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Research Article

Effect of feeding *Carum Copticum (Ajowan)* Seed Powder on Serum Malondialdehyde in NIDDM Patients

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Abstract

Diabetes mellitus is a metabolic disorder of carbohydrate metabolism. NIDDM or type 2 diabetes comprises 90% of all people in developed and developing countries. NIDDM is characterized by hyperglycemia and other metabolic and pathological complications due to glucose intolerance. The glucose intolerance and auto-oxidation of glucose is the main source of free radical formation which plays a very important role in the development of complications of *diabetes*. Various methods have been employed to treat *diabetes mellitus*, including dietary modifications and the use of certain medicinal plants. The seed of *Carum copticum* (*Ajowan*) has been described in the old literature of *Ayurvedic* and *Unani* systems of medicine to possess many medicinal characteristics, including hypocholesterolemic, hypotriglyceridemic, and hypophosphatemic effects in four weeks of trial in normal albino rabbits. In light of the above, the present study aimed to evaluate the effect of feeding *Carum copticum* seed powder on the levels of oxidative stress in NIDDM patients of the 30-60 years of age group. The mean ± SD values of fasting plasma glucose and malondialdehyde were measured before the drug trial i.e., at the 0th day, 15th day, 30th day, 60th day of the drug trial period, and the 15th day of drug withdrawal. A significant (p<0.001) decline in the levels of malondialdehyde was observed throughout the drug trial period and the 15th day of the drug withdrawal.

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KEYWORDS: NIDDM, Malondialdehyde (MDA), Oxidative stress, lipid peroxidation.

1. INTRODUCTION

Diabetes mellitus comprises a group of metabolic disorders that shares a phenotype of hyperglycemia and hyperlipidemia, a consequence of disorders in carbohydrate and lipid metabolism [1]. Non-insulin dependent diabetes mellitus (NIDDM) also known as type 2 diabetes accounts for 90% of all patients with diabetes. The incidence of diabetes mellitus is on the rise worldwide. Based on the WHO reports the number of diabetes patients is expected to increase from 171 million in the year 2000 to 366 million or more by 2030 [2]. Diabetes mellitus is associated with hyperglycemia and increased free radical production. The mechanism of free radical production includes (a) increased polyol pathway flux (b) increased intracellular advanced glycation end-product formation (c) activation of protein kinase and (d) increased hexosamine flux pathway ultimately resulting in oxidative stress in a variety of tissues. The increased production of free radical can lead to damage of proteins, lipids and DNA and results in cellular damage and various complications [3,4]. Various methods have been employed to treat diabetes mellitus and its complications. These methods include

chemicals, dietary modifications and use of parts of certain medicinal plants. The chemical interaction includes oral hypoglycemic drugs and insulin therapy in type 2 diabetes mellitus. The dietary modification includes various energy giving nutrients, vitamins and minerals. No one has thoroughly determined how many patients with diabetes use complementary therapies [5]. The seed of Carum copticum (Ajowan) has been described in old literature of Ayurvedic and Unani systems of medicine to possess many medicinal properties in almost all organs of body [6,7,8]. There are few repots on Carum copticum (Ajowan) seed regarding the chemical effects exerted after its regular intake in which it is reported that Carum copticum (Ajowan) seed powder possessed hypolipidemic properties in normal albino rabbits and alcohol-induced hyperlipedemic albino rabbits [9]. However, the effect on the levels of oxidative stress which may be a causative factor for type 2 diabetes mellitus has not been studied. In light of the above, this study was designed to investigate the effect of feeding *Carum copticum (ajowan)* seed powder on the levels of oxidative stress in NIDDM subjects.

2. MATERIALS & METHODS

This study was carried out in the Department of Biochemistry, GSVM Medical College, Kanpur, (UP), India after permission of the ethics committee. In this study, 180 normal healthy subjects and 180 NIDDM patients of 30-60 years of age group were included. A prior consent of each subject was taken before including them in the study. NIDDM patients were advised to take medicinal plants/substances in the prescribed dose under study and they followed the guidelines of the treating physician. Taking into account the inclusion and exclusion criteria, only those diabetic subjects were included in this study who have no other disease (cardiovascular, hepatic, renal etc) except diabetes mellitus.

Preparation of *Carum copticum* seed powder

Shaded and air-dried *Carum copticum (Ajowan)* seeds were ground in waring blender powdered stored in air tight capped brown glass jar and placed in a cupboard under ambient conditions of temperature and humidity.

Selection of effective doses

Two doses were selected as 2.0 gm and 4.0 gm *Carum copticum (Ajowan)* seed powder for both normal subjects and NIDDM patients. Each dose was given in two divided doses filled in gelatin capsules immediately just after two principal meals along with a glass of water.

Actual plan of work:

Four groups were formed. Group I, Group II, Group III and Group IV. Group I comprised of normal healthy subjects for 2.0 gm dose. Group II comprised of normal healthy subjects for 4.0 gm dose. Group III comprised of NIDDM patients for 2.0 gm dose and Group IV comprised of NIDDM patients for 4.0 gm dose.

