Ameliorative effect of Celery( Apium gravealens) and Sweet Marjoram (Origanium marjoram) on some biochemical parameters of diabetic male rats

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ABSTRACT
The goal of this study was to determine some biochemical activities of two medicinal plants Celery( Apium gravealens) and Sweet marjoram (Origanium marjoram) on normal and diabetic rats for 30 successive days. Twenty mature rats of an average body weight of (150-180 gm) were divided into 4 groups 5 rats each. (G1) control , (G2) diabetic control group injected intraperitoneal by alloxan in a dose 150 mg/kg b.wt. (G3) diabetic rats fed on basal diet mixed with 1% dried Celery( Apium gravealens), (G4) diabetic rats fed on basal diet mixed with 1% dried Sweet Marjoram (Origanium marjoram) . At the end of the experiment, serum blood samples were collected to determine some biochemical parameters, some oxidative markers and relative organs weights. Rats were sacrificed and organs were weighed to determine relative organs weight. Results revealed that there were a significant decrease of serum levels of AST, ALT, ALP, cholesterol, triglyceride, urea and glucose as well as MDA than diabetic control groups at P<0.05. On the other hand our result found no effect on albumin, globulin and A/G ratio while catalase enzyme activity showed a significant increase than control diabetic one. The relative organs weight in (G3) and (G4) returned toward normal values. Conclusively, fed Celery or Sweet marjoram to diets of diabetic male had a beneficial practical tool to minimize the effect of diabetes without any adverse effect on metabolic parameters and organs weight of rats.

INTRODUCTION
Dietary factors play a key role in the development of various human diseases including diabetes and other metabolic diseases atherosclerosis, hyperlipedema (Banerjee and Maulik 2002). Diabetes mellitus (DM) is a group of metabolic disorders resulting from defects in insulin secretion or reduced sensitivity of tissues to insulin action or both (lanza et al., 1999) Diabetes mellitus (DM) is characterized by absolute or relative deficiencies in insulin secretion and or insulin action associated with chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism. In addition, various biochemical disorders associated with vascular complications such as hyperlipidemia and oxidative stress frequently coexist with diabetes mellitus (DM) (Mossaad and Abd Allah 2004). Medicinal plants continue to provide valuable therapeutic agents, in both modern traditional and medicine system. The doubts about the efficacy and safety of the oral hypoglycemic agents have prompted a search for safer and more effective drugs in the treatment of
DM (El- demerdash et al., 2005). In spite of the fact that insulin has become one of the most important therapeutic agents known to medicine researchers. It have been making efforts to find insulin substitutes for synthetic or plant sources for the treatment of diabetes.

Many herbs have remained as an alternative to conventional therapy especially in poor areas where insulin is not readily available. (Sanchez et al., 1994).

Celery (Apium graveolens) is a herbal member of family Apiaceae. It is an annual or biennial plant native to mediterranean regions (Kapoor, 2001). Celery has a potent antioxidant effect, it is an excellent source of vitamin C and dietary fiber, some vitamins and minerals. Chu et al. (2002). It has been extensively studied for its biological activities. Celery is a highly consumed vegetable with a high flavonoid as a epigenin, chrysoeriol as (phenolic acids, chologenic acid, cinnamic acid, caumarin) and their glycosides. (Khalid et al., 2013).

Celery is characterized by its antihyperglycemic, antitumor, antioxidant, dieuretic, antihypercholesteremic activities. (Nehal, 2011).

Sweet marjoram (Origanum marjoram) is one a member of family lamiaceae is widly used in Egypt and Middle Eas. Kapoor(2001). It is promising source of hepatoprotective, antioxidant activities and hypoglycaemic effects. It has been found to have a variety of pharmacological and antioxidant effects. Phytochemical constituents of sweet Marjoram such as flavonoids, tanins, sterols, triterpens and volatile oils had been previously isolated and identified. (Ali, 2011). The phytochemical of sweet Marjoram is related to its total phenolic content and antioxidant activities and controlling oxidative damage of pancreas and testis tissues El-Ashmawy et al.(2005). The goal of this study was to evaluate the ameliorative effect of celery and sweet Marjoram on some biochemical parameters and antioxidant activities on diabetes induced by alloxan in male rats.

MATERIALS AND METHODS

Materials

Plants:

Celery (Apium graveolens) and Sweet marjoram (Origanum marjoram) were obtained from Faculty of Agriculture farm. Plants were identified by Faculty of Pharmacy, department of Pharmacognosy, Cairo University, Egypt. The plants were air dried then ground and kept in a glass bottles till mixed with ration.

