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EFFECT OF SOME PLANTS HERBS AND SPICES ON DIABETIC RATS

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ABSTRACT: *The present study was carried out to investigate the effect 5% and 10% dried mixtures, from (dill, goadid and serees),(carrot, dates kernls and raisin),(cumin, turmeric and thyme),(chicory, rosemary and turmeric)and (flaxseed, pumpkin seeds and date kernel) on daily food intake , body weight gain, feed efficiency ratio, weight gain ratio, organs to body weight, serum glucose and lipids ,liver and kidney function of diabetic rats.*

A total of 72 male rats (120±5g body weight) were used in this study. Rats were divided into two main groups, the first group (1) was used as control (-ve) group(6 rats) and fed on the basal diet only , the second group(2) (66 rats) was injected with 150mg/kg B.W. alloxan to induce hyperglycemia in rats and then divided into (11) subgroup, one of these group was used as control(+ve) group received basal diet only, the other ten subgroups fed on basal diet containing 5%or10% of one of the formulated plant mixtures . The experimental feeding period was 28 days. The results revealed that:

Experimental diets with different levels of botanic blends showed significant reduction in serum glucose, triglycerides, low-density lipoprotein (LDL-c) and very low-density lipoprotein (VLDL-c) as compared to the positive control group. These results are of great importance because cardiovascular diseases (CVD) are statistically related to the high TC. level in blood serum.

Addition of experimental mixture (dill, goadid and serees) and (carrot, dates and raisin) (5% and10%) to the diets resulted in improvement of body weight gain.

All experimental diets especially 10% mixture of (dill, goadid and serees) and 5% of (cumin, turmeric and thyme) increased serum concentration of high-density lipoprotein cholesterol (HDL-c).

All treatment of experimental diets decreased the concentration of serum GOT and GPT enzymes. These phytogenic blends showed remarkable decrease in the mean values of serum uric acid, urea nitrogen and creatinine concentrations of diabetic rats, indicating their value for reducing side effects of diabetes mellitus.

Key Words: *Diabetes mellitus, rats, hypoglycemic effect, goadaid, serees dill, carrot, dates kernls, raisin, cumin, turmeric, thyme, chicory, rosemary, flaxseed, pumpkin seeds, plant blends.*

INTRODUCTION

Diabetes greatly increases the chance that an individual will suffer from cardiovascular disease (CVD) possibly, by 3-5 fold (Stamler *et al.,* 1993). Diabetes is a key factor in the predictive equations for CVD.It is therefore appropriate that dietary advice determined to be of use for the prevention and treatment of CVD should be considered as part of the advice for the prevention and treatment of diabetes *(Anderson et al., 1991).* The prevalence of type -2 diabetes mellitus is high in many developing communities, including many Arabic communities (Miller *et al.*, 2002).

Proper nutrition is essential for anyone living with the diabetes. Control of blood glucose levels is only one goal of a healthy eating plan for people with diabetes. A diet for those with diabetes should also help achieve and maintain a normal body weight as well as prevent heart and vascular disease, which are frequent complications of diabetes (Melzig and Funki, 2007).

Diet has been recognized as a corner stone in the management of diabetes mellitus. Spices are the common dietary adjuncts that contribute to the taste and flavor of foods. Besides, spices are also known to exert several beneficial physiological effects including the antidiabetic influence (Morsi, 1992; Dhandapani *et al.,* 2002 and Srinivasan, 2005).

Diabetes remedy that is gaining popularity today is herbal treatment, with a variety of plant- derived preparations being promoted as capable of controlling blood sugar levels. In fact, herbal treatment for diabetes is not unknown. Plants and plant extracts were used to combat the disease as early as 1550 B.C., with as many as 400 (prescriptions) before the development, earlier this century, of effective medications to control diabetes (Linda *et al.,* 2006).

Generally, the leaf of a plant used in cooking may be referred to as a culinary herb, and any other part of the plant, often dried, as a spice. Spices can be the buds (cloves), bark (cinnamon), roots (ginger), berries (peppercorns) , aromatic seed(cumin), and even the stigma of a flower (saffron) (Linda *et al.*,2006).

Herbs and plants which may be of value as remedy are numerous. Some of them are known to be valuable for distinct physiological orders while others are still to be investigated. Also the part of herb or plant (leaves, stem, roots, fruits and seeds), the method of application and amount to be given still needs for further studies (Bonar, 1985).

Hyperlipidemia is an associated complication of diabetes mellitus (Miller *et al.,* 2002). Chronic hyperglycaemia in diabetes leads to overproduction of free radicals and evidence is increasing that these contribute to the development of diabetic nephropathy (Sharma *et al.,* 2006). In recent years; a substantial body of evidence has indicated that free radicals contribute to cardiovascular disease. Oxidative modification of LDL is hypothesized to play a key role during the development of atherosclerosis. The use of antioxidants from dietary sources, including herbs and spices, is a promising

alternative to the use of antioxidant supplements. In general, herbs and spices have high antioxidant concentrations that have the potential to inhibit the oxidation of LDL .Like fruits and vegetables, herbs and spices contain many different classes of antioxidants in varying amounts. It has been shown that the intake of herbs can contribute significantly to the total intake of plant antioxidant (Linda *et al.*, 2006).

Melzig and Funki (2007) reported that antidiabetes of plant origin is in common use. A proof of their effectiveness or their mode of action is often missing. Herbal alpha- amylase inhibitors are rarely described in the literature; nevertheless they have the ability to lower postprandial blood glucose level and should be used in the supplementary treatment of diabetes. Important constituents for the inhibitory activity against alpha-amylase are mainly polyphenolic compounds.

Therefore, the present work was conducted to study the effect of diets containing some different dried mixtures of plants, herbs and spices with different levels (5% and 10%) on diabetic rats.