Group I was further subdivided as IIA for (30 -40 years), IB for (41-50 years) and IC for (51 – 60 years) of age group. Group II was further subdivided as IIA for (30 -40 years), IIB for (41 -50 years) and IIC for (51 -60 years) of age group. Further Group III was subdivided as IIIA, IIIB and IIIC for (30-40 years) (41-50 years) and (51-60 years) of age group respectively and Group IV was subdivided as IVA, IVB and IVC for (30 -40 years), (41-50years) and (51-60 years) of age group respectively.

Collection of blood sample

Separately 10 to 12 hours fasting blood sample of different age group was collected before the drug trial ie at 0th day and at 30th day and at 60th day of continuous drug trial and at 15th day of drug withdrawal and analysed for the plasma glucose [10] and malondialdehyde [11].

Statistical analysis: For analysis of the data, mean values were calculated. Results were represented through mean ± SD. Statistical analysis was done by using the student 't' test to find out the statistical significance (p-value) between different groups. p value> 0.05 was taken as insignificant however p value< 0.05 was taken as statistically significant and p value <0.01 was taken as highly significant. A paired 't' test was done for matched groups and an unpaired 't' test was done for unmatched groups to analyze the effect of the drug.

3. RESULTS

Analysis of blood samples after feeding Carum *copticum* seed powder showed a significant continuous decline in the levels of MDA in normal subjects and NIDDM patients during the drug trial period and on the 15th day of the drug withdrawal. Table 1, Table 2, Table 3, and Table 4.

Table 1: Showing the effect of feeding 2.0 gm & 4.0 gm Ajowan on the levels of MDA- (µ mol / l) in normal subjects of different age groups

Group	Number	On 0th day	On 30th day	On 60th day	On 15th day after drug withdrawal
IA	30	0.97± 0.06	0.79 ± 0.21 (17.86)**	0.67 ± 0.17 (30.87)**	0.69 ± 0.17 (28.29)**
IB	30	0.94 ± 0.07	0.81 ± 0.06 (13.30) **	0.70 ± 0.07 (24.86)**	0.71 ± 0.05 (23.81)**
IC	30	0.96 ± 0.06	0.84 ± 0.08 (12.60)**	0.70 ± 0.05 (26.49)**	0.73 ± 0.05 (24.00)**
II A	30	1.13 ± 0.18	0.83 ± 0.16 (26.8)**	0.60 ± 0.16 (47.39)**	0.66 ± 0.17 (41.96)**
II B	30	1.07 ± 0.16	0.76 ± 0.13 (28.53)**	0.55 ± 0.11 (48.56)**	0.58 ± 0.12 (45.70)**
II C	30	1.13 ± 0.17	0.82 ± 0.16 (27.04)**	0.59 ± 0.14 (47.24)**	0.64 ± 0.14 (43.18)**

Figures in parenthesis indicates percent change. p values, **< 0.01 highly significant

Table 2: Showing the effect of feeding 2.0 gm & 4.0 gm Ajowan on the levels of MDA (µ mol / l) in NIDDM patients of different age groups

Group	Number	At 0th day	At 30th day	At 60th day	At 15th day after drug withdrawal
III A	30	2.34 ± 0.24	1.98 ± 0.20 (15.63)**	1.67 ± 0.18 (28.56)**	1.75 ± 0.19 (25.26)**
III B	30	2.46 ± 0.21	2.05 ± 0.17 (16.81)**	1.74 ± 0.14 (29.29)**	1.82 ± 0.15 (26.08)**
III C	30	2.50 ± 0.23	2.13 ± 0.19 (15.05)**	1.79 ± 0.17 (28.52)**	1.88 ± 0.17 (24.75)**
IV A	30	2.43 ± 0.12	1.58 ± 0.09 (35.08)**	1.08 ± 0.05 (55.50)**	1.21 ± 0.07 (50.23)**
IV B	30	2.63 ± 0.25	1.68 ± 0.16 (35.86)++	1.08 ± 0.10 (58.63)**	1.34 ± 0.14 (48)**
IV C	30	2.50 ± 0.23	1.59 ± 0.14 (36.14)**	1.01 ± 0.10 (59.20)**	1.16 ± 0.10 (53.52)**

Figures in parentheses indicate percent change. p values **< 0.01 highly significant

Table 3: Showing the effect of feeding 2.0 gm & 4.0 gm Ajowan on the levels of plasma glucose (mg/dl) in normal subjects of different age groups

Group	Number	At 0th day	At 30th day	At 60th day	At 15th day after drug withdrawal
I A	30	86.63 ± 6.89	85.50 ± 5.87 (1.30)*	86.41 ± 6.35 (0.253)*	85.25 ± 6.00 (1.55)*
I B	30	86.42 ± 5.64	85.73 ± 5.45 (0.79)*	85.98 ± 5.44 (0.50)*	85.77 ± 5.38 (0.74)*
I C	30	84.27 ± 6.16	84.80 ± 5.30 (0.62)*	84.83 ± 5.02 (0.66)*	84.90 ± 6.08 (0.74)*
II A	30	83.83 ± 7.53	84.01 ± 7.61 (0.21)*	84.41 ± 7.25 (0.69)*	83.71 ± 7.26 (0.13)*
II B	30	85.96 ± 7.31	86.03 ± 6.14 (0.077)*	86 ± 5.86 (0.077)*	86.33 ± 5.67 (0.426)*
II C	30	87.29 ± 7.25	85.96 ± 7.30 (1.48)*	86.70 ± 6.60 (0.67)*	86.04 ± 6.18 (1.42)*

