

## *In vitro* anti-diabetic activity of the different extract of medicinal plant *Fimbristylis tetragon*

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### Abstract

Diabetes mellitus is very serious health problem. Most of the death in the world due to diabetes. This may cause the many complications and affect the numerous organs in the body. The diabetes is the main problem of the hyperglycemia. The diabetes causes the extensive term impairment to the abnormal functioning and causes the nonfunctioning of the organ. The diabetes in rat the consumption of diminished the carbohydrate leads to the lipolysis resulted in hyperlipidemia. In spite of the presence of known medicines against the diabetic activity in the therapeutic market but these molecules can cause the certain tricky like medicinal impact. Newly some medicinally active plants have good antidiabetic activity. There are 400-450 different species having good antidiabetic phenomena. In this paper we used the leaves of plant *Fimbristylis tetragona* for the antidiabetic activity. It has been showing the excellent antidiabetic activity. This activity was measured in terms of the alpha-Glycosidase inhibitory activity and it also shows the good in-vitro alpha-amylase inhibition. Both activities were performed in the inventor model. The aqueous extraction of leaves of plant *Fimbristylis tetragona* has excellent activity.

**Keywords:** *fimbristylis tetragona*, plant, leaves, alpha-amylase, alpha-glycosidase, antidiabetic

### Introduction

Chronic disorder like diabetes is responsible for death. During the metabolism very high blood glucose level is presence and has very danger physiological effect. Mostly the method is used to cure the rehabilitation for type 2 diabetes by maintaining the glucose level after the meal or by taking the meal. They play important in the development of type 2 in human. Type 2 diabetes mellitus endures to be a chief medical concern in human with animal all over the world [1-2].

Mostly the diabetes causes the changes in fat, protein and carbohydrate metabolism which affect the insulin secretion explained by the world health organization (WHO). The diabetes mellitus causes long term damage, failure of the various organ and dysfunction. It has the result in the loss of weight, polyuria, blurred vision and thirst [3]. There are various types of the diabetes mellitus. This diabetes which depends on the insulin and the gestational diabetes (Type 3). This are the major two types diabetes and the treatment is given by oral hypoglycemic drugs, the insulin therapy, postprandial hyperglycemia and preventing hypoglycemia. Different insulin forms are available such as the pork insulin, beef insulin and human insulin. They show the various complication effects [4]. The insulin in suitable dosage form is employed and there is disparity between the meals and that of injection insulin. They basically bind the sulfonylurea receptors and beta cell plasma; they may produce the ATP Sensitive of the potassium channel; it depolarizes the membrane of the cell and tissue. Administration is drugs for the 2 DM patient as sulfonylureas to type upsurges the hormones like insulin release after the pancreases and may increase or decrease the insulin and changes the hormonal secretion. It may

affect the outlying approval of glucose and affect the Lessen the hepatic sugar and affect the 10-30%, once affect the verbally and intravenously [5]. For the treatment of these diabetes, there are number of scientist and the others using the Ayurvedic products against the diabetic.

Authors like Rahman who has documented more than 400 herbal plant species with the antidiabetic activity or the hypoglycemic properties. They are classified the country origin. Various parts are used as nature's active agent. WHO listed 21,000 plants, and its used for the antidiabetic treatment [6]. Plants such as the *Acorus calamus* (*Acoraceae*) [7], other plant like *Aegle marmelos* (*Rutaceae*) [8], *Azelaia Africana* (*Leguminosae*), shows the anti-diabetic properties of water extract bark from stem of plant like *Azelaia africana* [9]. *Apocynaceae* family of the *Alstonia scholaris*. Plant extract of bark of *Alstonia scholaris* has found to different antidiabetic and antihyperlipidemic motion [10].