MATERIALS and METHODS:

Materials:

The studied materials consisted of dried mixtures, as follows:

1. Dill (*Arethum graveolens*), Goadaid (*Sonchus oleraceus*) and Serees (*Taraxacum officinalis*).
2. Carrot (Daucus carota), dates (*Phoenix dactylifera*) and raisin (Vitis vinefera).
3. Cumin (*Cuminum nigrum*), turmeric (*Curcuma longa*) and thyme (*Thymus vulgaris*).
4. Chicory (*Chieorinum intybus*), rosemary (Rosmarinus officinalis) turmeric (*Curcuma longa*)).
5. Flaxseeds (*Linum usitatissimum*) Pumpkin seeds (Cucurbita pepo) and date kernel (*Phoenix dactylifera*).

-All food items have been bought (from local markets, Egypt.) fresh, and prepared for experiment. Studied plants were prepared prior to inclusion in diets as follow: They were cleaned and washed (date kernels roasted), then were dried in an oven at 60'c., after drying they were homogenized to a fine powder and stored at room temperature. Powder was mixed with standard diet at level of 5and 10%.

-Kits used to determine serum glucose; cholesterol, triglycerides, HDL-c, LDL-c, VLDL-c, Urea, uric acid, creatinine, GOT and GPT were obtained from Egyptian - American Company for Llaboratory Service and supplied by Alkan Company. Cellulose was produced by El-Nassr Pharmaceutical Chemicals, Cairo, Egypt and supplied by El- Gomhoriya Company. Corn oil and corn starch were obtained from the local market.

Experimental animals:

Seventy two male albinos rats Sprague Dawley strain, weighing 120±5g each, were used in this study. All rats were housed in cages under hygienic laboratory conditions and fed with standard laboratory diet and water ad libitum for one week before the start of experiment.

Experimental design:

The basal diet used in experiment was formulated according to (AOAC, 1995). After one week period, the rats were divided into two main groups, the first group (6 rats) fed on basal diet and were used as negative control group (-ve), the second group (66 rats) treated by subcutaneous injection with alloxan (150mg/kg body weight) to induce hyperglycemia in the rats (Buko *etal.,* 1996) and then divided into (11 subgroup) as follows:

Subgroup (1): Fed on basal diet only and used as positive control group (+ve)

Subgroup (2): Fed on basal diet containing 5% dried mixture of (Dill, goadaid and serees).

Subgroup (3): Fed on basal diet containing 10% dried mixture of (Dill, goadaid and serees).

Subgroup (4): Fed on basal diet containing 5% dried mixture of (carrot, dates and raisin).

Subgroup (5): Fed on basal diet containing 10% dried mixture of (carrot, dates and raisin).

Subgroup (6): Fed on basal diet containing 5% dried mixture of (cumin , turmeric and thyme).

Subgroup (7): Fed on basal diet containing 10% dried mixture of ((cumin , turmeric and thyme).

Subgroup (8): Fed on basal diet containing 5% dried mixture of (chicory, rosemary and turmeric).

Subgroup (9): Fed on basal diet containing 10% dried mixture of (chicory, rosemary and turmeric).

Subgroup (10): Fed on basal diet containing 5% dried mixture of (flaxseed, pumpkin seed and date kernel).

Subgroup (11): Fed on basal diet containing 10% dried mixture of (flaxseed, pumpkin seed and date kernel).

Body weight gains (BWG), food intake (FI) and feed efficiency ratio (FER) were calculated.Body weight gain % was determined according to (*Chapman et al.,* 1959). The organs (liver, heart, kidney and spleen) were removed and weighted:

$$\text{Relative organs weight} = \frac{\text{organs weight}}{\text{Animal body weight}} \times 100$$

Biochemical analysis of serum

At the end of the experiment period the rats were fasted overnight, then the rats were anaesthetized, sacrificed and blood samples were collected from aorta. Each sample was placed in a dry clean centrifuge tube, then centrifuged for 10 minutes at 3000 round per minute to separate the serum. Serum was carefully transported into dry clean Wasserman tubes by using a Pasteur pipette and kept frozen till analysis.

Glucose was determined in the serum according to the method described by (Tietz, 1976). Total cholesterol was determined in the serum according the method described by *(Allain et al., 1974).* Triglycerides were determined in serum according to the method described by *(Trinder and Ann, 1969).* Determination of serum HDL-cholesterol was carried out according to the method of (Fredewaid, 1972 and Gordon and Amer, 1977). The determination of serum VLDL-cholesterol and LDL-c were carried out according to the method of *(Lee and Nieman, 1996).* Determination of GOT (AST) and GPT (ALT) were carried out according to the method of (Bergmeyer *et al.,* 1985). Serum creatinine was determined according to the method described by (Henry, 1974). Serum uric acid was determined according to the method described by (Fossati *et al.,* 1980) .Serum urea nitrogen was determined according to the method described by (Patton and Crouch, 1977).

The obtained data were statistically analyzed by using, a computer program (SPSS). The results were tested for significance using one way analysis of variance (ANOVA) test according to (Armitage and Berry, 1987).

RESULTS AND DISCUSSION:

Body weight gain (BWG %), feed efficiency ratio (FER) and daily food intake (FI) :

The results of table (1) show the BWG%, FER and FI of rats as affected by feeding on different tested mixtured plants, herbs and spices. It could be noted that the live weight of rats in all treatments was increased pronouncedly during the period of feeding experiment with the tested, plants and herbs mixtures. This means that all feeds were acceptable and no wasting occurred. The results revealed that all treatments resulted in BWG% which was higher as compared with (+ve) control group. BWG% of treated diabetic group which fed basal diet containing 10% of (dill, goadaid and serees) increased significantly ($P<0.05$) as compared to all groups. These results agreed with that of *Abd El-Aziz,Gehan(2006),*she found that treatments with goadaid and serees showed BWG% were the highest compared to all tested treatment as (+96.89% and+66.45%)respectively. Dhandapani *et al.,* (2002) reported that cumin prevented a decrease in body weight of diabetic rats.

