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Pharmacological investigations of *Ficus carica* Linn (Moraceae)

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Abstract

An endocrine system metabolic disease is diabetes mellitus. Patients with diabetes have excessive blood sugar, which is detrimental to numerous bodily functions because they are either unable to generate insulin or are unable to use it correctly in the body. Elevated blood glucose levels can cause substantial harm over time to the heart, kidneys, eyes, nerves, and blood vessels. Inflammation is a primary protective response, it initiates when the body faces distressed physiological saturations such as swelling, heat, redness, pain, and injury. To repair tissues and destroy or inactivate the attacking organisms' body inflames. It is a critical reaction originated by the immune systems of the body to suppress inflammation. Natural substances are way better than pharmaceutical drugs as they have many side effects along with curative properties. Various parts of plant and herbal products are utilized traditionally for curing various diseases. The purpose of this study was to evaluate the anti-diabetic activity and anti-inflammatory activity of *Ficus carica* extract, which was checked by performing anti-diabetic assay Glucose uptake by yeast cells assay (50% at 80µg/ml) and its anti-inflammatory properties by membrane stabilizing assay of red blood cells (74.77 % at 100µg/ml). Both anti-diabetic and anti-inflammatory assays have revealed noteworthy results that give support to the traditional use of *Ficus carica* as a natural remedy. However, for its further therapeutic effect against diabetes mellitus and Inflammation in vivo study is needed.

KEYWORDS

Anti-diabetic, Anti- Inflammatory, plant extract, *Ficus carica*

1.0 INTRODUCTION

All over the world medicinal plants are used to treat a broad range of minor diseases. As there are a lot of chemicals present so medicinal plants have various biological uses. As Medicinal plants are important source of natural goods as well as these plants are very selective and cost effective in nature [1]. These plants are found in tropical regions of Arabia, Africa, Zanzibar, Mascarenes Islands Madagascar, and southwest in India [2]. For millennia, individuals have utilized plants as beneficial ingredients in medications, cosmetics, drinks, scents, and colors to maintain their health and improve their quality of life. The foundation of herbal medicine is the belief that plants naturally possess the power to promote health and heal illness. The focus on plant research that is currently taking place has produced a wealth of information showing the great potential of medicinal plants that are used in many traditional systems. The public is currently very interested in using herbal therapies [3]. In recent decades, diabetes has come to be seen as one of the issues that are directly related to obesity. The main causes of this connection are the degradation of the insulin secretory systems and the resistance of the cells' available insulin caused by fat. One of the two primary pathogeneses of type 2 diabetes (T2D), as well as certain other pathophysiological disorders like hyperlipidemia, hypertension, and hyperglycemia, is insulin resistance [4]. The increased percentage of T2D in the African population may be

somewhat attributed to the high incidence of obesity. The projected number of diabetics in Africa in 2010 was over 12.1 million; by the end of 2014, that figure had risen to 20 million [5, 6]. Although there are many various techniques for treating diabetes and obesity, one of them involves inhibiting the enzymes that break down carbohydrates and lipids, such as pancreatic lipases, α -glucosidase as well as α -amylase. The inhibition of these enzymes considerably lowers blood glucose and body fat levels in addition to reducing the digestion and absorption of fats and carbs. However, phytochemicals have been acknowledged as a more affordable option to contemporary medications for the treatment of metabolic disorders including diabetes and obesity [7]. It has been demonstrated that *Ficus carica* leaf extracts exhibit anti-inflammatory activity as compared to standard drug [8].

There are more than 800 species of trees, shrubs, and epiphytes in the genus Ficus (Moraceae), one of the largest angiosperm genera in the world. These species live in locations that are tropical or subtropical [9]. It belongs to the 40 genera that comprise the Moraceae family of mulberries. With 500 different species of Ficus, the Asian-Australasian region is the richest and most diversified region in the world. Conversely, there are only about 130 and 110 species of Ficus in the Neotropics and Africa, respectively. The majority of Ficus species are functionally dioecious, with around half being monoecious [10]. Numerous Ficus species possess a multitude of variations, significant genetic diversity, and remarkable pharmacological attributes that hold great commercial value [11].

