



RESEARCH ARTICLE

ANTI-HYPERGLYCAEMIC EFFECT OF EUPHORBIA HIRTA TO SWISS ALBINO MICE

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Abstract

Diabetes is a chronic disease that affects the body's ability to utilize the energy found in food. This is a condition in which the pancreas does not produce enough insulin, which the body needs to regulate glucose metabolism. Diabetes mellitus is a complicated health condition with multiple causes and many natural treatment options. In Euphorbia **hirta** afzelin, quercitrin, myricitrin, rutin, quercetin, euphorbin-A, euphorbin-B, euphorbin-C, euphorbin-D, 2,4,6-tri-O-galloyl-β-D-glucose, 1,3,4,6-tetra-O-galloyl-β-D-glucose, kaempferol, gallic acid, and protocatechuic acid have been isolated. Euphorbia hirta has antidiabetic, antioxidant, antibacterial, sedative, anxiolytic, anti-epileptic, anti-inflammatory, analgesic, antipyretic, antihistamine, anti-asthmatic, anti-diabetic, anti-cancer, and wound healing properties. It exerts healing, gastrointestinal, diuretic, antiparasitic, immunological, hepatoprotective, galactose producing, and angiotensin-converting enzyme inhibitory effect. Medicinal plants have been reported to be useful for diabetes all over the world and are empirically used as antidiabetic and antihyperlipidemic agents. Therefore, the present study was designed to investigate antihyperglycaemic effect of Euphorbia hirta with different doses. The antihyperglycaemic properties of methanolic extract of the Euphorbia hirta was evaluated in Swiss albino mice in order to scientifically validate its traditional therapeutic use with the different doses as per bodyweight. In this experiment, among all the doses, the methanolic extract of Euphorbia hirta decrease the blood sugar level. The low dose (50 mg/kg body weight) decrease the glucose level compared to control but not as much as standard value. Oral administration of methanolic extract of Euphorbia hirta doses equivalent to 100, 200 and 400 mg/kg body weight produce significant antihyperglycaemic effects respectively.

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Introduction:-

Diabetes mellitus is a collection of physiological dysfunctions marked by hyperglycemia that is directly caused by insulin resistance and insufficient insulin production. ^[1]The onset of micro and macrovascular disorders is often linked to diabetes. ^[2]Diabetes will continue to rise if early detection techniques are not developed for diabetes

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mellitus, which is the epidemic of the century. Research is needed in this field base on natural medicine that will eventually reflect on the ultimate objective to improve treatment and minimize the chance of chronic complications development.^[3]

Asthma weed and milk weed are two frequent names for *Euphorbia hirta*, which is found all over the world. In Bangladesh and West Bengal, it is known locally as "Boro Keruie."^[4] Dudhi, also known as *Euphorbia hirta* Linn, is an annual herb that can be found growing in areas such as wastelands, along walls, and beside roadsides in conditions of high humidity. The stem of this plant is slender, smooth, densely branched, and reddish in color, with delicate roots that emerge from nodes. The leaves are elliptic to obovate in shape, paired in opposition to one another, and have serrated edges. The plant's alkaloids, flavonoids, and other components have been proven to have anti-diabetic benefits. In diabetic rats, it has been demonstrated to lower blood glucose levels.^[5,6]

E. hirta is a possible species that is widely distributed and is well-known for its ethnobotanical, cultural, and therapeutic applications. *E. hirta* is frequently used to treat a range of illnesses, such as dysentery, diarrhea, coughing, and asthma. In addition, this herb's prepared decoction is used to treat skin and wound infections, boils, blisters, asthma, and oral thrush. In addition, it has been used in eastern, western, and central Africa as an antispasmodic, antipruritic, carminative, depurative, diuretic, febrifuge and purgative. [7,8]

The present study includes a comparative assessment of the anti-hyperglycaemic potential of the methanolic extract of *Euphorbia hirta* and a commonly used antidiabetic drug to hyperglycaemic Swiss albino Mice.