The results sowed also that, diabetic rats fed on basal diet containing 10% of (carrot, dates and raisin) revealed a significant increase in feed efficiency

ratio compared to (+ve) group. There are also significant changes in feed efficiency ratio between (-ve) and (+ve) control groups. While there was no significant difference of daily food intake between (-ve) and (+ve) control groups. Daily food intake was decreased in groups fed on basal diet containing 5% and10% of (cumin, turmeric and thyme) and group fed on 5% and 10% of (chicory, rosemary and turmeric) compared with both (–ve) and (+ve) control groups .

Delzenne *et al.*,(2005) found that dietary inulin- type fructans extracted from chicory root reduced food intake in diabetic rats and could play a role in management of obesity and diabetes through their capacity to promote secretion of endogenous gastrointestinal peptides involved in appetite regulation.

Effect of different mixtures of plants, herbs and spices on organs weight ratio of hyperglycemic rats:

The effect of different mixtures, of plant, herbs and spices on weight of kidney, liver, heart, lungs and spleen to body weight % is recorded in table (2). The mean value ±SD of liver weight to body weight % in diabetic control (+ve) group was 3.32±0.18g compared to 2.46±0.04g in the control (-ve) group. All tested experimental diets showed a significant decrease ($P<0.05$) in liver weight to body weight % with exception of one case which was chicory , rosemary, turmeric blend (5%) where only nonsignificant increase was recorded compared to control (+ve) group .

Concerning kidney weight to body weight % the results showed that the mean value ±SD of kidney weight in diabetic rats control (+ve) group was 1.75±0.35 compared to 1.6±0.3 for the control (-ve) group. Treating diabetic by feeding rats on tested diets showed nonsignificant changes of lungs weight when compared with both control groups (+ve and –ve).

Table (1): Body weight gain (BWG %), feed efficiency ratio (FER) and daily food intake (FI) :

Groups	BWG%	FER	Food intake (g/day)
Group(Control-ve)(A)	51.28±1.22d	0.288±0.03b	9.65±1.2a
Group(Control +ve)(B)	14.55±0.23j	0.068±0.05d	9.6±0.7a
Dill, Goadaid and Serees 5%	64.12±0.55b	0.243±0.011b	9.82±1.1a
Dill, Goadaid and Serees 10%	68.55±0.63a	0.244±0.01b	9.95±0.71a
Carrot, Dates and Raisin 5%	57.4±0.42c	0.28±0.05ab	8.07±0.66bc
Carrot, Dates and Raisin 10%	64.31±1.33b	0.286±0.035a	10.12±0.14a
Cumin, Turmeric and Thyme5%	41.45±1.9f	0.247±0.012b	7.05±0.32d
Cumin, Turmeric and hyme10%	47.45±1.15e	0.256±0.013ab	7.46±0.64cd
Chicory, Rosemary and Turmeric5%	38.21±1.21g	0.245±0.022b	7.1±0.11d
Chicory, Rosemary and Turmeric10%	39±0.5f	0.242±0.045b	7.2±0.23d
Flaxseed, pumpkin seeds and Date Kernel 5%	27.6±0.95l	0.145±0.031c	8.46±0.15bc
Flaxseed, pumpkin seeds and Date Kernel10%	31.85±1.45h	0.159±0.022c	9±1.5ab

All results are expressed as mean ± SD.

Values in each column which have different letters are significantly different ($P<0.05$)

Table (2): Effect of different mixtures of plants, herbs and spices on organs weight ratio to body weight ratio of hyperglycemic rats:

Groups	Relative weights (%) of				
	Liver M±SD	Kidney M±SD	Spleen M±SD	Lungs M±SD	Heart M±SD
Group(Control-ve)(A)	2.46±0.04ef	1.6±0.3a	1±0.1b	1.46±0.11a	0.8±0.2ab
Group(Control +ve)(B)	3.32±0.18a	1.75±0.35a	1.4±0.4a	1.75±0.15a	0.96±0.05a
Dill, Goadaid and Serees 5%	2.63±0.02cde	1.60±0.011a	0.95±0.15b	1.5±0.1a	0.05±0.05-
Dill, Goadaid and Serees 10%	2.36±0.04f	1.45±0.05a	0.85±0.1b	1.43±0.14a	0.63±0.05bc
Carrot, Dates and Raisin 5%	2.79±0.01bc	1.73±0.30a	0.9±0.1b	1.57±0.30a	0.95±0.01a
Carrot, Dates and Raisin 10%	2.71±0.01cd	1.6±0.2a	0.75±0.05b	1.46±0.11a	0.92±0.04a
Cumin, Turmeric and Thyme5%	2.96±0.04b	1.45±0.45a	1.05±0.15b	1.5±0.3a	0.96±0.04a
Cumin, Turmeric and Thyme10%	2.83±0.01bc	1.3±0.4a	0.8±0.1b	1.15±0.25a	0.6±0.1c
Chicory, Rosemary and Turmeric5%	3.3±0.1a	1.8±0.1a	1.15±0.01ab	1.4±0.3a	0.90±0.01a
Chicory, Rosemary and Turmeric10%	2.5±0.3def	1.55±0.25a	0.85±0.05b	1.35±0.25a	0.80±0.01ab
Flaxseed, pumpkin seeds and Date Kernel 5%	2.67±0.04cde	2±0.2a	1.05±0.35b	1.2±0.2a	0.82±0.04a
Flaxseed, pumpkin seeds and Date Kernel10%	2.57±0.03de	1.53±0.05a	0.91±0.01b	1.12±0.03a	0.8±0.1ab

All results are expressed as mean ± SD

Values in each column which have different letters are significantly different (P<0.05)

The results revealed that the mean value ±SD of heart weight to body weight % in diabetic rats was 0.96±0.05 compared to 0.8±0.2 in healthy rats (control –ve group). All tested diets did not alter significantly the mean value of heart weight to body weight % with exception of two cases which were dill goadaid, and serees (5% and 10%) and cumin turmeric thyme (10%) (0.05 ± 0.05, 0.63 ± 0.05 and 0.6 ± 0.1) respectively as compared to the positive group.

