# Effect of Ginkgo biloba extract on plasma glucose level

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## Abstract:

***Background:*** Ginkgo biloba extract the most popular traditional natural herbal product has been widely used for may clinical purposes including treatment of cerebral insufficiency, cognitive impairment, dementia, peripheral vascular disease, premenstrual syndrome, schizophrenia, tinnitus, and vertigo. This study was designed to evaluate the effect of single oral dose on plasma glucose level.

***Material and methods:*** The effect of ginkgo biloba extract on plasma glucose level after sucrose load in non diabetic healthy volunteer were investigated on one hundred fifty healthy volunteer randomly divided into two equal groups. Group I was administered one gram per kg glucose; groups II was administered one gram per kg glucose and 240 mg Ginkgo biloba extract. Blood samples were collected from each volunteer before and 15, 30, 60,120, 180 post ingestion of glucose for separating the plasma, which was utilized for the determination of plasma glucose levels.

***Results:*** The result show considerable decrease in plasma glucose in 60 and 120 mint and also considerable decrease in AUC (p value <0, 05) due to use of Ginkgobiloba extract.

***Conclusion:*** The Ginkgo biloba extract attenuate the plasma glucose level after sucrose load and may be promising treatment of diabetes as adjuvant therapy.

***Keywords:*** Ginkgo, Biloba, Plasma, Diabetic, Glucose.

## Introduction:

A 347million person with diabetes has been recorded by World Health Organization in 2008 that account for (9.5%) of the global Adult population [1, 2, 3].

Diabetes presents a major challenge to healthcare systems around the world. Diabetes is a chronic metabolic disorder of multiple etiologies that characterized by chronic hyperglycemia with disturbance of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both [4].

Ginkgobiloba extract (GBE), made from the dried leaves of the Ginkgo tree, is one of the top sellers within the growing market for herbal remedies in many European countries as well as in the USA [4, 5, 6].

Ginkgobiloba extract contain many active ingredients but the most important pharmacologically active ingredients are flavonols and terpene trilactones. The therapeutic effects of Ginkgo biloba is usually attributed to combined effect of several components in the whole extract rather than one compound [5, 6].

Many studies on antioxidant effect and neuroprotective effect of ginkgo biloba are available, and for treatment of cerebral insufficiency, cognitive impairment, dementia, peripheral vascular disease, premenstrual syndrome, schizophrenia, tinnitus, and vertigo as well. However few studies available for ginkgo biloba use in treatment of asthma, different types of cancer, Reynaud disease,

hyperlipidemia, exposure to radiation, and drug-induced sexual dysfunction, treatment of cerebral insufficiency, cognitive impairment, dementia, peripheral vascular disease, premenstrual syndrome, schizophrenia, tinnitus, and vertigo as well as in treatment of hyperglycemia [7, 8, 9].

Increased oxidative stress level in diabetic patients largely contribute to neurological, cardiovascular, retinal, renal diabetic complications A panoply of defenses against oxidative stress has evolved and operates at distinct levels. They are reduced generation of reactive oxygen species, enhancement of antioxidant enzymes like- Superoxide dismutase (SOD), catalase, glutathione peroxidase (GPX), and Glutathione reductase (GSH) and repair systems at the level of DNA. Hyperglycemia that is associated with diabetes greatly diminishes glutathione levels that lower the defense mechanisms against oxidative stress. N-acetyl cysteine a precursor of GSH inhibited the development of functional and structural abnormalities of peripheral nerves in experimental diabetes [10, 11].

Ceruloplasmin also may participate in the defense mechanisms against oxidative stress by blunting the oxidative stress that result tissue iron. Though the role of oxidative stress in the development of diabetes mellitus and its complications are extensively studied, there are very few therapeutic agents, which are targeted to this. Recently several thiazolidenediones such as troglitazone and pioglitazone have been developed as antidiabetic drugs. Of interest among these is troglitazone, which possess structural similarity to alpha tocopherol an established antioxidant. Several studies have revealed the antioxidant properties of troglitazone, which complements the drugs hypoglycemic, and hypolipidemic effects in diabetic patients [12].

## Patients and methods:

The study was carried out on one hundred fifty non diabetic healthy volunteer with mean BMI of 22 kg /$m^2$, and fasting plasma glucose 96.4 in an open label, placebo controlled over design. Initially the health state of all subjects was reported they do not have any previous or current disease, not use any medication or nutrient supplement known to influence plasma glucose regulation and all have normal physical activity. The subjects were informing to avoid consuming tea, coffee, dark chocolate and soft drinks for at least three days before the day of the experiment. Blood samples were obtained from a vein using a 3ml syringe, and glucose level was estimated representing zero time measurement (fasting glucose). A cross-over design of treatment was followed. After an overnight fasting, two cap of ginkgo biloba extract (120 mg/cap) (group II), or placebo (group I) was orally ingested. Thirty minutes following administration of doses, each individual in group I and II consumed one gram of glucose mixed in 250 ml water. Plasma glucose level was estimated before and at 15, 30, 60, 90, 120 and 180 min using Reflotron plus costume kit according to the supplier instruction .The total plasma glucose over 3 hours was expressed as integrated area under curve for glucose (AUC0-180). The Ginkgo biloba capsule was purchased from Nature's Bounty (USA) contains (24%) ginkgo flavone glycoside, (6%) terpen lactones.

