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Herbal Cellular Concentrate for Type 2 Diabetes

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Abstract

Diabetes is a group of metabolic disorders associated with chronic hyperglycemia in the blood due to defects in insulin secretion, insulin function, or both. Although the proper treatment of diabetes includes insulin injection continuously to maintain blood glucose levels, nowadays, there is an increasing interest in the use of alternative approaches for treating insulin resistance, and T2D Chicory significantly reduces blood sugar and glucose fluctuations, increases metabolism due to inulin in type 2 diabetes patients with excess weight. *Equisetum arvense* is one of the most effective plants for blood sugar, stabilizing metabolism, and hormone production. Tuberous roots are rich in inulin, enabling glucose utilization in the human body, and can potentially ameliorate insulin sensitivity in diabetic patients. Blueberry leaves improve insulin sensitivity and action. *Galega officinalis* lowers blood sugar levels for prediabetes and type-2 diabetes patients. Due to the side effects and temporary use of chemical drugs, herbal and natural medicines and chemical drugs are recommended for people with diabetes. However, more scientific studies are needed to confirm the effectiveness of herbal supplements in diabetes cases.

Keywords: Type 2 diabetes, Herbal Cellular Concentrate, health

Introduction

Scientists studied the traditional herbalists' recipes and unfolded their full potential by improving the formulas and preparing the herbs in a new way. Diabetes mellitus is the most widespread metabolic disease in the world. It is a group of metabolic disorders associated with glucose consumption failures and chronic hyperglycemia. Therefore, the development of either absolute or relative insulin insufficiency in the blood occurs due to a defect in the insulin secretion or insulin function, which leads to hyperglycemia development. Type 1 diabetes is an autoimmune disease that destroys pancreatic beta cells in producing insulin. Type 2 diabetes causes an increase in blood glucose due to decreased insulin secretion and function (Pallag et al., 2016).

Diabetes is characterized by persistent hyperglycemia, insulin resistance, and complications such as neuropathy, arteriopathy, kidney dysfunctions, cardiomyopathy, cardiovascular diseases, and kidney and liver failures. Although the proper treatment of diabetes includes continuous insulin

injections to maintain blood glucose levels, nowadays, researchers are following some natural herbs for diabetes (Pallag et al., 2016).

This study aimed to use the herbal Concentrate as many people around the globe as possible and make their lives healthier.

How is herbal cellular concentrate effective on diabetes?

Diabetes is a group of metabolic disorders associated with chronic hyperglycemia in the blood due to defects in insulin secretion, insulin function, or both. Although proper diabetes treatment includes insulin injection continuously to maintain blood glucose levels, there is an increasing interest in using alternative approaches for treating insulin resistance and T2D. Chicory significantly reduces blood sugar and glucose fluctuations and increases metabolism due to inulin in type 2 diabetes patients with excess weight. Equisetum arvense is one of the most effective plants for blood sugar, stabilizing metabolism, and hormone production. Tuberous roots are rich in inulin, enabling glucose utilization in the human body, and can potentially ameliorate insulin sensitivity in diabetic patients. Blueberry leaves improve insulin sensitivity and action.
Galega officinalis lowers blood sugar levels for prediabetes and type-2 diabetes patients. Due to the side effects and temporary use of chemical drugs, herbal and natural medicines and chemical drugs are recommended for people with diabetes. However, more scientific studies are needed to confirm the effectiveness of herbal and natural supplements in treating diabetes. Herbal concentrate of 11 herbs results in our research on 150 Patients in a pilot study showed a significant reduction in mild to moderate type 2 diabetes to prediabetes condition, and prediabetes seems to reverse in this study by Jain et al.

Chicory and diabetes

Chicory (*Cichorium intybus L*) is a main crop in northwestern Europe, and the chicory roots are rich in fiber inulin (Roberfroid, 2007). A bitter drink made from chicory roots is a substitute for coffee in France and Japan, where people of all ages can drink chicory root extract due to its noncaffeine components. Chicory inulin leads to decreasing energy calorie intake and is a powerful substitute for dietary fat (Nishimura et al., 2015). Inulin is a fructo-oligosaccharide, a fructose polymer with b (2/1) glycosidic linkages. Inulin in chicory significantly reduces blood sugar and glucose fluctuations (Nishimura et al., 2015).

