Acta Scientific NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 5 Issue 6 June 2021

Short Communication

Role of *Trigonella foenum-graecim* Extract along with Ursolic Acid a Pentacyclic Triterpenoid as Newer Plant Products for the Therapy of Diabetes Mellitus - A Short Communication

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Received: March 23, 2021

Published: May 17, 2021

Abstract

Lots of medicinal plants have shown the potential for Treatment of diabetes mellitus (DM). We have already reviewed the role of lot of plants as well as plant products related to this that can be utilized in future to prevent the cost and side effects of the oral hypoglycaemic agents like monoterpenes that get produced in various organisms including bacteria, fungi, plants and animals, role of protein tyrosine phosphatase 1B (PTP1B) inhibitors (produced by marine organisms was plants, role of herbs and spices, Anthocyanins are present in berries which include blackberries, bilberries, chokeberries, elder berries, cranberries and raspberries that are the richest sources of anthocyanins. Many other highly colored fruits like strawberries, black currant, cherry, grape, coloured cabbage, eggplant and radish also have high levels of anthocyanins, thus it is important to include these in the low-calorie diets plans to improve insulin resistance (IR) along with helping in weight reduction. Here we further report on two potential new compounds for therapy of DM, like *Trigonella foenum-graecim* extract along with ursolic acid another pentacyclic terpenoid.

Keywords*: Trigonella foenum-graecim* Extract; Ursolic Acid; Diabetes Mellitus; Plant Products

Lots of medicinal plants have shown the potential for Treatment of diabetes mellitus (DM). We have already reviewed the role of lot of plants as well as plant products related to this that can be utilized in future to prevent the cost and side effects of the oral hypoglycaemic agents like monoterpenes that get produced in various organisms including bacteria, fungi, plants and animals, role of protein tyrosine phosphatase 1B (PTP1B) inhibitors (produced by marine organisms as well as plants, role of herbs and spices, Anthocyanins are present in berries which include blackberries, bilberries, chokeberries, elder berries, cranberries and raspberries that are the richest sources of anthocyanins. Many other highly colored fruits like strawberries, black currant, cherry, grape, coloured cabbage, eggplant and radish also have high levels of anthocyanins, thus it is important to include these in the low-calorie diets plans to improve insulin resistance (IR) along with helping in weight reduction [1-6].

Here we have tried to emphasize the antidiabetic effects of *Trigonella foenum-graecim* is one such plant [7,8] along with ursolic acid, another terpenoid. *Trigonella foenum-graecim* is considered a utilizable plant from the family Fabaceae [7]. It gets developed annually, cultivated all through the world that includes Ethiopia. *Trifonella foenum-graecim* cultivation is proper for areas receiving moderate to low rainfall. An erect plant attaining a height of 30 - 60 cm, with the compound pinate trifoliate leaves, having an auxiliary white-yellow coloured flowers, as well as 3-15cm long thin pointed

beaked pods that possess 10-20 oblong green brown seeds [8,9]. These seeds get utilized as spices all through the world, whereas leaves get used as green leafy vegetables in a diet. The seeds of *Trigonella foenum-graecim* is seeds have a bitter taste, a fact known for quite some time for their medicinal property [7,9,10]. Ancient literature, religious books, travel records, as well as anecdotal facts from different continents from various time periods of history report medicinal qualities of various kinds that are correlated with *Trigonella foenum-graecim* is plant. These medicinal property vary from wound healing to but enhancement or facilitation of lactation along with acting as a sex stimulant akin to an aphrodisiac [11-13]. Further the medicinal property are oral antihypearglycaemic bioactive compounds for the formation of new pharmaceutical agents, as well as good dietary supplements to the present therapies. Thus the main aim of this study was to evaluate the action of *Trigonella foenum-graecim* is seed powder solution on the lipid profile in newly diagnosed type 2 diabetes mellitus (T2DM) with patients having abnormal blood d sugars with fasting blood sugars (FBS > 150 mg/dl) but did not start Treatment till now. Gebremeskel., *et al*. studied a total of 114 newly diagnosed T2DM with patients without any significant complications as selection criteria. Two groups were formed -the Treatment group made of n = 57 took 25g *Trigonella foenum-graecim* is seed powder solution orally bd for one month as well as 2nd group as the control groups made of n = 57 took metformin. Blood sample was drawn from every participant by a medical technician prior to as well as following the study. Lipid profile was evaluated by utilizing Mindray BS 200 E fully automated clinical chemistry analyzer. At the end of the intervention time the Treatment group displayed significantly low total cholesterol (189.29 ± 29.06 vs 208.2 ± 40.2, $p < 0.001$); triglycerides level further decreased by 23.53% act baseline levels (195.8 ± 82.95 vs 244.1 ± 96.9, $p < 0.05$); as well as compared to control group (195.8.82.95 ± 82.95 vs 244. 1 ± 96.9, $p < 0.05$); as well as low density lipoprotein (LDL) cholesterol amount also decreased by 23.4% as compared to the baseline amounts (137.9 ± 26.9, vs 105. 6 ± 24.2, $p < 0.001$); as well as the control group (bet groups) (105.6 ± 24.2 vs 144.1 ± 23.3 $p < 0.001$) but the Treatment group demonstrated significantly escalated high density lipoprotein (HDL) cholesterol amounts by 21.7% as compared to the baseline amounts within groups (37.8 ± 1,51 vs 48. 3 ± 11.9, $p < 0.001$) as well as the control group (between groups (48.3 ± 11.9 vs 36.01 ± 9.5, $p < 0.001$). Nevertheless the Lipid profile in the control group were not significantly altered. Thus concluding that this delivery of *Trigonella foenum-graecim* is seed powder solution significantly escalated lipid metabolism In T2DM patients with no side effects, making them an attractive option for medical therapy [14].