Experimental animals:

Twenty apparently healthy male albino rats of an average body weight 150-180g were obtained from the laboratory of animal colony, Helwan, Cairo, Egypt. Rats were fed on standard ration and water supply was given ad-libitum.

Preparation of diabetic rats:

Alloxan tetrahydrate pure (99% ) was obtained from Sigma Company (Germany) was dissolved in sterile distilled water and injected to fifteen rats intrapretoneally at a dose of 150 mg/Kg b wt according to (Desai and Bhide, 1985).
Experimental design:
Twenty rats were divided into 4 equal groups. All groups were fed the experimental basal diet with or without the tested plants for 30 days as follows:
Group (1): Control group was fed on basal diet. Group (2): Diabetic rats were fed on basal diet.
Group (3): Diabetic rats were fed on basal diets mixed with Celery in Concentration of 10g/kg ration (1%).
Group (4): Diabetic rats were fed on basal diets mixed with Sweet marjoram in concentration of 10 g/kg ration (1%).

Sampling:
Blood samples: were collected from each rats at the end of the experiment. Blood samples were taken from retro-orbital venous plexus into clean, sterile and labeled centrifuge tubes to separate serum to determine some biochemical parameters as follows: Serum aspartate aminotransferase (AST) and serum alanine transferase (ALT) were determined according to Reitman and Frankel (1957) and alkaline phosphatase was measured according to the method described by Tietz (1986). Total cholesterol (T.chol.) and triglycerides (Trigs) were estimated according to the method described by Watson (1960) and Whalerfeld (1974) respectively. Urea and glucose were measured spectrophotometrically according to the method described by Reises et al., 1965 and Trinder, 1969 respectively. Total protein (TP) and albumin (ALb) were determined according to method described by Weichselbaum (1946) and Doumas et al., (1971) respectively.

Statistical analysis:
Parametric data were statistically analyzed by using Anova tests and comparison between means were preformed using Duncan Multiple range test for comparative of means using SPSS ver 14 (2006). Results were represented as (Mean ± S.E.).

RESULTS AND DISCUSSION
Diabetes mellitus (DM) is a chronic, systemic and metabolic disease manifested by hyperglycemia. It is characterized by alteration in the metabolism of carbohydrate, protein and lipids. The cumulative effects of these metabolic derangement lead to cell damage and circulatory changes. Other clinical consequences of diabetes include ne nephropathy, retinopathy and liver dysfunction (Wild et al., 2004). Herbal and natural products represents the most common forms of complementary and alternative medicine (Graham et al., 2005). They are readily available and can
be obtained from supermarkets and pharmacies. As these products are usually used without medical prescription, they must be safe for human (Ernst, 2006). Numerous studies have reported the antioxidant properties of many natural products against many toxic materials (Shati and Alamri 2010). Antihyperglycemic effects of these plants are attributed to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or inhibit the intestinal absorption of glucose or to the facilitation of metabolites in insulin dependent processes (Oliver – Bever, 1986). Most plants contain glucoside, alkaloids, terpenoids, flavonoids, and carotenoid which may be implicated as having antidiabetic and antioxidant effect (Loew and Kaszkin, 2002).

The present study was carried out to investigate the ameliorative effect of available herbs as Celery and Sweet marjoram on some biochemical parameters and antioxidant markers in normal and diabetic rats. The obtained results in (table 1) showed that feeding rats a ration mixed on Celery 1% and Sweet marjoram 1% of produced a significant decrease in AST, ALT and Alp levels at P<0.05. This finding are in agreement with Ahmed et al. (2002) and Amnah (2013) who studied the effects of methanolic extracts of Celery against liver damage induced by paracetamol in rats. They reported that methanolic extract of Celery seeds showed a significant hepatoprotective effect due to its antioxidant effect. It contains large amount of vitamin C which has the ability to improve liver dysfunction due to its antiperoxiditive property. Moreover, El -Ashmawy et al.(2005) found that administration of Sweet marjoram extraction to rats intoxicated with lead acetate for one month induced significant decrease in serum transeaminases and improved liver and kidney histology in comparison to lead acetate treated group. Data in table (1) also indicate that diabetic rats showed a significant elevation in total cholesterol and triglyceride levels comparing with control group while rats fed Celery and Sweet marjoram showed significant reduction in total cholesterol and triglyceride concentrations compared to diabetic control group at P < 0.05. Similar observations on Celery were reported with Jelodar et al. (2007) and Khan and Balish (2001) and who found that Celery on some biochemical parameters of decreased serum levels of total cholesterol and triglyceride of diabetic rats. Also Dhanapakiam et al. (2008) and Ahmed et al. (2009) reported that oral administration of Marjoram and Chicory or Their extracts at 5% and 10% lowered total cholesterol and triglyceride concentrations.