Concerning spleen weight to body weight % the results showed that the mean value ±SD of spleen weight in diabetic rats control (+ve) group was 1.4±0.4 compared to 1.0±0.1 for the control (-ve) group .All tested experimental diets showed a significant decrease in spleen weight to body weight compared to the control (+ve) group. On the other hand all tested experimental diets showed nonsignificant changes as compared to negative control group.

El- Metwalli, Eman *et al.,* (2005) found that, feeding on basal diet supplemented with chicory root caused a significant decrease in average relative weight of animal organs (liver, kidney, heart and spleen).

Effect of different mixtures of plants, herbs and spices on serum glucose levels of diabetic rats:

Data of table (3) show the serum glucose level of diabetic rats fed on different investigated mixtured plants. All studied samples proved to be medicinal mixtured plants as they significantly decreased the serum glucose level as compared to positive (+ve) control group. The best result of serum glucose recorded for diabetic group fed on basal diet containing 10% and 5%(dill/ goadaid/ serees) followed by 5% and 10% of (carrot / dates /raisin) because these treatment showed nonsignificant changes in serum glucose level as compared to negative control groups .

These results are in agreement with those reported by (Akhtar and Ali, 1985) suggested that the cumin seeds contain one or more of hypoglycemic principles which can significantly reduce the blood glucose. Miller *et al., (*2002*)* reported that dates are consumed worldwide and are dietary staple for many Arabic people.

Dates are a sweet and good source of dietary fiber. Many studies show that diets low in fat and high in fiber are associated with reduced risks of diabetes mellitus, cardiovascular disease and some types of cancer. Fiber comes in two forms; soluble and insoluble .Each serves a valuable function. Insoluble fiber increases the rate at which food moves through the digestive system. Soluble fiber may help control diabetes by decreasing elevated blood glucose levels *(*Sue, 1985*)* .The consumption of dates may be of benefit in glycaemia and lipid control of diabetic patients (Miller *et al.*,2003).

Delzenne *et al.*, (2005) reported that dietary inulin-type fructans extracted from chicory root decreased glycaemia, increased pancreatic and serum insulin content in diabetic rats. The hypothesis that dietary inulin-type fructans could play a role in the management of obesity and diabetes; their capacity to promote secretion of endogenous gastrointestinal peptides involved in appetite regulation.

Suzuki *et al.*, (2002) suggested that intake of vegetables and fruits rich in carotenoids might be protective factor against hyperglycemia. Flavonoids are functional constituents of many fruits and vegetables. Some flavonoids have hypoglycemic properties because they improve altered glucose and oxidative metabolisms of diabetic states. *Pinent et al., (2004)* study the effects of an extract of grape seed procyanidins on diabetic rats and found that procyanidins have insulin-like effects in insulin- sensitive cells that could help to explain their antihyperglycemic effect in vivo. These effects must be added to their antioxidant activity to explain why they can improve diabetic situations.

Table (3): Effect of different mixtures of plants, herbs and spices on serum glucose levels of diabetic rats:

Groups	Glucose(mg/dl) M±SD
Group(Control-ve)(A)	96±0.5c
Group(Control +ve)(B)	198±0.2a
Dill, Goadaid and Serees 5%	95±2c
Dill, Goadaid and Serees 10%	93±0.55c
Carrot, Dates and Raisin 5%	98.5±1.5c
Carrot, Dates and Raisin 10%	99±3c
Cumin, Turmeric and Thyme5%	128.5±16.5b
Cumin, Turmeric and Thyme10%	113.5±6.5bc
Chicory, Rosemary and Turmeric5%	127±20b
Chicory, Rosemary and Turmeric10%	119.5±2.5bc
Flaxseed, pumpkin seeds and Date Kernel 5%	134.5±12.5b
Flaxseed, pumpkin seeds and Date Kernel10%	114.5±12.5bc

All results are expressed as mean ± SD
Values in each column which have different letters are significantly different (P<0.05)

Platel and Srinivasan (1997) reported that vegetables are among numerous plant adjuncts tried for the treatment of diabetes mellitus, green leafy have shown the beneficial hypoglycemic influence in both experimental animals and humans.

Akhtar and Ali (1985) suggested that the oral administration of 1, 2, 3 and 4g/kg of *Cuminum nigrum* seeds produces a significant hypoglycemic effect in normal as well as in diabetic rabbits. This study suggested that *cuminum nigrum* seeds contain one or more hypoglycemic principles which can significantly reduce the blood glucose in normal and in diabetic rats. Ahmad *et al.,* (2000) reported that the seeds of Cuminum *nigrum* were screened phytochemically and were found contain 8% flavonoids and 0.01% alkaloids. When studied for their effect on blood glucose levels, oral administration of the flavonoids contents of the plant caused a hypoglycemic effect at a dose range of 0.5 to 1.5g/kg, both in normal and alloxan-diabetic rabbits.

Honda *et al.,* (2006) reported that ingestion of turmeric oleoresin and essential oil inhibited the development of increased blood glucose and abdominal fat mass in obese diabetic mice.Curcumin, the principal active component of turmeric, is reported to exert a number of therapeutic actions, including a hypoglycemic / antidiabetes action. Best *et al.,* (2007) reported that the stimulation of beta-cell function by curcumin could contribute to the hypoglycemic actions of this compound, and these findings identify a novel potential therapeutic target for the treatment of type 2 diabetes mellitus.

Effect of different mixture of plant herbs and spices on lipid profile of diabetic rats:

The effect of different tested mixtured plants, herbs and spices on total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol

(HDL-c), low-density lipoprotein (LDL-c),and very low density lipoprotein (VLDL-c) in diabetic rats ,is shown in table (4).

It could be noticed that the control (+ve) group has shown a significant increase $P<0.05$ in the mean values of TC, TG, LDL-c and VLDL-c as compared with those of the control (-ve) group. Concerning the mean value of serum HDL-c, the control (+ve) group exhibited a marked significant decrease as compared to the negative control group. Tested groups in the present study showed a significantly lower value in the serum of total cholesterol, TG, LDL-c and VLDL-c as compared to positive control group. On the other hand all treated groups with different levels of experimental diet induced a higher mean value of HDL-c as compared to the positive control group.