*Anacardium occidentale* (*Anacardiaceae*) shows the good antidiabetic activity [11], the aqueous extract of *Annona squamosa* dose of 250 mg/kg [12], *Anoectochilus roxburghii* aqueous extract used for the treatment of diabetes diseases [13]. *Artemisiapallens* Wall. Ex-DC. *Besser* (*Asteraceae*) aqueous extract of the plant [14], and dragon herb *Artemisia dracuncululus* Lis commonly known as shows the good antidiabetic activity [15]. *Artemisia herba-alba* from the *Asteraceae* was the perennial herb used against the several types of the diabetes [16]. The neem tree from the India show the good antidiabetic activity [17]. The plants like the *Bruguieragymnorhiza*\* and their roots used for the treatment of the diabetes. *Biophytumsensitivum* ethanol extract used for the reducing the glucose level in the animal [19]. *Caesalpinia bonducella* leaves aqueous extract was used for the treatment of the diabetes [20]. *Camellia sinensis* plant

having the medicinal property and its ethanol extract used for the treatment of diabetes [21]. The *Ficus benghalensis* (*Moraceae*) bark extract was used as antidiabetic agent. *Ficus racemosa* (*Moraceae*) plant leaves were used to decrease the glucose level [22]. Most of the time leaves in aqueous extract of *Gymnemasylvestre* (*Asclepidaceae*) used for the diabetes treatment [23]. The common plant like the *Helicteresisora* L. (*Malvaceae*) leaves are used for tolerate anti-diabetic activity [24], plants from the *Acanthaceae*. Plant *Justicia beddomej* shows the good antidiabetic activity [25]. The common plant *Lantana camara* L. (*Verbenaceae*) leaves shows good antidiabetic activity. The plants like the *Momordica charantia* affect the glucose level of the plants [27]. *Morinda lucida* leaves extract of the plant used to decrease the glucose level. The plant like *Murrayakoenigii* Linn, its leaves shows the antidiabetic activity [28]. *Ossimumgratissium* (*Labiatae*) can be used against the hypoglycemic effects as their leaves extract [29]. Aqueous extract of the plant *Polyalthialongifolia* shows the good antidiabetic activity [30]. The methanol extract of the *Polyalthialongifolia* also shows the good antidiabetic activity [31]. In this studied we have used the plant such as the *Fimbristylis tetragona* R.Br., Cooke, Bombay 3: 393. 1958 (Repr. ed.). Perennial with short rhizome. Stems densely tufted, erect, slender, quadrangular, smooth, 10-50 cm long. Leaves reduced into sheaths, highest repeatedly with an unimportant lanceolate blade, acute-acuminate at top. Inflorescence terminal spikelet. Spikelet's bracteates, ovoid to spherical,  $c. 7 \times 5$  mm, compactly various-flowered. Glumes with membranous, more spiral, highly closely highly imbricate, round and oblong or egg-shaped, thickheaded or acute-thickheaded at zenith. Stamen customarily 1, at times up to 3 with filaments highly elongate while more fruiting. Good Style  $c. 1.5$  mm long, more slightly widened and dark brown at base, thoroughly ciliate; stigmas 3, shorter than style. Nut oblong cylindrical, obtuse at apex, slightly curved,  $c. 2 \times 0.5$  mm, light beige, with persistent style and staminal filaments. Phenology-Flowering: August–September; Fruiting: September–December. Voucher specimen: ANC 1727. Collection localities: Abasaheb Marathe College, Vikhare Gothane, Rajapur tehsil of Ratnagiri District, Maharashtra, India. Distribution: *Fimbristylis tetragona* is distributed in tropical Asia and Australia. In India mostly occur in the Maharashtra. Illustrations: K.M. Matthew, Further Illus. Fl. Tamilnadu Carnatic 4: t. 675. 1988; Note : Nut oblong-cylindrical, obtuse at apex. Commonly found in open wet places, lateritic plateaus and wet harvested rice fields. We have used the leaves of this plant for the study of the antidiabetic activity. *Fimbristylis tetragona* R.Br., belongs to family *Cyperaceae* (Sedge family).

## Materials and Methods

### Chemicals and Reagents

All the chemical required for the study were purchased from the S.D. fine limited Mumbai, India.

