WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 7, Issue 18, 263-269. Research Article ISSN 2277– 7105

ORAL GLUCOSE TOLERANCE TESTS WITH *FLACOURTIA JANGOMAS* (LOUR.) RAEUSCH. (SALICACEAE) FRUITS

Nasrin Akter Shova, M. M. Maidul Islam, Khoshnur Jannat and Mohammed Rahmatullah*

Department of Pharmacy, University of Development Alternative, Lalmatia, Dhaka-1207, Bangladesh.

Article Received on
09 September 2018,
Revised on 30 Sept. 2018,
Accepted on 21 Oct. 2018,
DOI: 10.20959/wjpr201818-13618

***Corresponding Author**
Prof. Dr. Mohammed Rahmatullah
Department of Pharmacy, University of Development Alternative, Lalmatia, Dhaka-1207, Bangladesh.

ABSTRACT

Background: *Flacourtia jangomas* (Lour.) Raeusch., otherwise known as Indian plum tree is a Salicaceae family tree usually found in the wild in Bangladesh. The fruits are edible and although not well-liked, are lately finding attention because of anecdotal reports on their blood glucose lowering properties. The objective of the present study was to evaluate the oral glucose tolerance efficacy of methanol extracts of the fruits (MEFJ). **Methods:** Oral glucose tolerance test (OGTT) was done to evaluate glucose tolerance. **Results:** In oral glucose tolerance tests, methanol extract of fruits dose-dependently and significantly reduced blood glucose levels in glucose-loaded mice. At doses of 100, 200 and 400 mg per kg body weight, MEFJ lowered blood glucose levels by 9.3, 21.1, and 32.5%, respectively, compared to control animals. By comparison, a standard antihyperglycemic drug, glibenclamide reduced blood glucose levels by 41.9% at a dose of 10 mg per kg. **Conclusion:** The fruits can be an effective means for lowering blood glucose in persons with elevated blood glucose levels.

KEYWORDS: Antihyperglycemic, *Flacourtia jangomas*, OGTT, diabetes.

BACKGROUND

Elevated blood glucose level is a symptom of impaired glucose metabolism, which can be caused by diabetes (both Type 1 and Type 2 as well as gestational) and pre-diabetic conditions. A drastic change in lifestyle of human beings from the hunter-gatherer stage to a more sedentary lifestyle in the modern era combined with changes in food habits (like

consuming refined sugar in high amounts) is probably the cause of diabetes reaching almost endemic proportions throughout the world.[1]

Diabetes does not have any cure. Moreover, unless the elevated blood glucose is kept under control, it can quickly lead to other complicated life-threatening disorders [2]. Blood glucose can be kept under control with allopathic drugs and traditional medications. But allopathic drugs are costly and beyond the reach of a substantial number of people in under-developed countries. Traditional medications, for the most part, lack the necessary scientific validations to back up their blood glucose lowering claim. Moreover, since the ingredients of even established traditional medications may not be under proper regulatory control, wide variations in effects plus toxicities are often reported for herbal drugs.[3]

Towards discovery of possible anti-diabetic drugs from plants, we had been screening various plants of Bangladesh for their blood glucose lowering efficacies for a number of years [4-22]. *Flacourtia jangomas* (Lour.) Raeusch., otherwise known as Indian plum tree is a Salicaceae family tree usually found in the wild in Bangladesh. The fruits are edible and although not well-liked, are lately finding attention because of anecdotal reports on their blood glucose lowering properties. The tree is known in the local vernacular as paila. The fruits have a plum-like color. The objective of the present study was to evaluate the oral glucose tolerance efficacy of methanol extracts of the fruits (MEFJ).

METHODS

Plant material collection

Ripe fruits of *Flacourtia jangomas* were collected from a fruit market in Dhaka city. The fruits were identified at the University of Development Alternative.

Preparation of methanolic extract of Flacourtia jangomas fruits (MEFJ)

For preparation of methanol extract of fruits of *Flacourtia jangomas* (MEFJ), ripe fruits were thoroughly sliced, dried in the shade, and pulverized into a fine powder. 50g of the powder was extracted with 250 ml methanol over 48 hours. Methanol was evaporated at 40^{o}C and the extract was dissolved in Tween 20 prior to administration to mice by gavaging. The final weight of the extract was 10.9g. The extract was maintained in small aliquots at -20^{o}C till use and care was taken not to freeze-thaw the extract vials repeatedly.

Chemicals and Drugs

Glibenclamide and glucose were obtained from Square Pharmaceuticals Ltd., Bangladesh. All other chemicals were of analytical grade. Glucometer and strips were purchased from Lazz Pharma, Bangladesh.

Animals

Swiss albino mice, which weighed between 12-15g 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 time, the animals were fed with mice chow (supplied by ICDDR,B) and water *ad libitum*. The study was conducted following approval by the Institutional Animal Ethical Committee of University of Development Alternative, Dhaka, Bangladesh. Care was taken that the animals did not suffer from any unnecessary pain during the acclimatization period.

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 [23] with minor modifications. Briefly, fasted mice were grouped into five groups of five mice each. The various groups received different treatments like Group 1 received vehicle (1% Tween 20 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, respectively, MEFJ at doses of 100, 200 and 400 mg per kg body weight. The amount of Tween 20 administered was same in both control and experimental mice. Following a period of one hour as described earlier,[20, 21] all mice were orally administered 2g glucose per kg of body weight. Blood samples were collected 120 minutes after the glucose administration through puncturing heart following previously published procedures.[20,21] 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 MEFJ administered mice (Groups 2-5), and control mice (Group 1), respectively. Gavaging was done carefully such that injuries do not happen, and no mice fatalities occurred during gavaging. Mice were handled carefully throughout the experiment so that they did not get subjected to any unnecessary pain.

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.[10]

RESULTS

In oral glucose tolerance tests, methanol extract of fruits dose-dependently and significantly reduced blood glucose levels in glucose-loaded mice. At doses of 100, 200 and 400 mg per kg body weight, MEFJ lowered blood glucose levels by 9.3, 21.1, and 32.5%, respectively, compared to control animals. By comparison, a standard antihyperglycemic drug, glibenclamide reduced blood glucose levels by 41.9% at a dose of 10 mg per kg. Although any higher doses of MEFJ were not studied, it is quite possible that at higher doses, MEFJ can be equivalent to glibenclamide in its ability to lower blood glucose.

Table 1: Lowering action of MEFJ 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	5.78 ± 0.10	-
Glibenclamide	10 mg	3.36 ± 0.11	41.9*
(MEFJ)	100 mg	5.24 ± 0.12	9.3*
(MEFJ)	200 mg	4.56 ± 0.16	21.1*
(MEFJ)	400 mg	3.90 ± 0.03	32.5*

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

DISCUSSION

Methanolic extract of leaves and stems of *Flacourtia jangomas* has previously been shown to exhibit hypoglycemic activity in streptozotocin-diabetic and alloxan-diabetic rats.[24,25] Leaves and fruits reportedly have antioxidant activity [26], which can be helpful during diabetes. Our results suggest that the fruits can be a source of anti-diabetic compound(s).

CONCLUSION

The results suggest that methanolic extract of fruits of *Flacourtia jangomas* can be used for lowering of blood glucose.

CONFLICTS OF INTEREST

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

ACKNOWLEDGEMENTS

The authors thank Md. Sohel for his help in the experiments.

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