose tested, MECEE demonstrated nearly comparable ability to glibenclamide in its antihyperglycemic activity or improved oral glucose tolerance ability. The results are shown in Table 1. As this plant is widely available in Bangladesh, it has the potential to be a replacement for costly anti-diabetic drugs.

Table 1: Effect of MECEE 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	5.98 ± 0.12	-
Glibenclamide	10 mg	3.48 ± 0.09	41.8*
(MECEE)	50 mg	5.08 ± 0.12	15.1*
(MECEE)	100 mg	4.52 ± 0.10	24.4*
(MECEE)	200 mg	4.06 ± 0.17	32.1*
(MECEE)	400 mg	3.84 ± 0.11	35.8*

All administrations were made orally. Values represented as mean ± SEM, (n=5); $^*P < 0.05$; significant compared to hyperglycemic control animals.

DISCUSSION

It is interesting that other Araceae family plants belonging to different genera have also been shown to be effective in reducing blood glucose levels or otherwise acting as anti-diabetic agents. The various genera studied have been *Amorphophallus*, *Colocasia*, and *Xanthosoma*.[33-38] The presence of alkaloids and flavonoids in MECEE may account for the observed antihyperglycemic activity for such activity as has been shown before with these two classes of compounds.[39, 40]

CONCLUSION

The results suggest that MECEE possess antihyperglycemic effects as demonstrated through OGTT.

CONFLICTS OF INTEREST

The author(s) declare that they have no competing interests.

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