Thus, chicory has an inulin content of 150 g kg^{-1} on a fresh weight basis and 750 g kg-1 on a dry weight basis (Letexier et al., 2003).

Chicory increases metabolism and weight loss; therefore, it is highly recommended for type 2 diabetes patients with excess weight. Chicory provides high vitamins B and C and boosts energy levels. The presence of high vitamins and microelements enhances immune responses. The infusion and brew of Chicory increase appetite and regulate digestive activity (Nishimura et al., 2015). In one clinical trial on type 2 diabetic women, using 10 g/d inulin for 2 months improved the concentration of fasting blood glucose, insulin, and hemoglobin A1c (HbA1c) and reduced

malondialdehyde levels compared with using maltodextrin (Pourghassem Gargari et al., 2013). Also, consuming 12 g/d inulin for 2 weeks was tolerated by adults. It caused a significant improvement in bowel movements and substantially increased Bifidobacterium and Lactobacillus in cases with average fecal Bifidobacterium (García-Peris et al., 2012).

In another trial, cases who used the chicory root extract for 4 weeks showed a significant decrease in the changes of HbA1c compared with the control. No significant differences in the fasting blood glucose or insulin and total cholesterol, low-density lipoprotein-cholesterol (LDL), High-density lipoprotein-cholesterol (HDL), triglyceride, or serum adiponectin were observed before and after consumption of chicory root extract. Inulin fructans can modulate lipid metabolism in human cases and animal models (Nishimura et al., 2015). Using 10 g inulin/d for 6 weeks in 18 cases decreased the TG and T- levels (Letexier et al., 2003). Regarding the results, no significant differences in blood pressure were observed between groups (Nishimura et al., 2015).

The chicory root extract containing less inulin improved hyperglycemia and bowel movement (Nishimura et al., 2015). Oligosaccharides such as inulin also improved glucose metabolism. Inulin is less susceptible to degradation by a-glucosidase. Therefore, chicory root extract gradually increased postprandial plasma glucose. Inulin fructans cannot be digested easily by salivary and gastric juices due to b-(2/1) fructose linkages (Letexier et al., 2003).

Bioactive components of *Equisetum arvense*

Equisetum arvense L. belongs to the Equisetaceae family. This weed is widely spread in the northern hemisphere in fields and uncultivated land (Hegedűs et al., 2020). Horsetail has been used in ancient Greek medicine. Whole or cut, dried aerial parts, *Equiseti herba*, of *Equisetum arvense L.* used in phytotherapy (Pallag et al., 2016).

E. arvensis contains high concentrations of phenolic compounds, saponins, aconite, oxalic and malic acid, resins, tannins, pectin, flavonoid compounds, vitamin C, carotenoids, and minerals (Kukric et al., 2013).

The number of bioactive components in *E. arvense* varies in different geographical areas. Field horsetail contains polyphenols, flavonoids, saponins, dietary fibers, vitamins A, E, C, potassium, calcium, and silicates with antidiabetic activity (Pallag et al., 2016). The total phenolic compounds in the field horsetail extract were 355.80±17.8 mg GAE/g of the dried section, depending on environmental and geographical conditions (Hegedűs et al., 2020). Also, total phenolic compounds in the n-butanol, ethyl-acetate, and water extract of Horsetail in the mountain of Zlatibor and Serbia was 96.4, 26.4, and 15.4 mg GAE/g of the dried section, respectively (Pallag et al., 2016). The total phenolic in ethanol extract was 355.80±17.8 mg GAE/g of the dried area. The high antioxidant and antimicrobial activity of *E. arvense* ethanol extract is directly linked to high entire phenolic content (Pallag et al., 2016).