## Statistical Analysis:

The data were expressed as mean ±SD. The change in plasma glucose level with respect to baseline and time was estimated to represent area under the curve. Statistical significance was performed by one way factorial analysis of variance (ANOVA), followed by Benferroni's post hoc comparisons to compare means of AUC, using graph-pad prism 5 for windows software. P values less than 0.05 were considered to be statistically significant.

## Results:

Ingestion of sucrose (1g/kg ) increases blood glucose level in normal control individuals and maximum concentration (C max ) of glucose (142.9 mg/dl) was achieved within 30 min (T max) after ingestion of sucrose while pretreatment with Ginkgobiloba extract resulted in C max of 142.9, 30 min post sucrose load (figure 2; table 1). In control group, the average increment of blood glucose was 49.33mg/dl after 30 min of sucrose load, while Ginkgobiloba use produces 46.5 mg/dl increase at the same time (figure 1, table 1). AUC over 3 hr period revealed that Ginkgobiloba extract show significant results compared to control (figures 2 and; table 2).

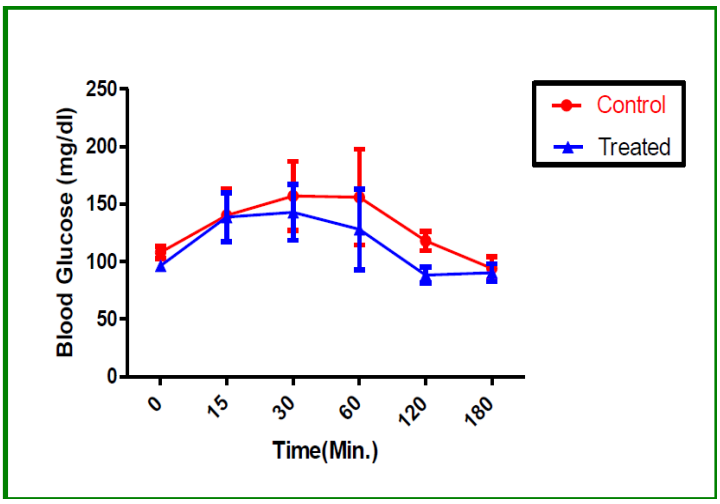


**Figure (1):** Blood glucose spikes in control and treated groups.

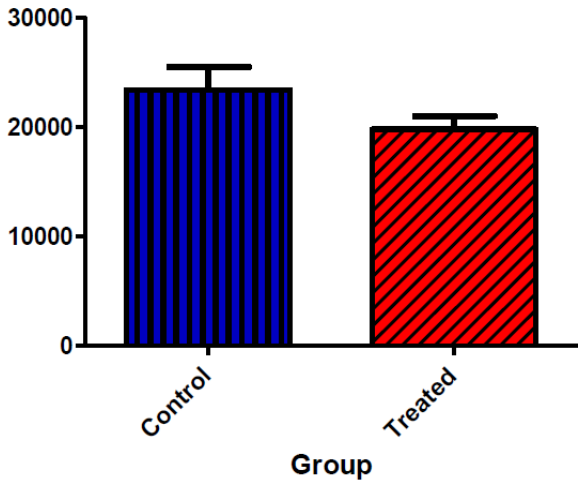


**Figure (2):** AUC of plasma glucose

**Table (1)**: Blood glucose levels in control and treated.

| Blood glucose level mg/dl | | | | | | |
|---|---|---|---|---|---|---|
| Group | zero tine | 15 min | 30 min | 60 min | 120 min | 180 min |
| Control | 108.65±5.20 | 140.08±23.09 | 157.98±30.06 | 156.84±41.50 | 118.58±8.30 | 94.75±10.10 |
| Treated | 96.40±3.23 | 138.60±21.22 | 142.90±24.23 | 128.00±35.23 | 88.21±7.00* | 90.43±7.87 |

Values represent mean± SD; * significantly different *vs*. control ($P< 0.05$).

**Table (2):** Calculated AUC, Cmax, Tmax.

| Group | AUC | $C_{max}$ | $T_{max}$ |
|---|---|---|---|
| Control | 23363 | 157.0 | 30 |
| Treated | 19781 | 142.9 | 30 |

## Discussion:

Diabetes is increasing at an alarming rate worldwide, which can mainly be attributed to the sedentary life style and calorie-rich diet [(1)].

Actually, controlling postprandial plasma glucose level is critical in the early treatment of diabetes mellitus (DM) and in reducing chronic vascular complications. So, inhibition of enzymes that digest complex carbohydrates would reduce the rate of glucose release and absorption, and consequently suppress postprandial hyperglycemia Previous study reported the anti-postprandial hyperglycemic effect of grape flavonoids and phenolic compounds in diabetic mice, suggesting the valuable benefit of these bioactive products in management of impaired blood glucose levels in type II diabetes mediated by their capacity to inhibit α-glycosidase activity, the crucial enzyme for digestion of maltose into absorbable glucose [(5)].

So, we evaluate the effect of standardized Ginkgo biloba extract on postprandial hyperglycemia after sucrose load in healthy individuals. The reported data in the present study showed that Ginkgo biloba extract provided significant differences (p value < 0.05) for 30 and 60 min postprandial hyperglycemia relative to untreated control, indicating the potency of Ginkgo biloba extract to attenuate postprandial hyperglycemic. Treatments provided statistically significant differences after sucrose load between the control (placebo) and treated group as indicated by the results of AUC (figure 1 and table 2). In conclusion The Ginkgo biloba extract attenuate the plasma glucose level after sucrose load and may be promising treatment of diabetes as adjuvant therapy.

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