The *Ficus carica* tree typically grows to a height of 15 to 20 feet, has several spreading branches, and rarely has a trunk larger than 7 feet in diameter. The plant's milky-white latex is primarily composed of the protein hydrolytic enzyme ficin [12]. The plant's roots are typically shallow and widely dispersed. Carica is a species name that refers to leaves that resemble papayas. Figs that are commonly shaped like pears grow axillary on leafy branchlets. The mature "fig" has a strong peel that can be pure green, green that has brown flecks, brown, or purple. When the fruit is ripe, the peel frequently cracks, revealing the flesh inside. Flowers grow from the axils of old leaves and are visible in receptacles. Female flowers occupy the upper portion of the container, while male flowers occupy the lower portion. Saikonium, the mature fruit, is filled with numerous tiny pale seeds. There may be 30 to 1600 seeds per fruit, and they might be large, medium, microscopic, or even tiny. If not pollinated, the abundant edible seeds are typically hollow. Pollinated seeds are what give dried figs their distinctive nutty flavor. The inside is made up of a white inner ring that encloses a seed mass held together by a jelly-like mass of flesh. The plant has single, big, alternating leaves that are bright green and can reach lengths of up to one foot. They have 1–5 sinuses and are generally deeply lobed, with the upper surface being rough-haired and the bottom being soft-haired. It has a smooth bark. The outer bark is ash- or silvery grey in color and flaked off in irregular shapes. The center portions of the bark have a brownish or light reddish-brown color. Layers of granular tissue with a light yellowish or orange-brown tint make up the inner part [9]. Though native to central India, Bengal, and the Sub-Himalayan region, it has been extensively cultivated elsewhere. The species known as "figs," or temperate *Ficus carica*, is indigenous to southwest Asia and the Mediterranean region, which stretches from Afghanistan to Portugal. Its nutrient-dense fruits have led to its widespread cultivation since ancient times. In the tropics, figs are highly valued for their numerous practical uses as well as for religious significance. This plant's biological activity has piqued the interest of researchers worldwide. *Ficus carica's* medicinal properties have been referenced in traditional medical systems such as Ayurveda, Unani, and Siddha [13]. It has been used to treat issues related to the digestive system (scabies, gonorrhea, and skin disease), reproductive system (menstrual pain), endocrine system (diabetes), respiratory system (liver diseases, asthma, and cough), and gastrointestinal tract (ulcer and vomiting) [9].

2. MATERIALS AND METHODS

2.1 Plant selection and extraction

The Ficus carica plant was collected from the Kalabat area of district Swabi Khyber Pukhtun Khawa Pakistan in the month of Feb 2023. The plant sample was identified in the University of Swabi and voucher number UOS/Bot-211 was placed in the herbarium of said department.

2.2 Extraction

The plant samples were dried at room temperature for ten days. The plant material had been powdered after drying and grinding. All of the plant chemicals were then extracted by crushing up the plant portions and soaking them in methanol for 14 days. After that, the extracts were concentrated at low pressure and temperature using a rotating evaporator.

2.3 Biological Activities

2.3.1 INVITRO ANTIDIABETIC ASSAY

Yeast Glucose Uptake Assay

According to the methodology of [14], research revealed glucose transport across the membrane of yeast cells. Industrial baker's yeast was dissolved in distilled water and was repeatedly centrifuged at 3000rpm for 5min to obtain clear supernatant. In distilled water, a suspension made up of 10 percent volume/volume was created. A 5mM glucose solution was mixed with various doses of *Ficus carica* extract ranging from 10 to 80µg/ml and then incubated at 37ºC for 10 minutes. After the initial incubation period of 60 minutes at 37ºC, 100µl of yeast suspension was mixed in and the reaction was initiated once more. The tubes were centrifuged for five minutes at 3800 rpm following incubation. The absorbance of the supernatant at 520 nm was measured with a UV 5100B spectrophotometer. The metronidazole was chosen as the standard. Utilizing the following formula, the percentage of glucose uptake was calculated.

$$\text{Percentage glucose uptake} = \frac{\text{C. A} - \text{S.A}}{\text{C. A}} \times 100$$

C.A- Control absorbance, **S.A-** Sample absorbance

2.4 In Vitro Anti-Inflammatory Activity

2.4.1 Human Red Blood Cell (HRBC) membrane stabilization assay

The effects of plant extract on human red blood cell (HRBC') hemolysis in a hypotonic saline solution were investigated, as was previously described [15]. An EDTA sample vial containing five milliliters of blood was obtained from a man donor in good health. Who hadn't taken an anti-inflammatory drug in the ten days prior. A clear supernatant was obtained by spinning the HRBC several times with normal saline. The test sample was then pipetted into test tubes at varying concentrations (10 to 100 ug/mL) after being dissolved in a hypotonic saline solution, coupled with 0.5 mL of a 10% HRBC suspension. After being incubated for thirty minutes at 37°C, the solutions were centrifuged for five minutes at 3000 rpm. Using a spectrophotometer, the supernatants' absorbance at 560 nm was measured. The reference standard was diclofenac, while the control was a hypotonic solution. Percent hemoglobin denaturation inhibition was checked and determined by applying the formula below.