### Collection of Plant Materials

Plant Material *Fimbristylis tetragona* were collected from Rajapur, Raigad region and other Sahyadri region of the Maharashtra India.

The Plant was identified and authenticated by Dr. Arun Chandore, Abasaheb Marathe College, Rajapur, tehsil of Ratnagiri District, Maharashtra, India, stored in Department of Botany in the Abasaheb Marathe College, Rajapur.

## Experimental

The leaves of plant *Fimbristylis tetragona* collected from Rajapur region. This Plant material was kept for drying at room temperature, after complete drying, it converted to the fine powder using the pestle and mortar. The extract was prepared in different solvents extraction. This was carried using Soxhlet extraction using solvents of various polarity as water, methanol, chloroform, ethanol, and acetone were used.

### In-Vitro Alpha-Amylase Inhibition.

Amylase inhibition as the alpha inhibition activity. Activity was resolute consuming an altered method but one of the new revised evaluate of termed in the manual of enzyme. Worthington is good method reported in literature. The 500  $\mu$ L of the sodium phosphate buffer with conc. 0.02 M with the pH 6.9 along with 0.06 molar sodium chloride, then we added 0.5 mg/mL of alpha-amylase enzymes in the test tube. This can be kept in the room temperature for 10 min. then we added the dinitrosalicylic (DNS) acid interval with the shaking.

Then add 1.0 mL of colour reagent by stopping the reaction then kept in the boiling water bath in the 5 min. The scientist Phoboo et al. was reported by the test-tube assays of antidiabetic activity. The combination was dilute by adding 3 to 15 mL of condensed water, absorbance was measured at 540 nm previously described light colorimeter or spectrophotometer compared with buffer solution [32-39].

### Alpha-Glycosidase Inhibitory Activity

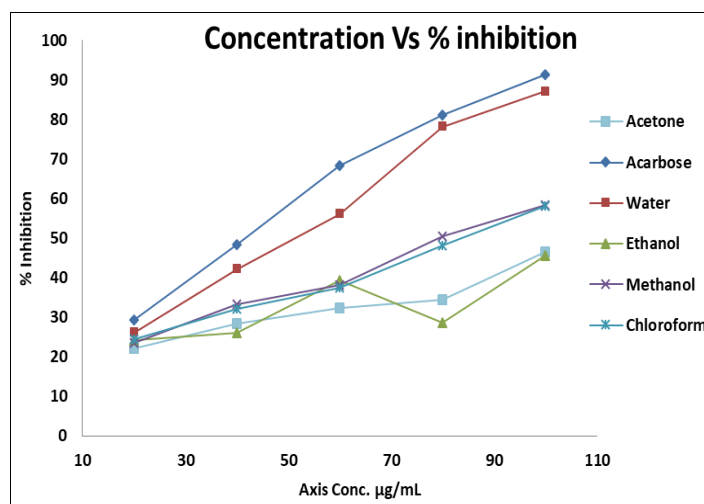
A better method to square activity of mixtures for diabetes is alpha-glucosidase inhibitory activity. The growth of new protocol during recent years have been developed. The alpha-glycosidase usually tested using 50 microliter extract and the 100 microliter, buffer of the pH 6.9 as the phosphate buffer using the solution alpha-glycosidase solution and incubated properly for 10 min at 25 °C. Then we added the 50 microliters of solution with 5 mM *p*-nitro phenyl- $\mu$ -*d*-glucopyranoside and resulted solution subjected to the absorbance measurement. Then absorbance was measured at the 405 nm using the spectrophotometer.

## Results and Discussion

*In vitro*-glucosidase inhibitory assay, we studied the antidiabetic activity using the glucosidase as the inhibitory assay of the various extracts such as water, methanol, ethanol and chloroform. This is shown in the Table 1. The water extract shows the excellent antidiabetic activity as the comparable with the standard antidiabetic drug. The water extract having the better activity than the methanol, ethanol and Chloroform extract. All the extract shows the good activity against the diabetes. The different extract of the leaves contains the various phytochemicals such as the phenols, flavonoids saponins, steroids, alkaloids, terpenoids may responsible for the antidiabetic activity of leaves of plant *Fimbristylis tetragona*.

