



# Metabolite Analysis and Antidiabetic Activity of *Solanum betaceum*

S. Vijaya Bharathi<sup>\*1</sup>, Roshini<sup>1</sup> and Sindhu<sup>1</sup>

<sup>1</sup>Department of Biotechnology, FSH, SRMIST, Kattankulathur, Tamilnadu- 603203.

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Corresponding Author Email: [shavisa04@gmail.com](mailto:shavisa04@gmail.com)

## Abstract

Medicinal plants have been reported to play an important role in modulating glycemic responses and have preventive and therapeutic implications. The intestinal digestive enzymes play a vital role in the carbohydrate digestion. The present study is carried out for identifications of chemical constituents of *Solanum betaceum* using standard procedures of phytochemical analysis. The crude extract of the fruit was analyzed for  $\alpha$ -amylase inhibition activity. From the study, it was identified that the fruits contain various classes of secondary metabolites like flavonoids, tannins, saponins etc. The fruit possessed a moderate anti-diabetic activity in terms of alpha amylase inhibition. The inhibition percentage of *Solanum betaceum* was 60.50%.

## Keywords

*Solanum betaceum*, alpha amylase inhibition, phytochemicals.

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## INTRODUCTION

*Solanum betaceum* (SB) is cultivated throughout the world because of its wide medicinal value. Common name of SB is tamarillo and its fruits are ovoid in shape, the colour varies from yellow, orange and red. Tamarillo is the best source of anthocyanin [1]. It is identified as low calorie fruit and contains potassium, Vitamin-B complex, and important dietary fibre [2]. Tamarillo is a fast growing tree, showed good adaptability to different environment [3]. Traditionally the leaves and fruits are used to treat sore throat, gum diseases [4].

Improper regulation of carbohydrate, protein and lipid metabolism by insulin is found to result in high blood glucose. Diabetes is a chronic disorder when not treated properly it will affect major organs like kidney, eye, heart etc. [5]. Three types of diabetes are type I (Insulin dependent), type II (Insulin independent), gestational diabetes [6]. Alpha

amylase is calcium containing enzyme which hydrolyzes the carbohydrates to its simplest form. In case of diabetes individual due to impairment in carbohydrate metabolism this enzyme action may further increase the glucose level [7]. Targeting this enzyme helps in avoiding the post prandial glucose level increase, so in this present study the crude extract of tamarillo was checked for its inhibitory potential against amylase.

## MATERIALS & METHODS

### Collection & extraction

Red coloured fruits were collected from Kodaikanal, Dindigul district, authenticated and shade dried. 50g of powdered fruit was extracted with ethanol (500ml) by placing the sample for 1-week period at room temperature, mixing it frequently by shaking thoroughly. Then the extract was filtered, evaporated, concentrated and stored [8].

### Gas chromatography- Mass spectrometry analysis

Volatile compounds of SB crude extract were analysed by GC- MS technique. The procedure was followed as mentioned in Duraisamy Gomathi et al., 2015 work for analysing the bioactive compounds of ethanol extract of *Evolvulus alsinoides*. The peak obtained was analysed with NIST library [9].

### $\alpha$ – amylase inhibition assay

A total of sample extract (1mg/ml) of varying concentration was added to 10 $\mu$ l of  $\alpha$ - amylase solution was incubated at 37°C for 10 minutes. After pre incubation, 500 $\mu$ l of 1% starch solution was added to each tube and incubated for 1 hour at 37°C. The reaction was stopped with 10 $\mu$ l of dil. Hydrochloric acid. The test tubes were added with 200 $\mu$ l of iodine solution. The result was compared with a control. The control used was acarbose. The absorbance was measured at 565 nm [10].

## RESULTS & DISCUSSION

Alkaloids, flavonoids, tannins and saponins were the metabolites found in ethanol tamarillo fruit extract.

SB also showed the presence of carbohydrates, glycosides and oil (Table: 1). The peel of SB was reported to contain phenolics [11]. SB seeds extract showed the existence of alkaloids, tannins, polyphenols, flavonoids and terpenoids [12]. Racquel Barcelo 2015, identified the existence of alkaloids, steroids, flavonoids, saponins and tannins in the methanol fruit extract which was extracted only with flesh part [13]. Volatile metabolite analysis of crude extract by GC- MS showed the presence of various biologically active compounds (Table: 2). SB extract revealed 60.50% Of inhibition against  $\alpha$  amylase with IC50 value of 65.82  $\mu$ g/ml (Graph: 1). Crude extract, carotenoid crude extract and their combinations of SB was found to have  $\alpha$  –glucosidase inhibitory activity [1]. The peel of this fruit showed significant blood glucose reduction in alloxan induced diabetic rat [14]. Similarly, methanolic red coloured fruit extract also showed an effective antidiabetic potential in streptozotocin induced rats [15].