Equiseti herbal contains inorganic compounds (especially silica), caffeic acid, flavonoids, alkaloids, and saponins (Sing et al., 2010). Flavonoids (flavones and flavonols) are generally present in a glycoside form. Flavonoids and phenolic acids, such as Gallic acid, have antioxidant activity (Asgarpanah and Roohi, 2012). Total flavonoid contents in Pharmacopeia and the Romanian Pharmacopoeia require

At least 0.3% flavonoids (Pallag et al., 2016).

Equisetum arvense and diabetes

It is proved that *Equisetum arvense* is one of the most effective plants on blood sugar. In traditional medicine, Equisetum stabilizes blood sugar and is a hemostatic agent, inflammatory, and antibacterial treatment; it stabilizes metabolism and hormone production (Hegedűs et al., 2020).

During the 6 weeks, blood glucose levels in the animals treated with horsetail improved compared to those of the STZ- DC rats. Significant improvement in glucose tolerance was only in animals treated with the 100HT horsetail compared to the control (Pallag et al., 2016). Horsetail could enhance the impaired insulin production associated with STZ treatment. All STZ-treated groups reduced plasma insulin compared to the healthy controls due to the pancreatic B-cell function (Pallag et al., 2016).

Various doses of ethanol extract from horsetail have different effects on blood glucose and insulin resistance. Even fasting plasma insulin levels were low. However, 50 mg/kg horsetail extract does not affect hyperglycemia or insulin resistance, and 200 mg/kg was not achieved. However, 100 mg/kg significantly reduced blood glucose and improved insulin sensitivity in the cells (Pallag et al., 2016).

Helianthus tuberous roots

Helianthus tuberous roots are rich in inulin (16-18%), the natural equivalent of insulin, enabling glucose utilization in the human body. Long-term consumption of Equisetum lowers blood sugar levels. (Mariadoss et al., 2021). Species, cultivar, production conditions, and physiological age are effective on inulin content (2–60 fructose residues. This D-fructose polymer is a water-soluble fiber found in high stem levels. Inulin is a natural prebiotic that selectively stimulates the growth of probiotic bacteria in the gut. Inulin-type fructans are the most commonly used (Alexandra et al., 2019). Inulin and fructooligosaccharides (FOS) stimulate Bifidobacterium growth, reduce harmful bacteria in the human colon, and modulate immunity (Rastal et al., 2005).

Helianthus and Diabetes

It proved that Heliantus increased the activity of granulocytes MPO and enhanced lymphocyte apoptosis. The hypoglycemic action of *Galega officinalis* may prevent the development and progression of diabetes complications (Alexandra et al., 2019). Effect of inulin on glucose regulation, evaluated in animal models of diabetes. Results of Zacky et al. (2009) indicated that TPB tubers reduced serum glucose, total cholesterol, LDL cholesterol, and triglycerides in hyperglycemic rats compared to the positive control. In addition, improvements in liver and kidney functions were observed. Wang et al. (1997) indicated that TPB has potentially positive effects on symptoms of diabetes by repairing the liver damage caused by STZ in streptozotocin (STZ)-induced diabetic rats. Yang et al. (2012) reported that in diabetic rats, TPB improved insulin sensitivity; Chang et al. (2014) reported that a diet containing 10% TPB significantly reduced the expression of malic enzyme 1 genes, whereas fructose increased the face of these genes.

Helianthus tuberosus L., commonly known as Jerusalem artichoke, might potentially ameliorate insulin sensitivity by decreasing fasting glucose in diabetic patients. Active compounds of plant extracts are natural antidiabetic drugs that stabilize blood glucose without harmful effects (Mariadoss et al., 2021). Due to fewer side effects and low cost, the plant's anti-diabetic components can treat DM patients (Choudhury et al., 2017). Glycosidase catalyzes the final stages of carbohydrate metabolism, and this enzyme's dysfunction accelerates post-prandial glucose in DM (Kooti et al., 2016).