The obtained data revealed that , the highest improvement of lipid fraction recorded for the group of rats treated with10% mixture of (dill / goadaid /seress)and 10% mixture of (carrot / dates / raisin) followed by 5% and 10% mixture of (cumin / turmeric / thyme) . In this respect *Linda et al., (2006)* reported that the antioxidant properties of herbs and spices are of particular interest in view of the impact of oxidative modification of low-density lipoprotein cholesterol in the development of atherosclerosis. Herbs and spices have an important role in dietary flavonoids intake. Chamomile, onions, rosemary, sage and thyme have high flavonoids contents, but there is little evidence apart from epidemiological studies to support a direct cardiovascular health benefit from these herbs and spices.

Abd El-Aziz, *Gehan* (2006) reported that basal diets containing both serees and goadaid reduced the levels of bad cholesterol (LDL-c) concentration (-67.63% and-49.33%), VLDL-c (-11.63% and -9.46%), TC (-5.97% and-3.64%) and TG (-11.61% and-9.44%) respectively. She observed also that good cholesterol (HDL-c) level was raised in diet with serees (+51.22%), and (+39.58%) with goadaid.

Miller *et al.,* (2003) suggested that the consumption of dates may be benefit in lipid control of diabetic patients. *Olmedilla et al., (2001)* reported that high intakes of fruits and vegetables, or high circulating levels of their biomarkers (carotenoids, vitamin C and E), have been associated with a relatively low incidence of cardiovascular disease. Exposure to high fruit and vegetable diet increases antioxidant concentrations in blood and body tissues and potentially protects against oxidative damage to cells and tissues.

Hyperlipidemia is an associated complication of diabetes mellitus. In study by Dhandapani *et al.*,(2002) to evaluate the role of *Cuminum cyminum* in diabetic rats found a significant reduction in plasma and tissue cholesterols , phospholipids, free fatty acids and triglycerides.

Table (4): Effect of different mixtures of plants, herbs and spices on lipid profile of diabetic rats:

Groups	Cholesterol (mg/dl) M±SD	Triglyceride(g/dl) M±SD	HDL-c(mg/dl) M±SD	LDL-c (mg/dl) M±SD	LDL-c (mg/dl) M±SD
Group(Control-ve)(A)	71.5±0.5b	32.5±2.5d	44±1a	21±0.13h	6.5±0.5d
Group(Control +ve)(B)	111±1a	86.48±0.50a	24±0.5c	69.7±0.2a	17.3±0.1a
Dill, Goadaid and Serees 5%	85.5±1.05b	48.5±1.5bcd	39.5±0.5ab	36.3±0.2cd	9.7±0.3bc
Dill, Goadaid and Serees 10%	74±5b	39.5±1.5cd	44±2a	22.1±0.4h	7.9±0.3cd
Carrot, Dates and Raisin 5%	82.5±14.5b	42±7bcd	36.5±2.5b	37.63±0.15c	8.4±1.4bcd
Carrot, Dates and Raisin 10%	73±9b	35±1cd	41±5ab	25±0.8g	7±0.2cd
Cumin, Turmeric and Thyme5%	89.5±0.1b	49.5±14.5bc	44.5±1.5a	35.1±0.15d	9.9±2.9bc
Cumin, Turmeric and Thyme10%	81.50±0.49b	42.5±3.5bcd	42±2ab	31±0.2e	8.5±0.1bcd
Chicory, Rosemary and Turmeric5%	88.5±15.5b	56±10b	37±2b	40.3±0.2b	11.2±2b
Chicory, Rosemary and Turmeric10%	79.2±0.2b	43.5±2.5bcd	42±2ab	28.5±0.5f	8.7±0.5bcd
Flaxseed, pumpkin seeds and Date Kernel 5%	77±7b	40±1cd	37.22±0.38b	31.8±0.2h	8±0.2cd
Flaxseed, pumpkin seeds and Date Kernel10%	72.5±5.5	37.5±0.5cd	38±2b	27±3.6f	7.5±0.1d

All results are expressed as mean ± SD

Values in each column which have different letters are significantly different ($P<0.05$)

Zhang *et al.,* (1999) reported that turmeric may also have a role in reducing the risk of atherosclerosis. Much scientific research has focused recently on the health benefits of herbs. Some of these benefits are broad-based, but others are specific to one or a few physiological functions in the body *(Broadhurst et al., 2000).*

Suryanarayana *et al.,* (2005) suggested that curcumin and turmeric treatment appear to have countered the hyperglycemia-induced oxidative stress, because there was a reversal changes with respect to lipid peroxidation, reduced glutathione, protein carbonyl content and activities of antioxidant enzymes in a significant manner. Also, treatment with turmeric or curcumin appears to have minimized osmotic stress, as assessed by polyol pathway enzymes.

Effect of different of plant herbs and spices mixtures on liver function of diabetic rats:

Liver function was evaluated by determination of the activities of the following enzymes: Aspartate Amino Transaminase "AST" & (GlutamicPyruvic Transaminase) "GPT".

