COMPARATIVE STUDIESY ONF ANTI-DIABETIC ACTIVITY OF *MOMORDICA CHARANTIA* AND *PSIDIUM GUAJAVA* ON ANTI-DIABETIC ACTIVITY

ABSTRACT:

Diabetes is a metabolic disease characterised by decreased insulin signalling and persistent hyperglycaemia. The most frequent progression of diabetes is known as diabetes mellitus which is defined as persistent hyperglycaemia brought on by either peripheral insulin resistance or impaired pancreatic β cell production of insulin. This condition is caused by the disruptions in the digestion of carbohydrates, fats and proteins which are caused by defects in the production, release and regulation of insulin. The breakdown of carbohydrates is significantly aided by the intestinal digestive enzymes α-glucosidase and α-amylase. One type of antidiabetic treatment is to lower the blood glucose levels after a meal by blocking the enzymes α-glucosidase and α-amylase. This could be a key tactic in blood glucose control. When compared to other commercial pharmaceuticals used to treat diabetes, herbal treatments are thought to be more in harmony with the human body and to have less harmful side effects. This herbal remedy is reasonably priced as well. The current study is set out to compare the anti- diabetic activity of the methanolic extracts of *Momordica charantia* and *Psidium guajava*. Alpha- glucosidase enzyme inhibition and alpha-amylase enzyme inhibition are both shown by the methanolic extracts in a dose dependent manner, which suggests that the presence of bio active compounds may be responsible for the plants many medicinal uses, including the treatment of diabetes.

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Key words: Diabetes mellitus, hyperglycaemia, insulin, resistance, α-glucosidase, α-amylase, herbal remedy.

1. INTRODUCTION:

Diabetes mellitus is a complicated and multifaceted set of conditions that impairs how fat, protein and carbohydrates are metabolised. Globally, the number of instances of diabetes mellitus has been rising recently. [1]. Diabetes mellitus is brought on by abnormalities in the glucose metabolism, which is connected to low levels of blood insulin of target organ insulin sensitivity. Although there has been significant advancement in the management of diabetes with oral hypoglycaemic medicines, the hunt for novel medications persists due to the numerous drawbacks of the current synthetic therapies [2]. Herbal medications possessing anti diabetic effects have not been developed into modern pharmaceuticals for commercial use, despite being highly regarded in conventional medical systems for their medicinal qualities [3]. Obese people typically develop type-2 diabetes, which is linked to dyslipidaemia and hypertension. Thus, the goal of the treatment is to lower insulin resistance and to increase the release of insulin [4]. Diabetes is a metabolic disease in which the body is unable to make or use insulin, a hormone needed to turn food, sugar and carbs into energy. The hallmark of diabetes mellitus is persistently elevated blood glucose levels. The human body uses glucagon and insulin to keep blood glucose levels within a fairly specific range. The liver releases glucose into the blood stream from its cells in order to produce energy. This is the functionjob of glucagon [5]. Type -1 Diabetes causes the body to be unable to secrete insulin, which lowers the rate at which muscles and adipose tissue absorb glucose. Herbal traditional medicines are employed for the treatment of diabetes in developing nations when the population finds the expense of conventional medications to be prohibitive [6]. Diabetes and its later consequences remain a serious medical issue even with the recent development of hypoglycaemic drugs derived from both the natural and artificial sources. It has been shown that numerous native Indian medicinal herbs can effectively treat diabetes. One of the main benefits is that it has very few adverse effects [7].

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2.PLANT TAXONOMYPROFILES:

2.1. *MOMORDICA CHARANTIA*:

- Botanical name: *Momordica charantia*
- Family: Cucurbitaceae
- Indian name: Bitter melon, bitter gourd
- Habitats: It is a warm season crop grown mainly in sub-tropical and hot-arid regions. They are susceptible to light frost and are provided with partial protection if grown during winter months. Temperature range of 24°C- 27°C is considered as optimum for the growth of the vines.
- Parts used: fruit
- Phytoconstituents: Tannins, flavonoids, Phenolic compounds, alkaloids, saponins, steroids, cardiac glycosides, phlobatannins, and anthraquinones.