$$\textit{Percent of protection} = \textit{Control} - \textit{Test sample/ control} \times 100$$

3. RESULTS AND DISCUSSION

3.1. Antidiabetic activity

To study the effect of *Ficus carica* on the glucose uptake by yeast cells in 5 mM glucose solution, various concentrations of *Ficus carica* were used 10, 20, 30,40, 50,60,70, and 80 µg which showed % glucose uptake of 10%, 12 %, 16 %,19 %, 28 %,32.9%,39%and 50% respectively. The Metronidazole was used as a standard group as 10, 20, 30,40, 50,60,70, and 80µg/ml which revealed 15 %, 19 %,25 %,34 %,40%, 45%,50%, and 60%% of glucose uptake respectively. See **Fig. 1**.

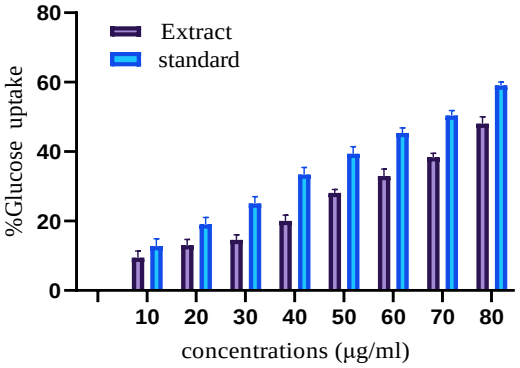

Fig. 1: Shows the effect of *F. carica* on glucose uptake by yeast cells.

3.2. Anti-Inflammatory Effect of *Ficus carica*

The HRBC-membrane stabilizing assay was utilized to investigate the extract's anti-inflammatory efficacy in vitro.

3.2.1. Human RBC effect of *Ficus carica*:

The extract was employed at 10, 20, 40, 60, 80, and 100 µg doses, which demonstrated the inhibition of 15.95%, 26.70%, 43.11%, 55.37%, 66.71%, and 74.77%, respectively. Using 10, 20, 40, 60, 80, and 100µg/ml of the diclofenac sodium medication as a standard group, the inhibition levels were found to be 32.66%, 54.23%, 67.38%, 74.57%, 80.95%, and 85.71%, respectively. At 10 µg, the lowest inhibition rate was 15.95%. At 100µg, the maximum inhibition rate was observed, which was 74.77% (**Fig. 2**).

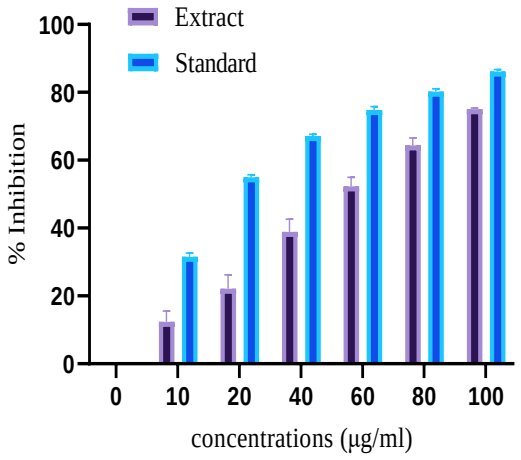

Fig.2: Shows the effect of *F.carica* on HRBC membrane stabilization.

4. CONCLUSION

In this study the Methanolic extract of *Ficus carica* was used to evaluate its anti-diabetic and anti-Inflammatory activity, performing anti-diabetic activity employing Glucose uptake by yeast cells assay (50% at 80µg/ml) and its anti-inflammatory properties by membrane stabilizing assay of red blood cells (74.77 % at 100µg/ml). All the anti-diabetic and anti-inflammatory assays have revealed noteworthy results that give support to the traditional use of *Ficus carica* as a natural remedy. However, for its further therapeutic effect against diabetes mellitus and Inflammation in vivo study is needed.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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