The results are recorded in table (5). Values of AST and ALT enzyme activity for the positive control group showed significant increase (P<0.05), as compared to the negative control group (85±3 and 68±0.9 vs. 63.66±0.35 and 25.2±1.8) respectively. These results agreed with those obtained by *El-Mallah, Maysa (2007).*

Table (5): Effect of different mixtures of plants, herbs and spices on liver function of diabetic rats:

Groups	GOT(u/L) M±SD	GPT(u/L) M±SD
Group(Control-ve)(A)	63.66±0.35b	25.2±1.8h
Group(Control +ve)(B)	85±3a	68±0.9a
Dill, Goadaid and Serees 5%	50.34±0.97cd	43±1.5d
Dill, Goadaid and Serees 10%	48.4±1.70cd	39.4±0.6f
Carrot, Dates and Raisin 5%	50.36±1.81cd	46.7±0.3c
Carrot, Dates and Raisin 10%	47.7±0.3cd	40.5±2ef
Cumin, Turmeric and Thyme5%	48.5±0.5cd	50.7±0.4b
Cumin, Turmeric and Thyme10%	47.16±1.05d	41.6±0.2de
Chicory, Rosemary and Turmeric5%	51.13±0.70c	42±1de
Chicory, Rosemary and Turmeric10%	49.28±0.02cd	37.6±0.1g
Flaxseed, pumpkin seeds and Date Kernel 5%	51.2±1c	46.4±0.6c
Flaxseed, pumpkin seeds and Date Kernel10%	47±2d	37.6±0.4g

All results are expressed as mean ± SD

Values in each column which have different letters are significantly different (P<0.05)

The present study revealed that feeding experimental diets to hyperglycemic rats for 28 day recorded significant decrease of the activity of AST (GOT) and ALT (GPT) enzymes, (P<0.05), as compared to (+ve) group. The group of rats which was fed on basal diet containing at 10% mixture of (chicory, rosemary and turmeric) and 10% mixture of (flaxseed, pumpkin seeds and date kernel) induced the highest decrease in ALT (GPT) value as compared to other treated groups but these groups were still recorded high increase in ALT value as compared to the (-ve) control group.

Effect of different mixture of plant herbs and spices on kidney function of diabetic rats:

The effects of different mixtured plant, herbs and spices on serum uric acid, urea nitrogen and creatinine, (mg/dl) of diabetic rats are presented in table (6). The mean values of urea nitrogen, uric acid and creatinine, (mg/dl) for the positive control group showed significant increase (P<0.05), as

compared to the negative control group (51 ±1.73, 2.33±0.15 and 1.59±0.01 vs.36.5±0.5, 1.6±0.4 and 0.63±0.62) respectively. These results agreed with those obtained by El-Mallah, Maysa (2007) who found that injected rats with alloxan increased kidney function parameters (urea nitrogen, uric acid and creatinine) of rats compared with with noninjected rats.

Table (6): Effect of different mixtures of plants, herbs and spices on kidney function of diabetic rats:

Groups	Urea nitrogen (mg/dl)M±SD	Uric acid(mg/dl) M±SD	Creatinine (mg/dl) M±SD
Group(Control-ve)(A)	36.5±0.5f	1.6±0.4b	0.63±0.62cd
Group(Control +ve)(B)	51±1.73a	2.33±0.15a	1.59±0.01a
Dill, Goadaid and Serees 5%	41.8±0.2d	1.7±0.05b	0.7±0.02b
Dill, Goadaid and Serees 10%	39.2±0.8e	1.6±0.02b	0.64±0.02cd
Carrot, Dates and Raisin 5%	33.8±0.1g	1.6±0.1b	0.67±0.02bcd
Carrot, Dates and Raisin 10%	32.4±0.05h	1.5±0.45b	0.61±0.01d
Cumin, Turmeric and Thyme5%	45±0.5b	1.8±0.2b	0.7±0.03b
Cumin, Turmeric and Thyme10%	34.66±0.35g	1.5±0.06b	0.66±0.04bcd
Chicory, Rosemary and Turmeric5%	43.7±0.3c	1.7±0.27b	0.66±0.005bcd
Chicory, Rosemary and Turmeric10%	36.9±0.1f	1.5±0.35b	0.65±0.01bcd
Flaxseed, pumpkin seeds and Date Kernel 5%	43.72±0.02c	1.7±0.1b	0.68±0.03bc
Flaxseed, pumpkin seeds and Date Kernel10%	36±0.2f	1.4±0.05b	0.63±0.03cd

All results are expressed as mean ± SD

Values in each column which have different letters are significantly different (P<0.05)

Kidney function (urea nitrogen, uric acid and creatinine) for all botanic treated groups at different levels recorded significant decrease, (P<0.05), as compared to (+ve) group. While nonsignificant changes in uric acid and creatinine as compared to (-ve) group were observed.

The present study revealed that all tested diet used different mixtures of plants, herbs and spices may be beneficial for patients infected with renal disorders because all of treatments showed significant decreases, in serum urea nitrogen, uric acid and creatinine when compared with the positive control group, on the, other hand showed nonsignificant changes when compared with the negative control group.

Sharma *et al.,* (2006) found that chronic treatment with curcumin significantly attenuated both renal dysfunction and oxidative stress in diabetic rats. These results provide confirmatory evidence about oxidative stress in diabetic nephropathy and point towards the possible anti-oxidative mechanism being responsible for the nephroprotective action of curcumin.

Liu *et al.,* (2006) studied the effects of grape seed proanthocyanidins extracts (GSPE) and its mechanism on early renal lesions of diabetic rats. The results revealed that GSPE has the effect in protecting kidney of diabetic rats; the mechanism might be related with the action in increasing the renal anti-oxidative ability.

At present, recommendations are warranted to support the consumption of food rich in bioactive components, such as herbs and spices. With time, a greater body of scientific evidence supporting the benefits of herbs and spices in the overall maintenance of health and protection from disease may come to light (Tapsell *et al.*, 2006).

REFERENCES

Abd El-Aziz, Gehan, G. (2006). Biological Study on the Probable Medical Action of some Common and Uncommon Botanical Parts in Man Diet. M.Sc. Thesis, Faculty of Home Economics, Minufiya Univ.

Ahmad, M., M. S. Akhtar, T. Malik and A. H. Gilani (2000). Hypoglycemic action of the flavonoids fraction of *Cuminum nigrum* seeds. Phytother Res., 14 (2):103-6.

Akhtar, M.S. and M.R. Ali (1985). Study of Hypoglycemic activity of *Cuminum nigrum* seeds in normal and alloxan diabetic rabbits. Planta Med., 51(2):81-5.

Allain, C., L. Poon and C. Chan (1974). Enzymatic determination of total serum cholesterol. Clin. Chem., 20:470-475.

Anderson, K. M., P. W. Wilson, P.M. ODell and W.B. Kannel (1991). An updated coronary risk profile: A statement for health professionals. Circulation, 83:356-62.