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2.2. *PSIDIUM GUAJAVA*:

- Botanical name: *Psidium guajava*
- Family: Myrtaceae
- Indian name: Guava, apple guava, lemon guava
- Habitat: It is an evergreen shrub or small tree native to the Mexico, central America, the Caribbean and the northern south America. It is grown in tropical and subtropical areas world-wide.
- Parts used: Leaf
- Phytoconstituents: Phenolic compounds, iso-flavonoids, gallic acid, catechin, quercetin, epicatechin, rutin, naringenin, kaempferol, caryophyllene oxide, p- selinene, chlorogenic acid, myricetin, avicularin, apigenin, guijaverin, caffeic acid[11].

3.MATERIALS AND METHODS:

The bitter melon fruits were purchased from the local market in the Gummadidala, Telangana. Distilled and deionized water was utilized in the studies. The bitter melon fruits were washed, sliced into little pieces, and then oven dried at 50°C. Next, the desiccated sample was finely ground in a grinder and kept in storage at 4°C until needed.

Fresh, green leaves wereare gathered from the Gummadidala area, allowed to air dried for two to three days, then ground into a powder using a mixer. The powdered material is then stored for further extraction.

PREPARATION OF EXTRACTS:

Fifty grams of finely grinded sample was weighed into a thimble and was extracted with 70% of methanol for 4hours. The sample residue was removed from the thimble. The extract was filtered using Whatman filter paper No.4 and evaporated on water bath to remove methanol. The concentrated extract was stored at 4°C until analysis.[8].

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4. QUALITATIVE PHYTOCHEMICAL ANALYSIS:

Phytochemical screening Physicochemical tests for *Momordica charantia* and *Psidium guajava*:

4.1 TEST FOR ALKALOIDS:

Wagner's test: Add 1 mLl of diluted hydrochloric acid and Wagner's reagent was added to the 2 3 mLl of the filtrate, and thoroughly shaken. Formation of rReddish-brown precipitate formation indicated the presence of alkaloids.

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Hager's test: A few drops of Hager's reagent wasare combined with 1 mLmillilitre of the extracttest solution. Appearance of yellow precipitate indicates the presence of Aalkaloids. are present when a yellow precipitate starts to form.

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Dragendorff's reagent: Two mL of extract was mixed with a mL of ~~An orange-red precipitate was generated when 1 millilitre of~~ dragendorff's reagent. The appearance of an orange- red precipitate indicates the presence of alkaloid. ~~was added to 2 millilitres of extract, signifying the presence of alkaloids.~~

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4.2 TEST FOR FLAVO~~A~~NOIDS~~:~~

Alkaline reagent test: ~~To the~~ Two~~2~~ mL~~l~~ of extract was mixed with ~~add~~ three drops of sodium hydroxide. T~~initially t~~he solution turns into deep yellow colour after adding dilute hydrochloric acid it becomes colourless indicating the presence of flavonoids.

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4.3 TEST FOR SAPONINS~~:~~

Foam test: A test tube was filled with 2 mL of the plant extract ~~in order to determine the amount of saponins present.~~ Following a strong 15 seconds of shaking, they were allowed to stand for 15 minutes. The height of the produced foam was measured. The presence of saponins was indicated by foam formation.

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4.4 TEST FOR AMINO ACIDS:

Ninhydrin test: It is essential to produce a 1% solution of the test solution in distilled water. To this solution, a few drops of the 2% ninhydrin solution are needed. It is necessary to submerge the test tube in warm water for around five minutes. Amino acids are present when a rich purple colour is produced.

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4.5 TEST FOR ANTHRAQUINONE GYLOCOSIDES:

Borntrager's test: One gram of the extract was added to ~~drug sample~~ and 5 mL ~~to 10 millilitres~~ of diluted HCl. This solution was boiled in a water bath for ~~and~~ ten minutes. ~~of boiling on a water bath~~. ~~Add~~ Five ~~5~~mL~~l~~ of chloroform along with 1 mL~~l~~ of 10% ammonia were added to the solution. This was shaken. The appearance of a ~~and shaking produces~~ bright pink colour ~~that~~ indicate~~ds~~ the presence of the anthraquinone moiety.

