

## The Effect of Coriander Seed Powder Consumption on Atherosclerotic and Cardioprotective Indices of Type 2 Diabetic Patients

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**Received:** 25 April 2012

**Accepted:** 1 June 2012

### Abstract

**Objective:** The purpose of this study was to investigate the effect of coriander seed powder (CSP) on the atherosclerotic and cardioprotective indices in type 2 diabetic patients.

**Materials and Methods:** In this study, fifty type 2 diabetic patients consumed 2 capsules of the CSP /day for a period of 6 weeks. Blood samples were collected from the patients before and after the course of CSP consumption after 12 h of fasting .The plasma glucose, total cholesterol, triglyceride, LDL-C , HDL-C ,urea and creatinine were measured before and after the CSP consumption for 6 weeks. Atherosclerotic and cardioprotective indices were calculated.

**Results:** The CSP consumption for 6 weeks in type 2 diabetic patients significantly reduced plasma glucose, total cholesterol, triglyceride, and LDL-C ( $p < 0.001$ ), but HDL-C was not significantly changed ( $p \geq 0.05$ ). But there was no significant effect on urea and creatinine concentrations. Atherosclerotic index decreased while cardioprotective indices increased.

**Conclusion:** Since the CSP consumption reduced several components of metabolic syndrome and decreased atherosclerotic and increased cardioprotective indices, the CSP may have cardiovascular protective effect in type 2 diabetic patients.

**Key Words:** Coriander seed powder, Atherosclerotic index, Cardioprotective

### Introduction

According to the World Health Organization (WHO), the prevalence of diabetes is increasing in every part of the world, and the impact is even greater in countries experiencing major socioeconomic development (1). Diabetes is the most common endocrine disorder in the world.

About 97% of diabetics suffer from type 2 diabetes mellitus and most of the population are pre-diabetic (2). Diabetes is a risk factor for cardiovascular disease and increases its mortality (3). Recently, the search for novel anti-diabetic medicines has been focused on medicinal plants because of their efficacy in

human clinical trial studies and their minimal side-effects(4). Coriander (*Coriandrum sativum* L.) is grown as a spice crop all over the world. The leaves and the fruits (seeds) of this herb, *Coriandrum sativum* L, are known as coriander. The seeds have been used to treat in digestion, diabetes, rheumatism, and joint pain (5). A large number of compounds have been isolated from coriander including flavonoids (quercetin and isoquercetin), polyphenols (rutin, caffeic acid derivatives, ferrulic acid, gallic acid and chlorogenic acid),  $\beta$ -carotenoids, tannins, and many other compounds. There are some evidence indicating the effects of CSP on plasma glucose, lipid profile and antioxidant effect of CSP in diabetic rats (17-21). But there is no report about the effect of CSP on plasma glucose, lipid profile, atherosclerotic and cardioprotective indices in type 2 diabetic patients. So the present study was established to evaluate the effect of CSP on atherosclerotic and cardioprotective indices in type 2 diabetic patients.

## Materials and Methods

### Study design and participants:

In this quasi-experimental interventional study, fifty patients with type 2 diabetes mellitus consumed 2 capsules of CSP daily for a period of 6 weeks. The patients served as their own controls because all data obtained after the CSP consumption was compared with the baseline values. None of the participants have received any antioxidant supplementations in the past 3 months. They followed their own normal diet. Coriander seeds were washed well with water, then were dried at room temperature and were powdered in an electric grinder to a coarse powder. Then CSP was packed in capsules, each containing 500mg CSP. The patients received CSP capsule 30–60 min before lunch and dinner. After 12 h of fasting, blood samples were collected from the patients before and after CSP consumption. Then serum was separated, and fasting blood sugar (FBS), total cholesterol, triglyceride, HDL-C and LDL-C

were measured by enzymatic and colorimetric kit method. Creatinine was measured by an enzymatic method and urea by the diacetylmonoxime method. Atherosclerotic index, a marker of atherosclerosis, which has a direct correlation with cardiovascular disease risk was calculated as: total plasma cholesterol –HDL-cholesterol/HDL-cholesterol (7). The cardioprotective index was calculated as the ratio of HDL-cholesterol/total cholesterol, which is a superior measure of cardiovascular disease risk (8).

Statistical analysis: The data were analyzed by the SPSS package, version 11. All reported data are expressed as mean  $\pm$  S.D. Paired samples T test was used to assess significant difference between the data obtained before and after treatment. The P-value  $<$  0.05 was considered significant.

## Results

The purpose of this study was to evaluate the effects of CSP on fasting blood sugar, lipid profile, lipoprotein, urea, creatinine, cardioprotective and atherosclerotic indices in type 2 diabetic patients. The mean age of patients was  $45 \pm 8$ y and the mean BMI was  $30 \pm 3$  kg/m<sup>2</sup>.

The obtained results demonstrate the beneficial effects of CSP on fasting blood glucose, blood lipids and lipoproteins. Cardioprotective index increased, although atherosclerotic index decreased. We observed a significant reduction of plasma glucose (50.3%), total cholesterol (50.3%), triglyceride (55.4%), LDL-C (50.99%) ( $P <$  0.001) and HDL-C (13.3%) ( $P <$  0.05). But there was no significant effect on urea and creatinine concentrations (Table 1). Cardioprotective index increased (81.6%), atherosclerotic index (56%) and ratio of LDL-C to HDL-C (43.53%) decreased significantly ( $p <$  0.02) (Table 2).