Ursolic acid is a pentacyclic triterpenoid (PT) [15,16], that has been known to possess capacity to decrease blood sugars as well as healing problems in case of diabetic mice. Nascimento and colleagues (2014) semi-synthesized two analogues of UA isolated from the Sambucus australis plant. Modifications to the UA structure were made at C-3 (hydroxyl group) in order to yield 3_-formyloxy-urs-12-en-28-oic acid (19) and 3_-acetoxy-urs-12-en-28-oic acid (20) [17]. Further PTP 1B is known to be decreased by UA, enhance phosphorylation of insulin receptors, as well as stimulate glucose absorption [18]. Wu., *et al*. [19], in 2014 developed a series of UA derivatives as well as analyzed their potency as a compound against α-glucosidase. Maximum derivatives displayed activity, but for one agent with 4 derivatives demonstrating significant inhibition at IC_{50} of 2.66 ± 0.84, 1.01 ± 0.44, 3.26 ± 0.21 as well as 3.24 ± 0.21μM [19]. Wu., *et al*. [20] further examined the antidiabetic action of various UA analogues against the α-glucosidase. They observed that maximum of these analogues showed significant inhibition action, with the 2 of the maximum potencies being IC_{50} of 1.27 ± 0.27 as well as IC_{50} of 1.28 ± 0.27 μM as compared to the rest of derivatives as well as the positive controls [20]. Khusnutdinova., *et al*. in 2015 [18] evaluated UA derivatives for their medicinal action (*in vitro* inhibition) against α-glucosidase. 2,3 indole UA derivatives [22], demonstrated a greater effectiveness against α-glucosidase having a value of 115. 1 μM, that was 3. 5 times more potent as compared to the standard drug acarbose [18].

Yu ., *et al.* in 2015 documented the antidiabetic action of UA derivatives in bone impairments (BMD) of diabetic mice (6wks old) induced by streptozotocin (STZ). Here, UA derivatives [21], got utilized as hypoglycaemic compounds for analyzing the treatment action against NP type 2 diabetic mice for2 wks. In this study, biomarkers in serum as well as urine got measured. Additionally, protein expression gene, as well as histomorphology evaluation got measured from mice tibias. Furthermore, femurs were collected for

bone Ca measurements as well as trabecular bone 3D architecture.

They documented decreased testosterone (T) amounts in the STZ serum of mice. UA analogues documented escalated bone Ca, BMD, significantly escalated fibroblast growth factor 23 (FGF23) as well as osteocalcin and reduced the diabetic mice parathyroid hormone (PTH) amounts as well as a crosslaps (CTX). UAD reversed the trabecular adverse actions resulting from STZ as well as induced remodelling of the bone. Treatment utilizing UAD for the STZ group significantly escalated the osteoprotegrin (OPG) nuclear factor κ (NFκB) ligand (RANKL) ratio. It has been demonstrated that UA derivatives can enhance the STZ induced bone impairments by correcting the mesenchymal stem cells (MSC)'s dysfunction [22].

Chinese hamster ovary (CHO-K1)neurons with the TGR5 gene got transfected by Lo*., et al*. [23] in 2017 for evaluation of the antidiabetic action of UA. Utilizing a fluorescent marker, the features of this transfected cells got checked via glucose uptake. Additionally, NCI-H716 cells which liberated incretin were also analyzed, as well as ELISA sets got utilized for quantification of the GLP-1 amounts. Actually, type 1 -like diabetic rats stimulated by STZ got utilized for defining the influence of *in vitro* UA. The amount of UA base escalated glucose uptake in TGR5 generating CHO-K1 cells. UA resulted in the concentration based enhancement of glucagon like peptide 1 (GLP-1) in NCI-H716 cells, that got inhibited by triamterene at effective amounts to inhibit TGR5. UA further increased the GLP-1 amounts by activation of TGR5, that was further shown *in vitro* with T1 diabetic rats [23,24].

Conclusions

Thus there is enough proof from these reports that both the extracts from the seed powder of *Trigonella foenum-graecim* is was Ursolic acid another terpenoid has strong antidiabetic activities and need to be exploited as antihypoglycaemic agents see figure 1 for the structure of ursolic acid derivatives.