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4.6 TEST FOR POLYPHENOLS~~:~~

Ferric chloride test: A mL of the extract was mixed with ~~addition~~ of 1 mL~~l~~ of ethanol and 2 mL~~l~~ of distilled water. Subsequently, ~~and~~ 4 drops of freshly prepared ferric chloride solution was added ~~to the 1 ml of extract produces~~. The appearance of blue or green colour indicated the presence of polyphenol.

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5. DRUGS AND CHEMICALS:

Acarbose, alpha-amylase, alpha-glucosidase, phosphate buffer, starch, dinitro salicylic acid (DNSA).

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6. INVITRO ANTI-DIABETIC ACTIVITY~~:~~

6.1 ALPHA-GLUCOSIDASE INHIBITION ASSAY~~:~~

200 µL~~l~~ of α-glucosidase enzyme was combined with 100 µL~~l~~ of extract (20 mg/ml) and incubated for 10 minutes at 37°C. Following the preincubation step a 100 µl solution of 5 mM PNPG (4-nitrophenyl α-d-glucopyranoside) was added, and the mixture was incubated for 30 minutes at 37°C. T~~t~~he UV spectrophotometer was used to detect the solution's absorbance every two minutes at 405 nm. As a control, phosphate buffer was employed. Acarbose's IC50 value served as the positive control. The % inhibition of α-glucosidase activity was computed using the following equation:

Glucosidase (%) inhibition: [Ac-As]/Ac×100

Where, As and Ac stand for the sample and control absorbance curve slopes, respectively ~~.~~[9].

6.2 ALPHA-AMYLASE INHIBITION ASSAY~~:~~

Quantifying~~tating~~ the reducing sugar (maltose equivalent) released under test conditions allowed for the assessment of α-amylase inhibition. A drop in the amount of maltose released per unit was used

to quantify the inhibitory activity of the enzyme. To determine the maltose equivalent, a modified dinitro salicylic acid (DNS) technique was used.~~8~~ 1mL of the chosen plant extracts' aqueous extracts were pre-incubated for 30 minutes with 1 U/mL of α-amylase, and then 1 mL (1% w/v) starch solution was added. The mixture was incubated for an additional 10 minutes at 37°C. After that, the reaction was halted by adding 1 mL of DNS reagent, which was heated for five minutes in a boiling water. Equal amounts of solution (20 mM sodium phosphate buffer with 6.7 mM sodium chloride, pH 6.9 at 20°C) were used to create two blanks: one without plant extracts and the other without the amylase enzyme. Measuring the absorbance at 540 nm. [10].

7. RESULTS AND DISCUSSIONS:

Phytochemical constituents of *Momordica charantia*~~The preliminary phytochemical analysis outcomes.~~

~~Outcomes of Initial Phytochemical Analysis of *Momordica charantia:*~~ ~~Regarding initial phytochemical examination of~~ *Momordica charantia* fruit was found to contain ~~reveal that~~ flavonoids, saponins, alkaloids, glycosides and phenolic compounds were~~are~~ present. This is indicated in Table 1.~~The table presents each and every result.~~

Table – 1 ~~Preliminary phytochemical analysis outcomes~~ Qualitative phytochemical constituents of *Momordica charantia:*

~~NAME OF THE~~ CONSTITUENT	METHANOLIC EXTRACT
Alkaloids	+
Flavonoids	+
Anthraquinone glycosides	+
Polyphenol	+
Amino acids	-
Saponins	+

Key:

Present : +

Absent : -

Phytochemical constituents of *Psidium guajava*~~The preliminary phytochemical analysis outcomes.~~

~~Outcomes of Initial Phytochemical Analysis of *Psidium guajava*~~

~~Regarding initial phytochemical analysis of~~ *Psidium guajava* leaves was found to contain ~~reveal that~~ alkaloids, flavonoids, saponins and phenolic compounds ~~are present~~. This is indicated in Table 2.~~e table presents each and every result.~~

Table-2: Qualitative phytochemical constituents of ~~Preliminary phytochemical analysis outcomes of~~ *Psidium guajava:*