Also Table (1) presented the effect of feeding 1% of Celery and Sweet Marjoram to normal and diabetic rats. The results showed that significant P < 0.05 reduction in urea level (table 1) in groups fed 1% Celery and 1% Sweet marjoram than diabetic rats. These results are consistent with El shabrawy and Nada (1996) and Aissaoui et al. (2008) who recorded that Celery seeds and stalks are effective in reducing urea and uric acid levels and have the ability to decrease inflammation and oxidative stress they are also rich in vitamins B complex, A and C.
Concerning glucose level (table 1) it was reduced significantly in Celery, and Sweet Marjoram treated rats as compared to diabetic group rats at P < 0.05 these finding was in agreement with khalid et al. (2013). This effect may be attributed to their phenolic content which are Known to be involved in the healing process of free radical mediated diseases Moreover their flavonoids which are the active principles ,it also possess an inhibitory effect on the aldose reductase enzyme. This enzyme played a role in catalyzing the reduction of glucose to sorbitol which cannot diffuse out of cell membrane. Bafeel and Ali (2009) and Jain et al. (2009).

Data tabulated in table (2) indicated that feeding Celery and Sweet marjoram to diabetic rats at concentration 1% for 30 successive days exhibited no changes in the level of total protein, albumin, globulin and A/G. Our finding are inagreement with Ibrabim et al., (2000) and Sreelatha et al. (2009).

Moreover table (3) demonstrated the antioxidant parameters after feeding 1% Celery or 1% Sweet marjoram to diabetic rats . The results revealed significant decrease MDA levels while catalase activity was significant increased in groups fed the tested plants compared to diabetic control one at P<0.05. our results consistent withand Yae et al., (2010) and Amnah 2013 who said that Celery is an excellent source of vitamin C and flavonoids which have a protective effect in minimizing the oxidative stress .Concerning Sweet marjoram is a potent antioxidant as it has the ability to trap free radicals. These free radicals may oxidize nucleic acids , protein or DNA and can lead to degenerative disease Nehal et al .(2014). Antioxidant compounds like phenolic acids,polyphones ,terpenoids and flavenoids scavenge the free radicals and thus inhibit the oxidative mechanisms kintzios et al.(2010).

Table (4): illustrated the effect of feeding tested plant ( Celery or Sweet marjoram)in concentration 1% for 30 successive days on relative organ weight (kidney, heart, liver and spleen) of normal and diabetic rats. Diabetic rats which received Celery or Sweet marjoram did not show changes in the body weight and liver weight while kidney ,heart and spleen relative weights significantly decreased at P<0.05 comparing with diabetic rats . Celery and Sweet marjoram improved significantly kidney relative weight of diabetic rats which could be due to antioxidant effect (Nehal,2011). Conclusively ,fed Celery or Sweet marjoram to diets of diabetic male had a beneficial practical tool to minimize the effect of diabetes without any adverse effect on metabolic parameters and organs weight of the rats.
Table (1): Effect feeding 1% of *Celery* or 1% *Sweet marjoram* for 30 successive days on some biochemical parameters in normal and diabetic rats (n = 5).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>AST (U/L)</th>
<th>ALT (U/L)</th>
<th>ALP (U/L)</th>
<th>T.chol. (mg/dl)</th>
<th>Trig. (mg/dl)</th>
<th>Urea (mg/dl)</th>
<th>Glucose (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>25.26 ± 0.24&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.5 ± 0.596&lt;sup&gt;a&lt;/sup&gt;</td>
<td>40.38 ± 0.618&lt;sup&gt;a&lt;/sup&gt;</td>
<td>62.23 ± 2.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>76.56 ± 0.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>36.23 ± 0.046&lt;sup&gt;a&lt;/sup&gt;</td>
<td>104.7 ± 2.92&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic</td>
<td>49.4</td>
<td>25.65</td>
<td>80.49</td>
<td>90.77</td>
<td>166.4</td>
<td>39.05</td>
<td>211.13</td>
</tr>
<tr>
<td>Diabetic rats fed 1% <em>Celery</em></td>
<td>43.268 ± 0.219&lt;sup&gt;c&lt;/sup&gt;</td>
<td>15.4 ± 0.416&lt;sup&gt;c&lt;/sup&gt;</td>
<td>45.58 ± 0.163&lt;sup&gt;c&lt;/sup&gt;</td>
<td>87.6 ± 2.55&lt;sup&gt;b&lt;/sup&gt;</td>
<td>162.3 ± 0.21&lt;sup&gt;c&lt;/sup&gt;</td>
<td>36.212 ± 0.189&lt;sup&gt;a&lt;/sup&gt;</td>
<td>140.6 ± 0.134&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic rats fed 1% <em>Sweet marjoram</em></td>
<td>45.942 ± 0.278&lt;sup&gt;c&lt;/sup&gt;</td>
<td>20.65 ± 0.426&lt;sup&gt;b&lt;/sup&gt;</td>
<td>63.38 ± 0.516&lt;sup&gt;d&lt;/sup&gt;</td>
<td>58.6 ± 3.39&lt;sup&gt;a&lt;/sup&gt;</td>
<td>162.454 ± 0.143&lt;sup&gt;c&lt;/sup&gt;</td>
<td>31.596 ± 0.145&lt;sup&gt;c&lt;/sup&gt;</td>
<td>179.68 ± 0.314&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean±SE. Means with different superscripts in the same column are significantly different (P<0.05).