The active fraction of *H. tuberosus* inhibits irreversibly alpha-glycosidase and alpha-amylase. Phytochemicals reduce the breakdown of polysaccharides, blood glucose, and post-prandial glucose (Mahmood et al., 2020). Huang et al. (2015) confirmed that the phenolic phytochemical improved the glucose uptake in HepG2 cells.

Blueberry leaves

Blueberry leaves help lower blood and urine sugar levels and increase metabolism (Stull et al. 2016). Studies reported that foods rich in anthocyanins and blueberries cause a lower risk of T2DM and peripheral insulin resistance index (Muraki et al., 2013; Wedick et al., 2012). Anthocyanin's polyphenols in Blueberries belong to the flavonoid as strong natural dark Antioxidants (Faria et al., 2005).

Anti-Diabetic Effect of blueberries

some researchers concluded that blueberries do not affect insulin resistance and glucose tolerance in obese mice and rats (Elks et al., 2015; Mykkanen et al., 2014). Although Vendrame et al. (2015) did not observe any significant changes in HOMA-IR using blueberry, they found significant changes in the glucose metabolism markers such as hemoglobin A1c, retinol-binding protein 4, and resistin concentrations). Another study applied a single oral capsule of 0.47 g bilberry extract (36% w/w anthocyanins) to T2DM cases (Hoggard et al., 2013).

Blueberry-leaf extract is rich in phenols that regulate glucose homeostasis, pancreatic *β*-cell function, and insulin sensitivity in induced diabetic mice fed a high-fat diet. Blueberry leaf extract contains chlorogenic acid and flavanol glycosides rich in phenolic-enriched BLE to improve glucose homeostasis and insulin sensitivity. The 1% blueberry-leaf extract administration decreases blood glucose and improves pancreatic function, induced by diabetes min ice-fed high-fat. Using 1% blueberry-leaf extract reduced glucose tolerance, body weight, plasma glucose, glycated hemoglobin, insulin, insulin resistance, triglyceride (TG), and non-esterified fatty acids. BLE reduced the pancreatic islet size and insulin content, increased the mRNA of pancreatic β-cell proliferation-related genes and pancreatic insulin signaling-related genes, and *GLUT-2*, and decreased the transcriptional expression of the *β*-cell apoptosis-related gene. BLE enhances insulin sensitivity by inhibiting TG synthesis and increasing lipid utilization in the liver and white adipose tissue. chlorogenic acid) of BLE increased *β*-cell proliferation and promoted insulin signaling. Phenolic compounds of BLE inhibit induced glucose tolerance and hyperglycemia by improving pancreatic β-cell function (Stull et al., 2015).

T2DM case that consumed capsules containing 80 mg anthocyanins obtained from the bilberry and blackcurrant twice daily) for 24 weeks, they significantly improved HOMA-IR (Li et al., 2015). Another study reached the same result by applying a single oral capsule of 0.47 g standardized bilberry extract (36% w/w anthocyanins) to the subjects with T2DM (Hoggard et al., 2013).

The milk contained in the blueberry smoothie did not mask the beneficial effects of the blueberries on

insulin sensitivity and endothelial function(Stull et al., 2010, 2015).Using blueberries in the diet of obese rodents showed decreased body weight gain and lipid accumulation in tissues with increased insulin sensitivity (Roopchand et al., 2013; Wu et al., 2013).

Blueberry anthocyanins protected obese mice against obesity (Prior et al., 2008; Prior et al., 2009). In addition, Seymour et al. (2011) reported that blueberries in the diet reduced abdominal fat and increased insulin sensitivity in obese Zucker rats. Despite no changes in body weight and fat composition, Stull et al. (2010) observed an increase in insulin sensitivity after 6 weeks of blueberry consumption without changing body weight and fat composition.

Mechanisms of the anti-diabetic effects of blueberries

There is an increasing interest in using alternative approaches for treating insulin resistance and T2D. It is confirmed that Blueberries, blueberry leaves, and cinnamon improve insulin sensitivity or insulin action. Obesity is linked with macrophage infiltration into adipose tissue and the activation of the inflammatory pathway, leading to insulin resistance (Weisberg et al., 2003; Xu et al., 2003).