~~NAME OF THE~~ CONSTITUENT	METHANOLIC EXTRACT
Alkaloids	+

Flavonoids	+
Anthraquinone glycosides	-
Polyphenol	+
Amino acids	-
Saponins	+

Key:

Present : +

Absent : -

PHYSICOCHEMICAL ANALYSIS:

Physicochemical properties ~~analysis~~ of *Momordica charantia*:

Physicochemical properties ~~Preliminary physicochemical analysis~~ of *Momordica charantia* was shown to have yellowish green colour, acrid odour and bitter taste. Thisis indicated in Table 3 ~~carried out. The factors such as colour, odour, taste, solubility was analysed.~~

TABLE-3. ~~RESULTS OF~~ PHSICOCHEMICAL PROPERTIES ~~PARAMETER ANALYSIS~~ OF *MOMORDICA CHARANTIA*:

PARAMETER	OBSERVATION
Colour	Yellowish-green
Odour	Acrid
Taste	Bitter

Physicochemical properties~~analysis~~ of *Psidium guajava:*

P~~reliminary p~~hysicochemical properties ~~analysis~~ of *Psidium guajava* was shown to have green colour, characteristic odour and taste. This is indicated in Table 4.~~carried out. The factors such as colour, odour, taste, solubility was analysed.~~

TABLE-4. RESULTS OF PHSICOCHEMICAL PARAMETER ANALYSIS OF *PSIDIUM GUAJAVA*:

PARAMETER	OBSERVATION
Colour	Green
Odour	Characteristic
Taste	Characteristic

Invitro anti-diabetic activity by inhibition of alpha amylase and alpha glucosidase methods

The invitro anti-diabetic activity by inhibition of alpha amylase and alpha glucosidase methods are indicated in table 5 and table 6 respectively for Momordica charantia and tabkes 7 and 8 for Psidium guajava. Where the highest inhibition was 79.83 at a concetration of 0.8 for *Momordica charantia* while the highest inhibition was 68.35 at a concentration of 0.8 for *Psidium guajava.*

Table-5. Inhibition of alpha glucosidase of methanolic extract of *Momordica charantia*

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Serial number	Concentration(mL)	%Inhibition (%)
1	0.2	43.02
2	0.4	63.86
3	0.6	67.22
4	0.8	79.83

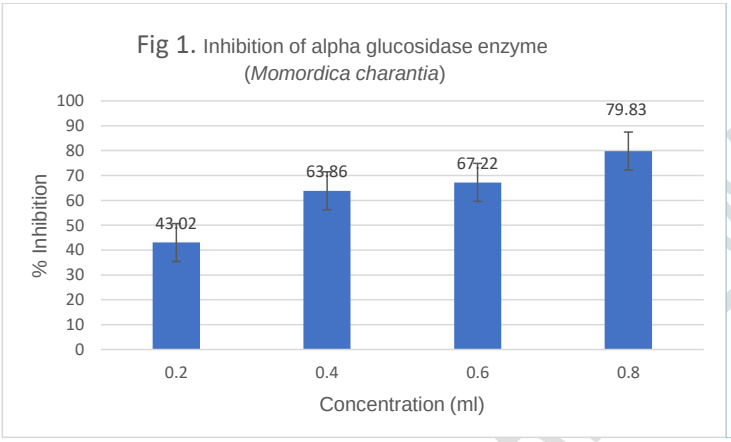

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Table-6. Inhibition of alpha amylase of methanolic extract of *Momordica charantia*

Serial number	Concentration (ml)	% Inhibition
1	0.2	21.39
2	0.4	46.45
3	0.6	60.50
4	0.8	68.35

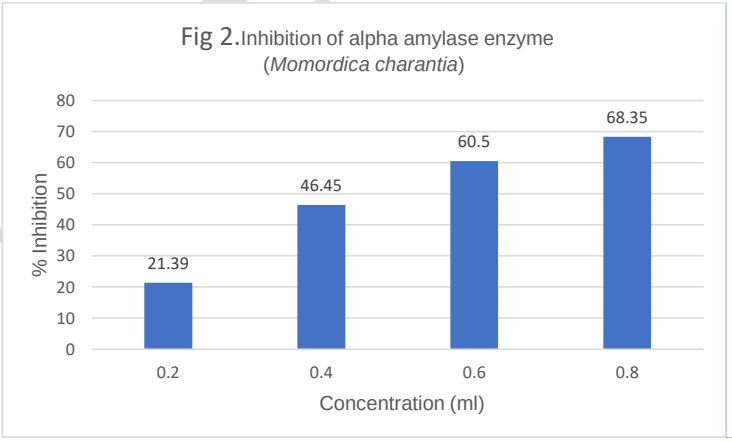

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Table-7. Inhibition of alpha glucosidase of methanolic extract of *Psidium guajava*

