ARTICLE / INVESTIGACIÓN

Study the effect of olive leaf extract and mango peel extract in treating diabetic disease in mice

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DOI. 10.21931/RB/2023.08.02.76

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Abstract: The current study aimed to determine the effect of olive leaf extract and mango peel extract on diabetic mice. Diabetes was created in the mice by injecting intravenously alloxan 100 mg/kg. The experimental mice were divided into four groups, where the first group was considered normal controls, while the second group was diabetic control. The third group represents the diabetic group treatment with olive leaf extract 100 mg/kg B.w i.p 5 days and the four groups diabetic group treatment with mango peel extract 100 mg /kg .B.w i.p 5 days. According to the biochemical observations, the levels of serum glucose, there was a significant decrease in serum glucose of the diabetic group under treatment with olive leaf extract lower than blood glucose level for diabetic mice treated with mango peel extract compared with the control group herbal treatment olive leaf extract to diabetic mice helps maintain normal sugar level in the blood.

Key words: Olive leaf, mango peel, diabetic disease.

Introduction

Diabetes is a chronic metabolic disease characterized by a relative or absolute lack of insulin, leading to hyperglycaemia[1]. Long-term complications of hyperglycemia affect the eyes as retinopathy, kidneys, nerves as neuropathy and blood vessels. There are several different classifications of diabetes, the most common being type 1 and type 2. Type 1 diabetes is an autoimmune disease that destroys the insulin-producing pancreatic beta cells in the islets of Langerhans. It is called insulin-dependent diabetes mellitus (IDDM), or juvenile-onset diabetes develops when the body's immune system destroys pancreatic ßcells, the only cells producing the hormone insulin that regulates blood glucose. Type 1 diabetes is most commonly diagnosed in children and young adults, and by the time of diagnosis, patients have minimal endogenous insulin production. Insulin, therefore, has to be replaced by regular subcutaneous injections; type 2 diabetes was first described as a component of metabolic syndrome in 1988[2].

Type 2 diabetes, also called non– insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes, accounts for about 90% to 95% of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce it. Is the most common form of diabetes characterized by hyperglycemia, insulin resistance, and relative insulin deficiency? This type is the interaction between genetic, environmental, and behavioral risk factors[3,4]. Mechanism of diabetic complications has been suggested that oxidative stress may contribute to the pathogenesis of different diabetic complications[5]. However, 537 million adults (20-79 years) are living with diabetes worldwide in 2021.

Diabetes Atlas Today, herbal drugs are primarily used in treating diabetes (6) and (7), where one of these hypoglycemic plants is the olive leaf and mango peel; the olive tree is one of the most critical trees in Mediterranean countries[8]. Olive leaf extract is a natural source of wellness with therapeutic properties; the olive leaf has extensive use in traditional herbal medicine (gastroprotective, neuro-protective, antimicrobial, anticancer, anti-inflammatory, anti-nociceptive, antioxidant[9,10]. Mango is an evergreen tree with many traditional medicinal resources besides its famous fruits. The largest mango-producing countries are India, China, Thailand, Indonesia, Pakistan, Mexico, Brazil, Bangladesh, Nigeria, and the Philippines.

Mango leaves are a potential source of minerals: nitrogen, potassium, phosphorus, iron, sodium, calcium, magnesium, and vitamins. A, B, E, and C. A major bio-macromolecule present in mango leaves is protein. Extracts of the mango leaves have been utilized for traditional medicines to cure diabetes, bronchitis, diarrhea, asthma, kidney, scabies, respiratory problems, syphilis, and urinary disorders[11,12].

Materials and methods

Olive leaf extract preparation

Take an olive leaf from the garden, rinse it with tap water for 10 min, and then drain; the dried leaves were powdered using a coffee grinder and then extracted. The soxhlet apparatus extracted 50 g of the processed plant in 250 ethanol (70%). The obtained extract was then evaporated at 37C° in the incubator, and the resultant crude extract was frozen at -20C° until use[13].

Mango peel extract preparation

Mango taken from the vegetable market rinsed with

Citation: R Ali Hasan M M. Study the effect of olive leaf extract and mango peel extract in treating diabetic disease in mice. Revis Bionatura 2023;8 (2) 76. http://dx.doi.org/10.21931/RB/2023.08.02.76
Received: 15 May 2023 / **Accepted:** 10 June 2023 / **Published:** 15 June 2023

water. Removed mango and drained; the dried peel was ground using a grinder. After that extraction, 50 g of the mango peel powder was extracted in 250 of ethanol (70%) using the soxhlet apparatus. The obtained extract was then evaporated using a rotary evaporator, and the resultant crude extract was frozen at -20C° until use.

Experimental animals

The study was conducted on random mice from the Ministry of Science and Technology. The animals were selected at a weight between (25-27) gm and healthy. The mice are placed in plastic cages with appropriate conditions of temperature as well as ventilation. Animals were also given a special diet and water. The animals were starved for 12 hours, and then intraperitoneal injection with Alloxan (British company BHD) at a dose of (0.1 g / kg of body weight) by dissolving 1 g of Alloxan in 10 ml of normal saline; control animals were injected with 1 ml of normal saline and given water and food usually (14). Animals with a glucose level greater than 200mg/100ml were considered diabetic.