AOAC (1995). Official Methods of Analysis of the Association of Official Analytical Chemists, 15th Ed., Washington, D .C.

Armitage, P. and G. Berry (1987). Statistical Method in Medical Research. Blackwell, Oxford, UK, PP. 93-213.

Best, L., A. C. Elliott and P. D. Brown (2007). Curcumin induces: Electrical activity in rat pancreatic beta-cells by activating the volume –regulated anion channel. Biochem. Pharmacol., 73(11):1768-75.

Bergmeyer, H. U., M. Horder and R. Rej (1985). Approved recommendation on IFCC method for the measurement of catalytic concentration of enzymes, Part2. J.Clin.Chem. 24(7):497-510.

Bonar, A. (1985). Herbs Acomplete guide to their cultivation and Use. Hamlyn, 10.

Broadhurst, C. L., M. M. Polansky and R. A. Anderson (2000). Insulin-like biological activity of herbs and medicinal plant aqueous extracts in vitro.J. Agric. Food-Chem., 849-52.

Buko, V., O. Luklvskaya, V. Nkitin, Y. Tarasov, L. Zavodink, A. Borodassky, T. Cioren, B. Shetein, B. Tanz and K. J. Mudermann (1996). Hepatic and pancreatic effects of polyenoylphatidyl choline in rats with alloxan induced dabetes.Cell Biochem .Furnet, 14(2):137.

Chapman, D.G., R. Castilla and J. A. Campbell (1959). Evaluation of protein in food: Determination of protein and food efficiency ratio. Can.J.Biochem. Physiol., 37:679-686.

Delzenne, N. M., P. D. Cani, C. Daubioul and A. M. Neyrinck (2005). Impact of inulin and oligofructose on gastrointestinal peptides. Br.J.Nutre, 93 suppl. (1):S157-61.

Dhandapani, C., V. R. Subramanian, S. Rajagopal and N. Namasivayam (2002). Hypolipidemic effect of *Cuminum cyminum* L.on alloxan- induced diabetic rats. Pharmacol. Ros., 46(3):251-255.

El-Mallah, Maysa, M. Sh. (2007). Study the Effect of Broccoli on both Hypercholesterolemic and hyperglycemic rats .Ph.D. Thesis, Faculty of Home Economics, Helwan Univ.

El-Metwalli, Eman, M., H. Hany and R. A. Abdelrahman (2005). Bioloigical and microbiogical studies on chicory roots .J. of Home Economics, Minufiya Univ.,15(4):91-107.

Fredewaid, W. T. (1972). Determination of HDL.Clin.Chem, 18-499.

Fossati, P., L. Prencipe and G. Berti (1980). Enzymatic colorimetric method of determination of uric acid in serum.Clin.Chem, 26(2):227-273.

Gordon, T. and M. Amer (1977). Determination of HDL. J. of Med., 62:707.

Henry, R. J. (1974). Clinical Chemist.Principles and Techniques, 2nd Edition, Hagerstown (MD), Harcer, Row. P.882.

Honda, S., F. Aoki, H. Tanaka, H. Kishida, T. Nishiyama, S. OKada, I. Matsumoto, K. Abe and T. Mae (2006). Effects of ingested turmeric oleoresin on glucose and lipid metabolisms in obese diabetic mice :A DNA microarray study .J. Agric. Food Chem., 54 (24): 9055-9067.

Lee, R. and D. Nieman (1996). Nutritional Assessment. 2nd Ed., Mosby, Missouri, USA.

Linda, C., L. Hemphill, C. Lynne, R. David, F. Michael, S. Craig, R. Steven, B. Jennif-er, M. Peter, G. Peter, A. Virginia and E. Karen (2006). Health benefits of herbs and spices: The past ,the present, the future. M. J .A., 185:S1-S24.

Liu, Y. N., X. N. Shen and G. Y. Yao (2006). Effects of grape seed proanthocyanidins extracts on experimental diabetic nephropathy in rats. Wei- sheng.Yan.Jiu, 35(6):703-705.

Melzig, M. F. and Funki (2007). Inhibitors of alpha-amylase from plants- a possibility to treat diabetes mellitus type 2 by phytotherapy. Wien Med. Wochenschr., 157(13-14): 320-324.

Miller, C. J., E. V. Dunn and I. B. Hashim (2002). Glycemic index of 3 varieties of dates. Saudi.Med.J. 23(5):536-538.

Miller, C. J., E. V. Dunn and I. B. Hashim (2003). The Glycemic index of dates and date/yoghurt mixed meals: Are dates the candy that grows on trees? Eur.J.Clin.Nutr, 57(3):427-430.

Morsi, E. (1992). Your Health and Medicine between Your Hands in the Herbs. The Company United to Opening and Allotment, Egypt.

Olmedilla, B., F. Granado, S. Southon, A. J. Wright, I. Blanco, E. Gil-Martinez, H. Berg, B. Corridan, A. M. Roussel, M. Chopra and D. I. Thurnham (2001).

Serum concentrations of carotenoids and vitamins A, E and C in control subjects from five European countries.Br. J. Nutr., 85 (2):227-238.

Patton, C.H. and S. R. Crouch (1977). Enzymatic colorimetric method to determine urea in serum.Anal.Chem, 49:464-469.

Pinent, M., M. Blay, M. C. Blad, M. J. Solvado, L. Arola and A. Ardevol (2004). Grape seed-derived procyanidins have an antihyperglycemic effect in streptozotocin-induced diabetic rats and insulinomimetic activity in insulin-sensitive cell lines .Endocrinology, 145(11):4985-4990.

Platel, K. and K. Srinivasan (1997). Plant foods in the management of diabetes mellitus: Vegetables as potential hypoglycaemic agents. Nahrung, 41(2):68-74.

Sharma, S., S. K. Kulkarni and K. Chopra (2006). Curcumin, the active principle of turmeric (*Curcuma longa*), ameliorates diabetic nephropathy in rats.Clin.Exp.Pharmacol. Physiol., 33(10):940-945.