**Table: 1 Bioactive compounds of *Solanum betaceum***

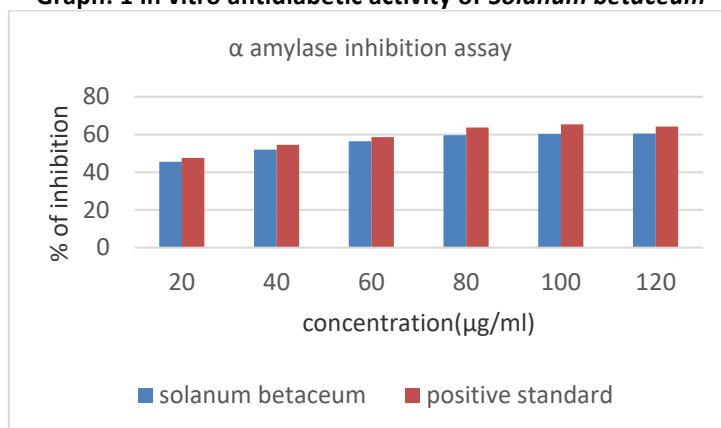
| S. No | Test          | Result |
|-------|---------------|--------|
| 1     | Flavonoids    | +      |
| 2     | Alkaloids     | -      |
| 3     | Tannins       | +      |
| 4     | Saponins      | +      |
| 5     | Steroids      | -      |
| 6     | Carbohydrates | +      |
| 7     | Glycosides    | +      |
| 8     | Fixed oil     | +      |

**Table: 2 GC- MS result of crude extract of SB**

| S.NO | RETENTION TIME | COMPOUNDS                       |
|------|----------------|---------------------------------|
| 1    | 5.992          | 2-heptanol, 3-methyl-           |
| 2    | 6.085          | Propanoic acid                  |
| 3    | 6.601          | 2-furancarboxaldehyde           |
| 4    | 8.522          | 2(3h)-furanone, dihydro-        |
| 5    | 9.002          | 2-Cyclopenten-1-one, 2-hydroxy- |
| 6    | 9.175          | 3-methyl-2,5-furandione         |
| 7    | 9.594          | 2-furancarboxaldehyde           |
| 8    | 10.058         | 2,5-furandione                  |
| 9    | 10.617         | 6,8-dioxabicyclo(3.2.1)octan-   |
| 10   | 10.658         | 8-Azabicyclo[3.2.1]octane       |
| 11   | 10.767         | 2-undecanol                     |
| 12   | 10.969         | 3-methylene-1,7-octadiene       |
| 13   | 12.217         | 4-oxopentanoic acid             |
| 14   | 15.419         | 1,5-anhydro-6-deoxyhexo-2,3     |
| 15   | 15.450         | 2,3-dihydro-3,5-dihydroxy-6-m   |
| 16   | 15.817         | Dodecane                        |
| 17   | 15.908         | Acetic acid, heptyl ester       |
| 18   | 17.533         | N-acetylmannosamine             |

| S.NO | RETENTION TIME | COMPOUNDS                         |
|------|----------------|-----------------------------------|
| 19   | 18.217         | Ethanethioic acid                 |
| 20   | 18.250         | Pentanoic acid                    |
| 21   | 18.647         | 2-Furancarboxaldehyde             |
| 22   | 19.690         | 2-Methoxy-4-vinylphenol           |
| 23   | 22.990         | 1,2-benzenedicarboxylic acid      |
| 24   | 23.950         | 3-hexenoic acid                   |
| 25   | 24.166         | Pidolic acid                      |
| 26   | 24.403         | Hexadecanoic acid                 |
| 27   | 24.525         | Phenol                            |
| 28   | 28.824         | 2,2-dideutero octadecanal         |
| 29   | 28.991         | Methyl tetradecanoate             |
| 30   | 30.396         | 9-octadecenoic acid               |
| 31   | 30.540         | 1-Iodo-2-methylnonane             |
| 32   | 31.966         | 1,2-benzenedicarboxylic acid      |
| 33   | 32.402         | Pentadecanoic acid                |
| 34   | 32.716         | 9-Hexadecenoic acid, methyl ester |
| 35   | 33.166         | Hexadecanoic acid, methyl         |
| 36   | 33.875         | Dibutyl phthalate                 |
| 37   | 33.988         | 9-hexadecenoic acid               |
| 38   | 34.457         | Hexadecanoic acid                 |
| 39   | 36.349         | Methyl octadeca-9,12-dieno        |
| 40   | 36.485         | 9-octadecenoic acid, methyl       |
| 41   | 36.957         | Octadecanoic acid, methyl ester   |
| 42   | 37.721         | Cis-Vaccenic acid                 |

**Graph: 1 In vitro antidiabetic activity of *Solanum betaceum***



## CONCLUSION

Pharmaceutically active compounds of *Solanum betaceum* has to be isolated, purified and to be assessed for its biological activity.

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