Table (2): Effect of feeding 1% *Celery* or 1% *Sweet marjoram* for 30 successive days on some Protein profile Aspects in normal and diabetic rats (n = 5).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T.P (g/dl)</th>
<th>Alb (g/dl)</th>
<th>Globulin (g/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>6.44 ± 0.13&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.55 ± 0.098&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.89 ± 0.125&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic control</td>
<td>6.5 ± 0.245&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.79 ± 0.17&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.7 ± 0.156&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic rats fed 1% <em>Celery</em></td>
<td>6.36 ± 0.175&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.812 ± 0.134&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>1.92 ± 0.29&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic rats fed 1% <em>Sweet marjoram</em></td>
<td>5.796 ± 0.40&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>4.22 ± 0.094&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>1.98 ± 0.34&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean±SE. Means with different superscripts in the same column are significantly different (P<0.05) different.
Table (3): Effect of feeding 1% Celery or 1% Sweet marjoram for 30 successive days on some oxidative markers in normal and diabetic rats (n=5)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>MDA (nmol)</th>
<th>Catalase (mmol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>7.83 ± 0.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>196 ± 1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic control</td>
<td>10.4 ± 0.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td>110.8 ± 3.2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic rats fed 1% Celery</td>
<td>8.8 ± 0.32&lt;sup&gt;b&lt;/sup&gt;</td>
<td>124.8 ± 2.35&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Diabetic rats fed 1% Sweet marjoram</td>
<td>8.6 ± 0.31&lt;sup&gt;b&lt;/sup&gt;</td>
<td>134 ± 4.84&lt;sup&gt;abc&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean±SE. Means with different superscripts in the same column are significantly (P<0.05).

Table (4): Effect of feeding 1% Celery or 1% Sweet marjoram for 30 successive days on relative organs weight in normal and diabetic rats (n=5).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Groups</th>
<th>Body weight (g)</th>
<th>Kidney (g)</th>
<th>Heart (g)</th>
<th>Liver (g)</th>
<th>Spleen (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>206.6 ± 3.06&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.71 ± 0.007&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.33 ± 0.01&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.74 ± 0.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.192 ± 0.007&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Diabetic control</td>
<td>195 ± 4.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.85 ± 0.022&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.391 ± 0.019&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.51 ± 0.092&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.364 ± 0.02&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Diabetic rats fed 1% Celery</td>
<td>199.17 ± 2.01&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.783 ± 0.031&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.352 ± 0.0154&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.76 ± 0.168&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.255 ± 0.017&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Diabetic rats fed 1% Sweet marjoram</td>
<td>198.33 ± 1.67&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.793 ± 0.031&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.338 ± 0.014&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.83 ± 0.154&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.268 ± 0.008&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Mean±SE, Means with different superscripts in the same column are significantly (P<0.05).
REFERENCES


