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Assess the Influence of Artemisia Leaves Methanol - Aqueous Extract on Certain Biochemical Parameters in Albino Rats Alloxan-Induced Diabetic

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Abstract

Background: For many generations, traditional medicine has utilised Artemisia L. as a treatment for a variety of ailments.

Objectives: This study aims to examine the chemical composition of the methanol-aqueous extracts of Artemisia leaves and assess their impact on blood glucose, total antioxidants, and Vitamins A & E in normal and alloxan-induced diabetic rats. Artemisia leaves placed inside a soxhlet apparatus, as well as, the leaves were extracted using double distillation for four to five hours while water was used as the running solvent. Male and female albino rats weighing between 190 and 400 g were used in this research. The rats were split into three groups, each with ten rats. G1: groups with diabetes, G2: diabetic groups obtaining 150 mg/Kg body weight of methanol-aqueous extract daily, and G3: control groups. To induce diabetes, G1 Rats were fasted for the entire night and then intraperitoneally injected with freshly prepared 10% alloxan solution. Serum glucose (Glc) and total antioxidants were measured using Biolab assay kits, and vitamins A and E were measured using the enzyme-linked immunosorbent assay (ELISA).

Results: After preparing the Artemisia extract of leaves in methanol and water, a chemical analysis was carried out. The extract of Artemisia leaves contained glycosides, flavonoids, submarines, alkaloids, tannins, saponins, and phenolic compounds, according to the results.. After fourteen days of oral treatment, diabetic rats treated with 150 mg/kg of Artemisia extract of leaves showed a significant reduction in blood glucose levels ($P<0.05$). On the other hand, on the final day of treatment, the administration of 150 mg/kg of Artemisia extract from leaves had no statistically significant increase in plasma total antioxidant levels ($P<0.05$) and concentration of Vitamins A and E ($P<0.05$) when compared with diabetic group.

Conclusion: The study shows that oral administration of Artemisia extract significantly reduced hyperglycemia in diabetic rats in groups treated with 150 mg/Kg Artemisia extract of leaves as compared with diabetes groups. On the other hand, no differences in improvement in total antioxidant and Vitamin A& E levels.

Keywords: Artemisia extract. Total antioxidants , serum glucose, Vitamin E, & A.

Introduction

Diabetes mellitus is becoming more commonplace worldwide, primarily due to lifestyle changes that have led to an increase in obesity [1]. An altered metabolism and abnormally high blood glucose levels are hallmarks of diabetes mellitus, a metabolic disease. In 2010, 285 million people, or 6.4% of the global population, were affected by this serious public health issue [2]. Type 2 diabetes , also known as non-insulin dependent diabetes mellitus, affects 90–95% of diabetic patients. Insulin resistance combined with insufficient insulin secretory response as a compensatory mechanism is explained by type 2 diabetes [3]. For the medical community, managing diabetes without any adverse effects remains a challenge. The medications' pharmacokinetic characteristics, rates of secondary failure, and concomitant side effects limit how they can be used [4]. The search for novel medications continues despite significant advancements in the use of oral hypoglycaemic agents to treat diabetes, as these synthetic medications have various drawbacks [5]. Insulin and oral anti-diabetic medications like sulfonylureas, biguanides, and -glycosidase inhibitors are the available treatments for diabetes. There are several major side effects associated with many of these oral anti-diabetic medications. As a result, managing diabetes without experiencing any negative effects is still difficult [6]. Locally, Artemisia afra is referred to as "chikugn," or African wormwood. The Asteraceae family includes it. In traditional medicine, it is one of the most well-known and frequently utilised plants. The leaves of Artemisia have been utilized for treating ailments, including coughs, colds, chills, stomach-aches, and dry dyspepsia. Further, it manages malaria and smallpox and acts as a purgative. Alcohol extracts, molasses, decoctions, and infusions are among the preparations. This plant's herbaceous leaves contain a strong-smelling, bluish-green essential oil that ranges from 0.3% to 1.4% v/w [7]. In both collective and alloxan-induced diabetic rat models, this investigation intends to explore the fragment structure of the methanol-aqueous extracts of Artemisia greeneries and assess their effects on plasma glucose, total antioxidants, and vitamins A and E.