**Table 1:** Alpha-Amylase Inhibition activity of leaves of Plant Extract in Different solvent Extract. (This can be carried using the *in vitro* protocol).

Conc. µg/mL	Acarbose (Standard) % inhibition	Water % inhibition	Ethanol % inhibition	Methanol % inhibition	Chloroform % inhibition	Acetone % inhibition
20	29.22	22.13	26.12	27.40	21.40	22.22
40	48.36	32.14	28.40	37.34	32.23	28.36
60	68.33	56.14	34.4	46.26	44.23	32.36
80	81.22	78.12	29.40	45.45	55.12	34.40
100	91.33	79.12	27.60	56.45	56.14	46.40

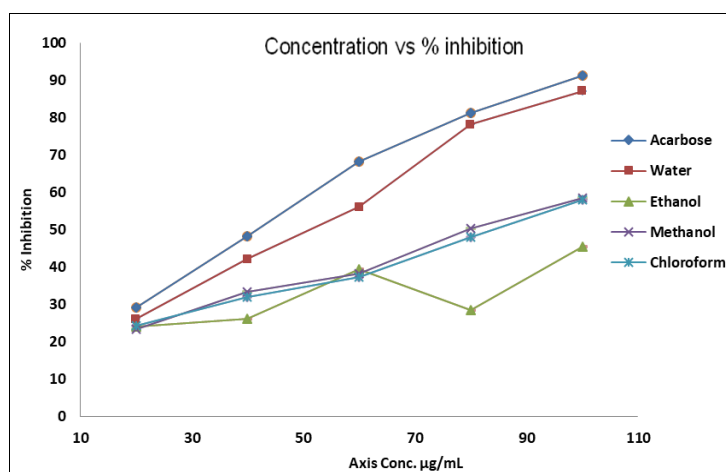
**Fig 1:** Alpha-Amylase Inhibition activity of leaves of Plant Extract in Different solvent.

In this we studied *in vitro*-amylase inhibitory activities (Table 2). We have prepared various extract from the leaves of plant *Fimbristylis tetragon*. All these activities carried out *in vitro* conditions by the amylase inhibitory activities. We have compared the antidiabetic activity of the leaves with the standard antidiabetic drugs. The aqueous extract shows the excellent activity compared with the standard antidiabetic activity. The aqueous extract shows the

excellent activity compare to methanol, ethanol and the chloroform extracts. The plant extract contains the various poly phenols in the leaves of the plant *Fimbristylis tetragon*. These are responsible for the inhibiting the growth and hydrolyzing the enzymes and the binding to the protein. The total phenolic content and various phytochemicals present in the given extracts of the leaves of the plant *Fimbristylis tetragon*.

**Table 2:** Alpha-Glycosidase Inhibitory Activity of Leaves of Plant Extract in different solvents. (This can be carried using the *in vitro* protocol).

Conc. µg/mL	Acarbose (Standard) % inhibition	Water %inhibition	Ethanol %inhibition	Methanol %inhibition	Chloroform % inhibition
20	29.22	26.13	24.10	23.48	24.40
40	48.36	42.18	26.10	33.34	32.10
60	68.33	56.10	39.40	38.26	37.34
80	81.22	78.14	28.50	50.48	48.10
100	91.33	87.10	45.50	58.45	58.10

**Fig 2:** Alpha-Glycosidase Inhibitory activity of leaves of Plant Extract in different solvents.

## Conclusion

We have prepared the various extract of the *Fimbristylis tetragona*, after the preparation of the extract in the different solvent such as water, ethanol, methanol and chloroform. After preparation this extract, we have tested this against Alpha-amylase inhibition activity and the alpha-glycosidase inhibitory activity. We have observed that the water extract shows the excellent activity against the standard. These extract shows the water extract shows the excellent activity against the diabetes. This is very cheap simple, low cost formulation for the development of natural diabetic agent.

## Relevant conflicts of interest/financial disclosures

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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