The accumulation of macrophages in the adipocytes leads to secret proinflammatory cytokines.

These changes in gene expression of inflammatory cytokines may cause an increase in insulin sensitivity. Increased insulin sensitivity, but no significant effect was observed on plasma inflammatory markers in obese Zucker rats (Seymour et al., 2011). Reported that using blueberry-anthocyanins did not increase glucose uptake in (i.e., skeletal muscle cells) (Roopchand et al., 2013). Still, Seymour et al. (2011) concluded that rats had an increase in mRNA transcripts related to glucose uptake and metabolism (e.g., insulin receptor substrate 1 and glucose transporter 4 (GLUT 4) in the skeletal muscle and retroperitoneal fat after consuming blueberries for 12 weeks.

This activation-induced upregulation of GLUT 4 and glucose uptake and utilization in these tissues without insulin. blueberries increased glucose uptake into the skeletal muscle cells and adipocytes

via an insulin-independent mechanism in Blueberry (Vuong et al., 2007).

Blueberry tea is a blend of dried blueberries (37% wt/wt), blueberry leaves, raspberry leaves, spearmint leaves, and cinnamon. Improving glycemic control is important for regulating insulin resistance, T2D hypertension, and cardiovascular disease (stroke, heart attack, and heart failure). The unique blueberry tea blend fully recovers insulin sensitivity in the muscles of insulin-resistant rats fed high-fat and is linked with improvements in muscle glucose uptake and insulin sensitivity of the body. Improvement in Glucose tolerance after 4 weeks of drinking blueberry tea. Drinking blueberry tea after 4 weeks improved Hemoglobin A1c (HbA1c), fasting Serum Lipid (cholesterol, HDL, LDL, triglycerides), fasting serum pro-inflammatory cytokine (IL-6, IL-1b, CRP, TNFa), Resting Blood Pressure (central and brachial blood pressure).

Burdock root

It stimulates the pancreas ferments production, has antiallergenic and antimicrobial characteristics, and regulates metabolism. (Ahangarpour et al., 2017). In traditional Iranian medicine, this plant's root has a blood sugar-lowering effect (Zargari, 1993). Anti-inflammatory, hepatoprotective, and free radical scavenging activities of *A. lappa* root (Sohn et al., 2011;). Phytochemical investigations indicated that *A. lappa* root is a rich source of phenols, saponins, lignans, tannins, and flavonoids (Al-Shammaa et al., 2013). Flavonoids are polyphenolic components that reduce diabetes complications by scavenging free radicals (Abbasnezhad et al., 2015). Administration of *A. lappa* root extract improved this body weight reduction in type 2 diabetic and healthy mice. (Ahangarpour et al., 2017)

Galega

Galega officinalis is a medical herb that lowers blood sugar levels for prediabetes and type-2 diabetes patients. Galega officinalis L. has long been used in folk medicine to treat diabetes (Nagalievska et al., 2018).

t administration of *Galega officinalis* extract (600 mg/kg per day Indicated a noticeable hypoglycemic effect in the DM condition. *Galega officinalis* extract inhibits programmed cell death by normalizing white blood cells containing apoptosis regulatory proteins and poly-(ADP)-glycosylated proteins in rats' leukocytes. Fatty acids and their esters (39.10% of all compounds), diterpenes (6.16%), triterpenes (7.41%), phytosterols (19.59%), and flavonoids (2.89%) were identified in the *Galega officinalis* extract (Nagalievska et al., 2018).

Conclusion

Although proper diabetes treatment includes continuous insulin injections to maintain blood glucose levels, researchers nowadays use some natural herbs for diabetes. Due to the side effects and temporary use of chemical drugs, herbal, natural, and chemical drugs are recommended for people with diabetes. However, more scientific studies are needed to confirm the effectiveness of herbal and natural supplements in treating diabetes.

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