## Discussion

The results of the present study showed that CSP is more effective in reducing the plasma

**Table 1- Effect of CSP consumption on plasma levels of glucose, lipids, lipoproteins, urea and creatinine in type 2 diabetic patients**

Biochemical parameter	Before CSP consumption(Mean±S.D)	After CSP consumption(Mean±S.D)	P. value
Plasma glucose (mg/dl)	172.79 ± 15.3	86 ± 0.11	<0.001
Total cholesterol (mg/dl)	203.47 ± 6.94	101.25 ± 4.63	<0.001
Triglyceride (mg/dl)	215.38± 19.23	96.15 ±8.46	<0.001
LDL-Cholesterol (mg/dl)	137.83 ± 7.72	67.56 ± 0.12	<0.001
HDL-Cholesterol (mg/dl)	49.42 ± 4.24	42.85 ± 0.10	<0.005
Urea(mg/dl)	25.7 ± 3.36	28.59 ± 3.36	NS
Creatinine(mg/dl)	0.75 ± 0.059	0.76 ± 0.058	NS

Data are expressed Mean ± S.D

**Table 2- Effect of CSP consumption on cardioprotective and atherosclerotic indices in type 2 diabetic patients**

Biochemical index	Before CSP consumption(Mean±S.D)	After CSP consumption(Mean±S.D)	P.Value
Cardioprotective index	0.24 ± 0.61	0.44 ± 0.83	<0.02
Atherosclerotic index	3.11± 0.63	1.36 ± 0.19	<0.02
LDL-C/HDL-Cratio	2.78 ± 0.54	1.57± 0.83	<0.02

Data are expressed Mean ± S.D

glucose level, lipids and lipoproteins levels in type 2 diabetic patients. Reduction of the plasma glucose level in the acute study may be due to: 1- Stimulation of glucose utilization by peripheral tissues, especially muscle and adipose tissue (by enhancement of insulin sensitivity), as shown for some plants, such as *Momordica charantia* fruit (9) or by enhanced insulin signaling (shown for xanthenes isolated from *Swertia punicea* Hems (10) 2- Increasing hepatic glucose uptake (increased glycogenesis) and decrease in hepatic glucose production/release such as shown for methylswertianin and bellidifolin isolated from *Swertia punicea* Hems, which decrease glucokinase activity and increase glucose-6-phosphatase activity (10) or by phenols, flavonoids and glycosides isolated from the bark of *Pterocarpus santalinus*, which increase glycolysis and decrease gluconeogenesis (11) 3- Inhibition of glucosidase and amylase activity in the gastrointestinal tract, such as indicated for polyphenols from *Gymnema montanum* (12) 4- Inhibition of glucose diffusion/absorption across the gastrointestinal tract, as reported for the *Coriandrum sativum* seed extract in vitro (13),

possibly by inhibition of intestinal nutrient transporters such as intestinal Na-dependent glucose transporter 1 (SGLT1). Although, treatment with the plant extract resulted in a decrease in HDL-cholesterol (probably as a result of a large decrease in total cholesterol), the atherosclerotic index decreased and cardioprotective index increased. There are several examples of plants or plant products causing a decrease in all cholesterol associated lipids, such as HDL-cholesterol, while improving the cardioprotective index (10) The mechanism of hypolipidemic action of the CSP is not known, but may involve one or more of the following: 1- Decrease in cholesterol biosynthesis especially by inhibition of 3-hydroxy-3-methylglutaryl coenzyme A reductase, the key enzyme of cholesterol biosynthesis, as has been shown in rats fed a diet fortified with coriander seed (14); 2- Increased degradation of cholesterol to fecal bile acids and neutral sterols (14); 3- Increase in lecithin-cholesterol-acyl transferase (LCAT) activity (14). The observed hypotriglyceridemic effect may be due to: 1- Decreased fatty acid synthesis (15); 2- Increased lipolytic activity by

inhibition of hormone-sensitive tissue lipases or suppression of lipogenic enzymes (16); 3- Activation of LCAT and tissues lipases (17) as shown in rats fed a diet supplemented with coriander seeds (18); (4) control of hyperglycemia.

The active compound(s) responsible for the beneficial effect of CSP on plasma glucose, lipid profile and lipoproteins actions are not known. Of the main constituents of *Coriandrum sativum*, the flavonoids and polyphenols may be responsible for the hypoglycemic and hypolipidemic effects such as shown for the flavonoid (22) and polyphenol fraction (23) isolated from several plants. In traditional medicine, the usual dose of *Coriandrum sativum* seed powder is from 1g three times a day, up to 5 g per day (24) that would translate to 43–71mg/kg oral dose for a 70 kg person, at which level no apparent toxicity was observed. There are no reports of human toxicity associated with the use of coriander seeds or leaves. Being a spice widely used worldwide, coriander is considered nontoxic. Additionally, in the present study, administration of CSP for six weeks did not result in any changes in blood urea or creatinine levels (markers of kidney function). So coriander seed, as consumed in

traditional medicine is non-toxic in humans. Since, administration of the CSP decreased plasma glucose [which has a direct and independent relationship with CV disease(25), reduced lipid and lipoproteins in risk factors for CV disease(26) and decreased the calculated atherosclerotic index and increased cardioprotective index, it may be deduced that the CSP has an overall CV protective effect. In this study we did not observe any side effects or undesirable signs concerning CSP consumption.

## Conclusion

The present study demonstrates that oral administration of CSP in type 2 diabetic patients normalized plasma glucose and decreased the total cholesterol, LDL-cholesterol, HDL-cholesterol and triglyceride without a significant effect on plasma urea and creatinine. These findings validate its use for the treatment and management of diabetes. Our results also imply that regular consumption of CSP (which is relatively non-toxic) could decrease plasma glucose and prevent or reduce CV complications caused by hyperlipidemia in type 2 diabetic patients.

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