From the glucose levels analysis by glucometer after 120 minutes glucose gavaging, we found that the control mean was 6.7 mmol/l and the glibenclamide treated sample mean was 3.42 mmol/l. On the other hand, the *Euphorbia hirta* MeOH extract low dose (50 mg/kg) treated mean was 5.55 mmol/l, moderate dose (100 mg/kg) treated mean was 4.78 mmol/l, medium dose (200 mg/kg) treated mean was 4.36 mmol/l and high dose (400 mg/kg) treated mean was 3.32 mmol/l. Comparing with control mean all doses significantly decrease the blood sugar level.

Methods and Materials:-

Plant material collection

Plants of *Euphorbia hirta* were collected from Hamdard University Bangladesh campus in Gazaria, Munshiganj. *Euphorbia hirta* were identified by an Unani Medicine expert of Hamdard University Bangladesh.

Preparation of methanolic extract of *Euphorbia hirta*

For preparation of methanol extract of *Euphorbia hirta*, dried in the shade and pulverized into a fine powder. 100g of the powder was extracted with 500 ml methanol over 48 hours. Methanol was evaporated at 40°C and the extract was dissolved in Tween 20 prior to administration to mice by gavaging. The final weight of extract was 5.98g.

Chemical and Drugs

We acquired glucose and glibenclamide from Square Pharmaceuticals Ltd. in Bangladesh. The other substances were all analytically graded. Strips and the glucometer were bought from BMA Bhaban, Dhaka, Bangladesh.

Animals

In the current investigation, Swiss Albino mice weighing 12–15g were employed. The International Center for Diarrheal Disease Research, Bangladesh (ICDDR, B) provided the animals. Before the real studies began, the animals were allowed to acclimate for three days. 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 Hamdard University Bangladesh.

Oral Glucose tolerance tests for evaluation of glycemic activity

The protocol originally published by Joy and Kuttan^[9] was slightly modified in order to conduct the oral glucose tolerance test (OGTT). Mice were divided into six groups of five mice each after they had fasted for twelve hours. 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 3–6 received, respectively, Methanolic extracts of *Euphorbia hirta* (MEEH) at doses of 50, 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, all mice were orally administered 4g glucose per kg of body weight. Blood

samples were collected 120 minutes after the glucose administration through puncturing heart following previously published procedures. 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 = $(1 - W_e/W_c) \times 100$,

Where W_e and W_c represent the blood glucose concentration in glibenclamide or MEEH administered mice (Groups 2-6), and control mice (Group 1), respectively.[9]

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:-

When administered at doses of 50, 100, 200 and 400 mg per kg body weight, methanolic extract of *Euphorbia hirta* reduced blood glucose in glucose-loaded mice by 8.0, 20.3, 29.2, and 32.0%, respectively. By comparison, a standard antihyperglycemic drug, glibenclamide, when administered at a dose of 10 mg per kg, reduced blood glucose levels by 48.8%. The results suggest that Methanolic extracts of *Euphorbia hirta* (MEEH) can be effective in their antihyperglycemic or blood glucose reducing capacities. The results are shown in (Table 1).

Table 1:- Lowering action of MEEH 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	6.70 $\pm$ 0.308	-
Glibenclamide	10 mg	3.42 $\pm$ 0.216	48.95*
(MEEH)	50 mg	5.55 $\pm$ 0.141	17.16*
(MEEH)	100 mg	4.78 $\pm$ 0.114	28.65*
(MEEH)	200 mg	4.36 $\pm$ 0.134	34.92*
(MEEH)	400 mg	3.32 $\pm$ 0.164	50.44*
All administrations were made orally. Values represented as mean $\pm$ SEM (standard error of mean), (n=5); *P < 0.05; significant compared to hyperglycemic control animals.			

Discussion:-

Extract of *Euphorbia hirta* showed a significant hypoglycemic effect in the alloxan-induced diabetic rats.^[11] In this study, the plants extract of *Euphorbia hirta* caused a decreased blood sugar level in oral glucose tolerance test.

Conclusion:-

The result of this experiment suggest that Methanolic extract of *Euphorbia hirta* have glucose lowering capacity to glucose loaded Swiss Albino Mice. Moreover, the richest source of natural antidiabetic substance is *Euphorbia hirta*.

Conflicts of interests

No conflicting interests are stated by the authors.

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