Srinivasan, K. (2005). Plant foods in the management of diabetes mellitus: Spices as beneficial antidiabetic food adjuncts.Int.J.Food Sci.Nutr. 56(6):399-414.

Stamler, J., O. Vaccaro, J. D. Neaton and D. Wentworth (1993). Diabetes, other risk factors, and 12-yr. cardiovascular mortality for screened in the multiple risk factor intervention trial.Diabetes Care men ;16:43-44.

Sue, R. W. (1985). Nutrition and Diet Therapy, 5th Ed., Times Mirror / Mosby College Publishing, St. Louis, Toyontom Santa Clara, p.34-46.

Suryanarayana, P., M. Saraswat, T. Mrudula, T. P. Krishna, K. Krishnaswamy and G. B. Reddy (2005). Curcumin and turmeric delay streptozotocin-induced diabetic cataract in rats. Invest. Ophthalmol.Vis.Sci., 46(6):2092-209.

Suzuki, K., Y. ITo, S. Nakamura, J. Ochiai and K. Aoki (2002). Relationship between serum carotenoids and hyperglycemia: A population-based cross-sectional study. J.Epidemiol, 12(5):357-366.

Tapsell, L. C., I. Hemphill, L. Cobiac, C. S. Path, D. R. Sullivan, M. Fenech, S. Roodenrys, J. B. Keogh, P. M. Clifton, P. G. Williams, V. A. Fazio and K. E. Inge (2006). Health benefits of herbs and spices.Med.J.Aust.,185:4-24.

Tietz, N. W. (1976). Fundamentals of Clinical Chemistry. Philadelphia, W. B. Saunders, P.243.

Trinder, P. and S. Ann (1969). Enzymatic test with lipid clearing factor to determine triglyceride. Clin.Biochem., 6:24-27

Zhang, W. L., D. W. Liu, X. D. Wo, Y. H. Zhang, M. M. Jin and Z. S. Ding (1999). Effects of *Curcuma longa* on proliferation of cultured bovine smooth muscle cells and on expression of low-density lipoprotein receptor in cells . Chinese Med.J, 112:308-311.

تأثير بعض النباتات والأعشاب علي الفئران المصابة بمرض البول السكري

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الملخص العربي

أجريت هذه الدراسة لمعرفة تأثير إضافة بعض خلطات من النباتات والأعشاب المجففة بنسبة ٥% و ١٠% علي معدل استهلاك الغذاء، الزيادة في الوزن، معدل التحول الغذائي وكذلك علي كل من مستويات السكر ودهون الدم وأيضا علي وظائف الكبد والكلي في الفئران المصابة بالسكري. من هذه الخلطات (الشبت، الجعضيض والسر يس)، (الجزر، البلح والزبيب)،(الكمون ،الكركم والزعتر)،(الشكور يا،حصا البان والكركم)و(بذور الكتان ،بذور القرع و نوى البلح).وقد تم استخدام عدد ٧٢ فأر ألبينو ذكر تم تقسيمهم إلي مجموعتين رئيسيتين، المجموعة الأولي عددها ٦ فئران تغذت علي الغذاء الأساسي (.B.D) واعتبرت مجموعة ضابطة سالبه (A) بينما المجموعة الثانية وكان عددها ٦٦ فأر تم حقنهم بالألو كسان حتى يتم إصابتهم بارتفاع سكر الدم .ثم قسمت هذه المجموعة إلي إحدى عشر مجموعة فرعية المجموعة الأولي منها وعددها ٦ فئران تغذت علي الغذاء الأساسي (.B.D) واعتبرت مجموعة ضابطة موجبة (B) أما باقي المجموعات تغذت كل منها علي الغذاء الأساسي (.B.D) مضاف إليه إحدى الخلطات سابقة الذكر.

أثبتت نتائج هذه الدراسة أن جميع المعاملات بمختلف الخلطات والنسب أدت الي تحسن أفضل فى وزن الفئران المصابة بالسكر وأظهرت إضافة الجزر ونوى البلح والزبيب بنسبة ١٠% أفضل النتائج من حيث زيادة الوزن ومعدل الكفاءة التحولية للغذاء (FER)وكذلك المعدل اليومي لاستهلاك الغذاء.

-أدت تغذية الفئران المصابة بالسكر علي الخلطات التجريبية الي نقص معنوي في مستوي جلوكوز الدم بالمقارنة بالمجموعة الضابطة الموجبة(B) وأظهرت التغذية علي خليط الشبت والجعضيض والسريس بنسبتيها ٥% و ١٠% وكذلك خليط الجزر ونوى البلح والزبيب بنسبتيها ٥% و ١٠% أفضل النتائج بالنسبة لتحسين مستوى الجلوكوز و دهون الدم حيث أدي الي انخفاض معنوي في كل من الكوليستيرول والجليسريدات الثلاثية والبروتينات الدهنية منخفضة الكثافة .في حين أدت التغذية علي خليط الشبت والجعضيض والسريس بنسبة ١٠% وكذلك التغذية علي خليط الكمون والكركم والزعتر بنسبة ٥% الي زيادة ملموسة في تركيز البروتينات الدهنية عالية الكثافة وكانت لهذه النتائج أهمية كبيرة لارتباط أمراض القلب (CVD) احصائيا بارتفاع نسبة الكوليستيرول الكلي في سيرم الدم .

-أدت جميع الأغذية التجريبية الي نقص في تركيز انزيمي أسبرتات أمينوترانسفيراز،ألانين أمينوترانفيراز الخاصة بوظائف الكبد.

-كما كما أشارت النتائج أيضا إلى أن جميع الأغذية التجريبية المستخدمة أدت الي نقص في تركيز حمض البوليبك واليوريا نيتروجين وكذلك الكرياتينين الخاصة بوظائف الكلي، مما يؤكد أن النباتات والأعشاب المستخدمة تلعب دور مهم في تقليل حدوث مضاعفات مرض البول السكري .