Serial number	Concentration (ml)	% Inhibition
1	0.2	32.94
2	0.4	56.30

3	0.6	63.86
4	0.8	70.58

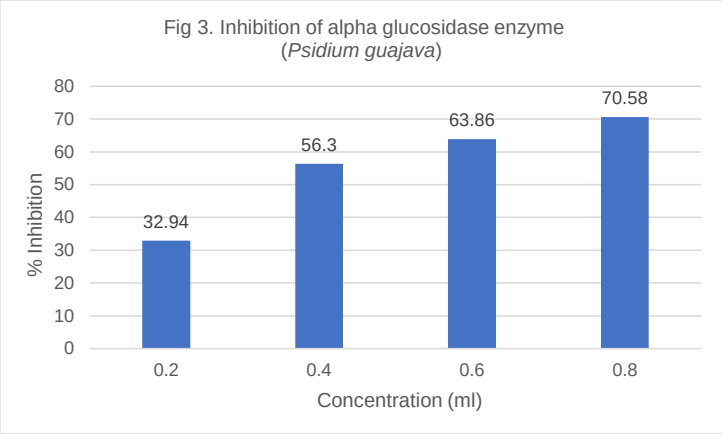

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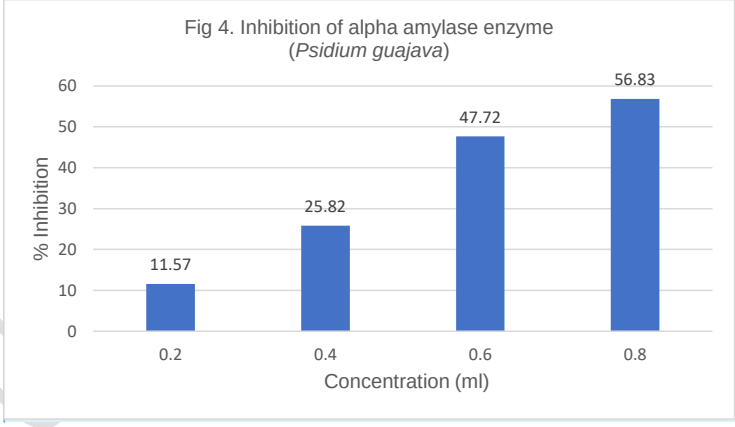
Table-8. Inhibition of alpha amylase of methanolic extract of *Psidium guajava*

Serial number	Concentration (ml)	% Inhibition
1	0.2	11.77
2	0.4	25.82
3	0.6	47.72
4	0.8	56.83



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8. CONCLUSION

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- Herbal medicines are the culmination of hundreds of years worth of therapeutic expertise gathered by generations of indigenous medical practitioners. Not only are herbal medications more widely used in underdeveloped countries for primary healthcare needs, but they are also more widely accepted culturally, have less adverse reactions on the body, and have fewer side effects.
- When it pertains to treating diabetes, herbal medications are said to be more in harmony with the human body and have less harmful side effects than many commercial treatments. This natural remedy is very reasonably priced.

- The findings from the current study shown that the methanolic extracts of *Momordica charantia (fruit) and Psidium guajava (leaf)* has a potential to inhibit the alpha amylase and alpha glucosidase enzymes in a dose dependent manner.
- When compared the individual inhibition activity of *Momordica charantia* (fruit) *and Psidium guajava* (leaf) on the intestinal enzyme's alpha amylase and alpha glucosidase Momordica charantia has better activity.
- In conclusion, further studies are required for the isolation and determination of several bioactive compounds that are responsible for the anti-diabetic activity.

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9. REFERENCES:

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