Figures in parenthesis indicates percent change. p values * > 0.05 insignificant

Table 4: Showing the effect of feeding 2.0 gm & 4.0 gm Ajowan on the levels of plasma glucose (mg/dl) in NIDDM patients of different age groups

Group	Number	At 0th day	At 30th day	At 60th day	At 15th day after drug withdrawal
III A	30	168 ± 31.65	128.96 ± 23.89 (23.44)**	105.34 ± 14.47 (37.46)**	94.35 ± 8.16 (43.99)+
III B	30	161.21 ± 31.63	139.79 ± 26.29 (13.28)**	123.38 ± 19.45 (23.46)**	112.24 ± 14.88 (30.37)**
III C	30	165.02 ± 20.06	138.16 ± 18.11 (16.27)**	119.85 ± 14.13 (27.37)	106.35 ± 13.73 (35.50)**
IV A	30	150.02 ± 25.38	124.86 ± 19.67 (16.77)**	117.58 ± 20.87 (21.62)**	107.39 ± 17.27 (28.41)**
IV B	30	157.27 ± 16.61	137.86 ± 13.24 (12.34)**	124.12 ± 11.45 (21)**	110.70 ± 8.11 (29.61)**
IV C	30	152.29 ± 19.96	135.78 ± 17.09 (10.83)**	122.58 ± 12.91 (19.50)+	113.28 ± 10.73 (25.61)**

Figures in parentheses indicate percent change. p **< 0.01 highly significant, $p^+ < 0.05$ significant

4. DISCUSSION

Diabetes mellitus is the single most important metabolic disorder recognized worldwide as one of the leading causes of death and disability. Type 2 diabetes is the commonest form of diabetes, constituting almost 90% of the diabetic population. Today, India leads the world with its largest number of diabetic subjects compared to any other country [12]. In diabetes mellitus, there is excess formation of free radicals contributed by several mechanisms, including hyperglycemia, elevated lipid peroxidation, and depleted antioxidant status, causing oxidative stress [13,14,15].

In this study, the maximum decline in the levels of MDA was 30.87% in normal subjects of the 30-40 years of age group (table 1) and 29.28% in NIDDM patients of the 41-50 years of age group (table 2) at 2.0 gm ajowan dose. However, at 4.0 gm ajowan dose max decline in the levels of MDA was 48.56% in normal subjects of 41-50 years of age group (table 1) and 59.20% in NIDDM patients of 51-60 years of age group (table 2).

A perusal of the literature suggests that no clear-cut reference is available to show the effect of Carum *copticum (Ajowan)* seed powder on the levels of oxidative stress. In this study increased levels of oxidative stress were observed in both control and

NIDDM patients, it may be because of hyperglycemic induction. These levels were found to be declined significantly by administration of doses of 2.0 gm and 4.0 gm ajowan seed powder. Observations suggested that *Carum copticum (Ajowan)* seed powder may possess some constituents that may have antioxidant properties. These effects were retained in normal and NIDDM patients after drug withdrawal. After administration of 2.0 gm ajowan seed powder continuously for the period of two months in both normal and NIDDM patients, it was observed that the highest percentage of plasma glucose declined by 1.55% in normal subjects of 30-40 years of age group (table 3) and 43.99% in NIDDM patients of 30-40 years of age group (table4). However, after administration of 4.0 gm of ajowan seed powder continuously for the period of two months in both normal and NIDDM patients, it was observed that the highest percentage of plasma glucose level declined by 1.48% in normal subjects of 51-60 years of age group (table 3) and 28.41% in NIDDM patients of 30- 40 years of age group (table4). These findings were significant ($p<0.01$) with NIDDM patients and insignificant ($p>0.05$) with normal subjects. Observations suggested that ajowan may possess the properties to augment the effect of oral hypoglycemic drugs taken by NIDDM patients. A perusal of the literature reveals that no reports of Ajowan seed powder regarding its effect on blood glucose levels have been reported yet, but it has been shown that it possesses hypolipidemic effect by declining risk factors (TC, TG & LDL-C) and increasing HDL-C and cholesterol binding reserve in male albino rabbits [9]. The physiological and pharmacological actions of ajowan seed powder are well elucidated, assessed, and studied in an experimental model [16,17,18].

5. CONCLUSION

The findings of this study suggested that ajowan seed which is a normal ingredient of our diet might possess some unidentified constituents and exhibit antioxidant properties by unknown mechanisms that need to be investigated. Therefore, a regular inclusion of *Carum copticum (ajowan)* seed in the diet of diabetic patients will help in alleviating the sufferings.

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