Experimental design

The mice were randomly distributed, using (20) adult mice; we divided the mice into 4 groups, including the control group (5mice per group) and caged separately:

1. Group 1 (untreated control).
2. Group 2 mice have received alloxan 1 ml (i.p.injection).
3. Group 3 Alloxan diabetic mice injected Ip with 100mg/kg olive leaf extract for 4 weeks.
4. Group 4 Alloxan diabetic mice injected Ip with 100mg/kg mango peel extract for 4 weeks.

Biochemical estimation

Blood samples were collected in laboratory tubes of each first, second, third and fourth group, respectively, from fasting mice. After that, the blood samples were separated by centrifuge for 15 minutes and measured sugar using a biochemical test (fast blood sugar) using a linear kit in the laboratory.

Statistical analysis

This study has calculated the mean ± SE of four groups, n = 5 mice in all groups. Statistical analysis of data was performed using one-way analysis of variance (ANOVA) with a Tukey's -test, and the results were considered statistically significant at $P < 0.05$.

Results

In this research, the effect of Alloxan was studied on the blood glucose level of mice, and it was observed that the glucose level was higher than its normal level in the blood compared to the level of glucose in the blood of animals that did not take Alloxan as shown in table 3.

In a study of the effect of two natural plant extracts, OLE and MPE, on animals with a high sugar level, the results explained a decrease in the blood sugar level of the animals treated with the OLE and MPE, as shown in Table 4.

A comparison was made between the effect of both extracts OLE and MPE on the glucose level, and it was noticed that the diabetic mice treated with olive leaf extract reduced the blood glucose level higher than the group of diabetic mice treated with mango peel extract compared to the control group. The statistical analysis revealed that there was a significant difference between different groups. Blood glucose levels for the diabetic mice treated with olive leaf extract were significantly ($p < 0.05$) lower than diabetic mice treated with mango peel extract, as shown in Table 5.

Discussion

The study finding of using olive leaf extract and mango

Plants extraction	Olive leave extract	Mango peel extract
Plants weight	50gm	50gm
Solvents and concentration	Ethanol 70%	Ethanol 70%
Volume of solvents	250ml	250ml

Table 1. Preparation of plant extraction.

groups	Name of treatment	Name of groups
Group1	Untreated mice	Control negative
Group2	Mice injected with Alloxan only	Control positive Diabetic mice
Group3	Injected Mice with Alloxan injected Ip with OLE	Diabetic mice treated with OLE
Group4	Injected Mice with alloxan-infected Ip with MPE	Diabetic mice treated with MPE

Table 2. Distribution of animals (*in vivo*).

Groups	Treatment	Serum blood sugar	Mean, SE
Group1	Untreated mice	82-90 mg/ml	86.2±1.4
Group2	Mice treated with Alloxan	213-230 mg/ml	218.4±3.1

Table 3. Effect of Alloxan on the blood glucose level of the mice.

Groups	Treatment	Serum blood sugar	Mean, SE
Group1	Mice treated with OLE	88.1-91mg/ml	87.02±1.3
Group2	Mice treated with MPE	88-97mg/ml	93.8±1.5

Table 4. Effect of OLE and MPE on the blood glucose level of the diabetic mice.

Groups	Weeks			
	1st	2nd	3rd	4th
Control -ve	**90.6**±0.26 c B	**92.9**±0.27 c B	**91.6**±0.16 b C	**93**±0.22 a B
Diabetic mice without treatment (control+ve)	**218.6**±0.4 c B	**219.8**±0.37 b B	**220.8**±0.37 b C	**223.6**±0.4 an AB
Diabetic mice treatment with OLE	**87**±0.7 a A	**84.8**±0.66 a A	**85.2**±0.73 a A	**84.6**±0.87 a A
Diabetic mice treatment with MPE	**93.8**±0.37 a A	**94.2**±0.66 a A	**93.4**±0.8 b B	**90.4**±0.67 c C

Table 5. Comparison between the effect of OLE and MPE in the treatment of diabetic disease in the mice comparison with control –ve and control +ve groups.

peel extract to treat diabetic mice presents a good agreement with (16,17). In comparison, olive leaf extracts recorded ($p < 0.05$) lower than mango and control treatment, which agreed with (18). This reduction of blood glucose levels by olive leaf extract may result from increased excretion of sugar from the body or increased insulin release from the pancreas[19]. The low level of sugar is due to the ability of phenolic compounds to delay the decomposition and absorption of sugars by inhibiting the action of the glucosidase enzyme[20]. This discrepancy between the two plants is due to a difference in the process of synthesizing the chemical compounds of the plants[21]. Ethanol was used to extract bioactive compounds from olive leaf and mango peel; it is less toxic than other solvents[15]. Due to the ability of these phytochemical compounds to fight free radicals and regulate the functioning of cells within the body, the extract is effective in pharmaceutical use and the prevention of many diseases.

Conclusions

The objective of this study was to use olive leaf extract and mango peel extract to treat the diabetic mice, where the peel ethanol extract showed a decrease in the blood glucose level for the diabetic mice treated with it compared with the control group.

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