Materials & Methods

collecting of plant material and preparation of the extract

To get free of surface dirt, the herb Artemisia leaf parts were washed under quickly running tap water. After drying the plant material to eliminate moisture, it was cut and powdered interested in a concentrate using a mechanical blender. After that, the powdered material was placed inside a Soxhlet apparatus and extracted over four to five hours using double distilled water as the running solvent. After heating the extract until it was complete dry, the final extract yield 16.5 % yield—was measured. Before being used, the dry extract was stored at 40C[8].

Preparation Plant Extraction

With minor adjustments, the extract was made using [9] methodology . A specific weight of finely ground wormwood powder was taken and combined in a ratio of 1 g plant material to 3 ml solvent (20% methyl alcohol: 80% distilled water, v/v). After the mixture was homogenised for half an hour at room temperature using an electric mixer, the end product solution had been filtered through medical gauze and heated to 50°C in an incubator to produce the dry extract, which was then kept dry until needed[9].

Quantitative evaluation of the plant extract's secondary components

Through the use of synthetic reagents, it was able to identify a few active compounds in the plant extract for this study. Glycosides were found using the Benedict reagent[10]. The Mayer Regent [11] was employed to identify alkaloids. The phenolic compound was detected using a 1% ferric chloride solution. Flavonoids were establish using the Jaffer method, whereas saponin compounds were found using a 1% solution of mercuric chloride [12]. A 1% lead acetate solution was utilized [12] to identify Tannis. Terpens, coumarines, steroids, and resin[10].

leading to Diabetes in Experiments

After an overnight fast, freshly prepared alloxan (10%) dissolved in distilled water was injected intraperitoneally into rats of both sexes, weighing 190-400 g, to induce diabetes [13]. After the

animals received an injection of alloxan three days later (72 hours later), they were fasted for sixteen hours, and a glucometer was used to measure their blood glucose levels. The experiment was limited to animals that on the third day following alloxan injection displayed stabilized diabetes (FBG ≥ 250 mg/dL) [14]. Rats were eliminated from the experiment if, on the third day, they did not exhibit signs of diabetes.

Three groups of ten rats each were formed: the G1 diabetic group, the G2 diabetic group (which received every day a dose of 150 milligrams per kg body weight of methanol-aqueous extract), and the G3 control group. After two weeks of exposure, the rats were placed for sample collection, and the models were stored at -20 degrees Celsius until needed. Each rat's blood pressure (BP) was recorded 12 hours after its final level was administered before the rats were put to sleep. Each animal's blood was drawn with a sinocular injection after 14 days. In order a full hour, the blood samples were left to clot at 25 °C. Following this, the serum samples were kept cold, at -20 °C, until they were required for various biochemical computations.

Biochemical analysis:

Using Bio-lab assay kits, Serum glucose (Glc) and total antioxidants were measured following the manufacturer's instructions. Vitamin A and Vitamin E were measured using the enzyme-linked immune-sorbent assay (ELISA) with Elabscience assay kits.

Statistical analysis: The study's means ± and standard deviations (SD) served to describe the findings. The Statistical Program for Social Sciences (SPSS) version 23 was utilized for evaluating the information. The significance level was calculated by applying a one-way analysis of variance (ANOVA). A p-value of 0.05 or lower ($P<0.05$) is mathematically significant[15].

Results:

The methanol-aqueous cutting of Artemisia leaves was subjected to chemical analysis, and results indicated that flavonoids, saponins, glycosides, tannins, coumarone, and alkaloids were present in the extract table(1). Related consequences were obtained by [16].

Table (1): Active compounds in the methanol-aqueous extract of Artemisia leaves.

Active compound	Results
Alkaloids	+
Glycosides	+
Phenolic compound	+
Saponins	+
Tannis	+
Coumarines	+
Resins	+
Terpens and Steroids	+

+ ve: indicates the presence of Secondary metabolites.

Effect of The Methanol- Aqueous Extract of Artemisia Leaves on some biochemical (Serum fasting glucose, total antioxidant, Vitamin A and E) in rats.(Mean±SD)

Groups	Serum glucose mg/dl	Total antioxidant µM	Vitamin A ng/ml	Vitamin E µg/ml
G1: diabetes mellitus (n=10)	545±180*	840±150	2.3±0.5	149±39
G2 :diabetes treatment with 150 mg/Kg extract of Artemisia Leaves(n=10)	113±37*	1013 ±327	8.33±2.5	287±85
G3: control group(n=10)	103 ±25*	888±286	3.5±1.5	249±80.0

*= The mean difference is significant at ($p<0.05$) level.