Bibliography

1. Kulvinder Kochar Kaur., *et al*. "Monoterpenes - A Class of Terpenoid Group of Natural Products as a Source of Natural Antidiabetic Agents in the Future -A Review". *CPQ Nutrition* 3.4 (2019): 01-21.
2. Kulvinder Kochar Kaur., *et al*. "Development of protein tyrosine phosphatase 1B (PTPIB) Inhibitors from marine sources and other natural products-Future of Antidiabetic Therapy : A Systematic Review". *Korean Journal of Food and Health Convergence* 5.3 (2019): 21-33.
3. Kulvinder Kochar Kaur., *et al*. "Bioactive Compounds within Herbs and Spices Contributing to Anti Diabetic Action in Type2 Diabetes Mellitus (T2DM) - A Short Communication". *Acta Scientific Nutritional Health* 4.1 (2020): 88-92.
4. Kulvinder Kochar Kaur., *et al*. "Role of Natural Products in the Treatment of Diabesity with Mechanism of Action-A Small Communication". *Acta Scientific Nutritional Health* 3.7 (2019): 140-142.
5. Kulvinder Kochar Kaur., *et al*. "Potential Role of Biochemical Components of Schisandra chinensis for Prevention and Treatment of Obesity, Type2 Diabetes Mellitus, Cancer and Prevention of Aging - A Systematic Review". *Acta Scientific Nutritional Health* 3.8 (2019).
6. Kulvinder Kochar Kaur., *et al*. "Importance of simultaneous treatment of obesity and diabetes mellitus: A sequelae to the understanding of diabesity-A review". *Obesity Research – Open Journal* 6.1 (2019): 1-10.
7. Birhane G. "Effect of processing on phytochemicals and nutrients composition of fenugreek (Trigonella foenum-graecum L.), and development of value added products (Doctoral dissertation)". AAU (2012).
8. Meghwal M and Goswami TK. "A review on the functional properties, nutritional content, medicinal utilization and potential application of fenugreek". *Journal of Food Processing and Technology* 3.9 (2012).
9. Prasanna M. "Hypolipidemic effect of fenugreek: diabetic patients: A clinical study". *Indian Journal of Pharmacology* 32 (2000): 34-36.
10. Campbell-Tofte JI., *et al*. "Harnessing the potential clinical use of medicinal plants as anti-diabetic agents". *Botanics: Targets and Therapy* 2 (2012): 7-19.

11. Sauvaire Y., *et al*. "4-Hydroxyisoleucine: a novel amino acid potentiator of insulin secretion". *Diabetes* 47.2 (1998): 206-210.

12. Gupta A. "Effect of Trigonella foenumgraecum (fenugreek) seeds on glycaemic control and insulin resistance in type 2 diabetes mellitus: a double blind placebo controlled study". *The Journal of the Association of Physicians of India* 49 (2001): 1057-1061.

13. Dangi RS., *et al*. "Assessment of genetic diversity in Trigonella foenum-graecum and Trigonella caerulea using ISSR and RAPD markers". *BMC Plant Biology* 4.1 (2004): 13.

14. Gebremeskel., *et al*. "Antidiabetic Effect of Fenugreek Seed Powder Solution (Trigonella foenum-graecum L.) on Hyperlipidemia in Diabetic Patients". *Journal of Diabetes Research* (2019): 8.

15. Sandjo LP., *et al*. "Triterpenes and Steroids from the Medicinal Plants of Africa". Elsevier: Amsterdam, The Netherlands (2013): 135-202.

16. Babalola I T and Shode F O. "Ubiquitous ursolic acid: A potential pentacyclic triterpene natural product". *Pharmacognosy* 2.2.

17. Nascimento PGD., *et al*. "Antibacterial and Antioxidant Activities of Ursolic Acid and Derivatives". *Molecules* 19 (2014): 1317-1327.

18. Khusnutdinova E F., *et al*. "Inhibition of Alpha-Glucosidase by Synthetic Derivatives of Lupane, Oleanane, Ursane and Dammarane Triterpenoids". *Natural Product Communications* 11 (2016): 33-35.

19. Wu PP., *et al*. "In vitro and in vivo evaluation of the antidiabetic activity of ursolic acid derivatives". *European Journal of Medicinal Chemistry* 80 (2014): 502-508.

20. Wu P., *et al*. "Synthesis and Evaluation of Novel Triterpene Analogues of Ursolic Acid as Potential Antidiabetic Agent". *PLoS ONE* 10 (2015): e0138767.

21. Yu SG., *et al*. "Ursolic acid derivative amelioratesstreptozotocin-induced diabestic bone deleterious e_ects in mice". *International Journal of Clinical and Experimental Pathology* 8 (2015): 3681-3690.

22. Zhang T., *et al*. "Ursolic acid reduces oxidative stress to alleviate early brain injury following experimental subarachnoid hemorrhage". *Neuroscience Letter* 579 (2014): 12-17.

23. Lo SH., *et al*. "Ursolic acid activates the TGR5 receptor to enhance GLP-1 secretion in type 1-like diabetic rats". *Naunyn-Schmiedeberg's Archives of Pharmacology* 390 (2017): 1097-1104.

24. Mlala S., *et al*. "Ursolic acid and its derivatives as Bioaxctive Agents". *Molecules* 24 (2019): 2751.

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