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Metabolite Analysis and Antidiabetic Activity of *Solanum betaceum*

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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 α-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].

α – amylase inhibition assay

A total of sample extract (1mg/ml) of varying concentration was added to 10µl of α- amylase solution was incubated at 37°C for 10 minutes. After pre incubation, 500µl of 1% starch solution was added to each tube and incubated for 1 hour at 37°C. The reaction was stopped with10µl of dil. Hydrochloric acid. The test tubes were added with 200µl 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 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% 0f inhibition against α amylase with IC50 value of 65.82 µg/ml (Graph: 1). Crude extract, carotenoid crude extract and their combinations of SB was found to have α –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*

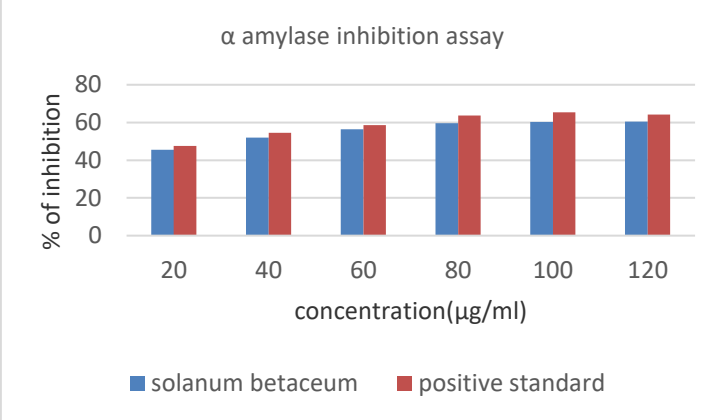
S. No	Test	Result
1	Flavonoids	+
2	Alkaloids	-
3	Tannins	+
4	Saponins	+
5	Steroids	-
6	Carbohydrates	+
7	Glycosides	+
8	Fixed oil	+

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.

REFERENCE

1. Puspawati G. A. K. D, Marsono Y, Armunanto R, Supriyadi, Inhibitory Potency of Indonesian Tamarillo (Solanum betaceum Cav) Crude Extract Against α-Glucosidase Enzyme Activity. Curr Res Nutr Food Sci, 6(2): 2018.
2. www.nutrition-and-you.com/tamarillo.html
3. Tandazo-Yunga JV, Ruiz-González MX, Rojas JR, Capa-Mora ED, Prohens J, Alejandro JD, The impact of an extreme climatic disturbance and different fertilization treatments on plant development, phenology, and yield of two cultivar groups of *Solanum betaceum* Cav. PLoS ONE, 12(12):2017.
4. Georgia Erdmann do Nascimento, Leticia Alencar Hamm, Cristiane H. Baggio, Maria Fernanda de Paula Werner, Marcello Iacomini, Lucimara M.C. Cordeiro, Structure of a galactoarabinoglucuronoxylan from tamarillo (Solanum betaceum), a tropical exotic fruit, and its biological activity. Food Chemistry, 141: 510–516, 2013.

5. Menakshi Bhat, Smita S. Zinjarde, Shobha Y. Bhargava, Ameeta Ravi Kumar, and Bimba N. Joshi, "Antidiabetic Indian Plants: A Good Source of Potent Amylase Inhibitors." Evidence-Based Complementary and Alternative Medicine, 2011: 6 pages, 2011.
6. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, Definition, Classification and Diagnosis of Diabetes, Prediabetes and Metabolic Syndrome. Can J Diabetes, 37: S8eS11, 2013.
7. Prashant Agarwal, Ritika Gupta, Alpha-amylase inhibition can treat diabetes mellitus. Research and Reviews Journal of Medical and Health Sciences, 5(4): 1-8, 2016.
8. Amita Pandey, Shalini Tripathi, Concept of standardization, extraction and pre phytochemical screening strategies for herbal drug. Journal of Pharmacognosy and Phytochemistry, 2 (5): 115-119, 2014.
9. Duraisamy Gomathi, Manokaran Kalaiselvi, Ganesan Ravikumar, Kanakasabapathi Devaki, and Chandrasekar Uma, GC-MS analysis of bioactive compounds from the whole plant ethanolic extract of Evolvulus alsinoides (L.) L. J Food Sci Technol, 52(2): 1212–1217, 2015.
10. M. Nirmali Wickramaratne, J. C. Punchihewa, D. B. M. Wickramaratne, In-vitro alpha amylase inhibitory activity of the leaf extracts of *Adenanthera pavonina.* BMC Complement Altern Med, 16: 466, 2016.
11. Sihombing, J. R., Dharma, A., Chaidir, Z., Almahdy, Fachrial, E., & Munaf, E, Phytochemical screening and antioxidant activities of 31 fruit peel extract from Sumatera, Indonesia. *Journal of Chemical and Pharmaceutical Research*, *7*(11): 190–196, 2015.
12. Saptarini, N. M., & Herawati, I. E, The effect of acetic acid on total anthocyanins content and antioxidant activity of tamarillo (Solanum betaceum Cav). *Drug Invention Today*, *10*(1): 10–12, 2018.
13. Racquel Barscelo, Phytochemical Screening and Antioxidant Activity of Edible Wild Fruits in Benguet, Cordillera Administrative Region, Philippines. Electronic Journal of Biology, 11(3): 80-89, 2015.
14. Jenny Ria Sihombing, Christian Agus Bona Satria Sidabutar, Edy Fachrial, Almahdy, Zulkarnain Chaidir and Abdi Dharma, Utilization of Fruit Peel Extracts of Persea americana, Cyphomandra betacea, Mangifera odorata and Archidendron pauciflorum as Antidiabetic in Experimental Rats. Research Journal of Pharmaceutical, Biological and Chemical Sciences, 8(1): 1407- 1410, 2017.
15. BR. Kaswala, Effect of *Cymphomandra betacea* extract of fruits in streptozotocin induced type 2 diabetes, 2010.