Discussion:

Plants produce a wide range of chemical compounds, which are divided into primary and secondary metabolites based on their chemical class, place of biosynthesis, and functional groups. While they have been linked, secondary metabolites do not directly contribute to biocatalysis [17]. Plants biosynthesize secondary metabolites for a variety of functions, such as defence against infections and predators, inter- and intra-specific interactions, and growth regulation [18]. The phytochemical constituents of the Artemisia extracts of greeneries were establish to contain Glycosides, saponins, flavonoids, alkaloids, tannins, sterols, Coumarines, terpenes and steroids, resins, and phenolic, according to the current preliminary qualitative analysis. It is established that every one of these nutrients possesses both therapeutic and physiological effects[19]. These compounds are either employed as chemotherapeutic agents or as building blocks for the creation of contemporary medications[19]. Contemporary science has explored various attributes of these distinctive components that may offer health benefits. These include antioxidant properties[20], anti-tumour properties[21], anti-inflammatory properties, anticoagulant properties[22], and anti-osteoporotic properties[23], in addition to neural protection and immune modulation, in the middle of other properties[22]. Due to their many biological characteristics, including cytotoxicity[24], analgesic, antispasmodic and antibacterial, and antiviral[25], alkaloids have been linked to medical applications for centuries. reports state that glycosides are known to lower blood pressure[26]. The function of flavonoids and phenolic as naturally occurring antioxidants and free radical scavengers is gaining a lot of attention again[27]. Many research investigations have indicated that oxidative stress co-operates a direct part in diabetic complications [28]. Excess free radical species and compromised antioxidant defences are the causes of increased oxygen consumption in diabetes [29]. Reactive oxygen species cause cellular injury, including oxidative damage to proteins, lipids, and genetic material. It also disturbs intra- and intercellular homeostasis. Additionally, it may result in cellular adaptation. Hypoglycaemic properties and toxicity of an aqueous Artemisia extract of leaves have been assessed in streptozotocin-induced diabetic rats[3]. When compared to the control group, the streptozotocin-induced diabetic rats that received the leaf extract had considerably higher body weights, lower plasma sugar levels, better glucose acceptance, and better-quality imbalance in lipid metabolism[30]. In the liver and kidneys of diabetic rats, aqueous extracts of Artemisia decreased the concentration of lipid peroxidation products, and the levels of glutathione reductase, glutathione peroxidase, superoxide dismutase, and glutathione were raised to standard levels[30]. It has been shown that the administration of specific antioxidants significantly reduces oxidative stress in diabetic animal models used in experiments . Additionally, A. leaves have anti-oxidant qualities. It was therefore hypothesised that it might have anti-diabetic properties[31]. According to the study's findings, administering an extract from Artemisia leaves reduced blood glucose significantly (113±37) when compared to the group that had diabetes mellitus (545±180). Additionally, the extract increased levels of total antioxidants, vitamin A and E (1013 ±327, 8.33±2.5, and 287±85, respectively) when compared to rats that had diabetes mellitus (840±150, 2.3±0.5, and 149±39) respectively as shown in the table 2. A decline in blood glucose levels is linked to a growth in antioxidant absorption. Superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX), and glutathione reductase (GSH-rd), Vitamins non antioxidants such as A& E are among the antioxidants that detoxify active oxygen species[32]. As a result, they restrict active oxygen species from forming. By interfering with the chains of free radical reactions after they are formed, these antibiotics work to stop the chains of oxidation of free radicals. Additionally, the water-soluble herbal extracts promoted the redevelopment of pancreatic β-cells, as seen via the yield of the pancreas/body weight ratio to near typical (0.27%) (from 0.13 to 0.23%). The antioxidant capability of Artemisia extracts is further demonstrated by a drop in the quantity of lipid peroxidation products such as

malondialdehyde (MDA)[31]. Following management with the aqueous extract, there was a significant improvement in the enzymatic activities of glutathione reductase, glutathione peroxidase, and superoxide dismutase [31]. These results imply that by lowering oxidative stress, Artemisia may protect tissues.

Conclusion:

To sum up, this study's qualitative phytochemical analysis of Artemisia leaf extracts identified key phytochemicals, which are bioactive substances that are known to have antiviral, immunomodulatory, and antioxidant properties for both humans and animals. Methanol-Artemisia leaf aqueous extract shows strong antioxidant and antihyperglycemic properties. Consequently, there is a good chance that the plant will be developed into a medication to treat diabetes mellitus. Therefore, more research on these advantageous biological characteristics is required.

Achievements

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