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EFFECT OF YOGHURT PILLARED WITH PROPOLIS ON HYPERGLYCEMIC RATS

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Abstract

Dietary supplementation of yoghurt with plants rich in antioxidants such as propolis which is an adhesive resinous material collected by honey bees is recently recommended. This study aimed at investigating the protective effect against the hyperglycemia and hyperlipidemia. The study showed that yoghurt with propolis had a hypoglycemic effect together with reduction of the serum levels of cholesterol, low density and very low density lipoproteins with elevation of high density lipoproteins. The atherosclerosis indices were affected with reduction of low density lipoproteins-cholesterol/high density lipoproteins-cholesterol and elevation of the high density lipoprotein-cholesterol/total cholesterol. This was attributed to the reduction of glucose absorption and inhibition of α-glucosidase together with the antioxidant activity with regain of the pancreatic β-cell function. The hypolipidemic effect and consequently protective effect against atherosclerosis was attributed to the binding, breakdown and reduction of absorption of cholesterol together with the antioxidant activity of both yoghurt and propolis. Down regulation of the expression of the angiogenic gene factors which have a role in the pathogenesis of atherosclerosis may play a role.

Thus, this dietary supplementation may be manufactured and used for its value in reducing hyperglycemia and hyperlipidemia in cases of diabetes mellitus.

Keywords: yoghurt, propolis, diabetes mellitus, atherosclerosis, hyperglycemia, hyperlipedemia, cholesterol, lipoproteins antioxidants.

INTRODUCTION

Yogurt is defined by the Codex Alimentarius of 1992 as a coagulated milk product that results from fermentation of lactic acid in milk by Lactobacillus bulgaricus and Streptococcus thermophilus **(Bourlioux and Pochart, 1988).**

Many investigators have studied the therapeutic and preventive effects of yogurt and lactic acid bacteria, which are commonly used in yoghurt production, on

diseases such as cancer, infections, gastrointestinal disorders, and asthma **(Cano *et al.*, 2002 & Simin and Woel-Kyu, 2000**). Moreover, many studies provide a strong rationale for the hypothesis that increased yoghurt consumption may enhance the immune response particularly in immunocompromised populations (**Simin and Woel-Kyu, 2000**). Some researchers mentioned the beneficial effect of yoghurt on the elevated blood glucose level and the preventive effect on the development of diabetic complications **(Bijyoet *et al.*, 1996 & Lee and De Boer, 1994)**.

In recent years, it has been shown that dietary supplementation with medicinal plants rich in natural antioxidants such as vitamins C and E, phenolics and flavonoids attenuated the oxidative stress and diabetic states **(Shori and Baba, 2011)**.

Propolis is an adhesive resinous material collected by honey bees from plants and certain plant sources neighboring their hives. The worker bees apply the resin to seal any cracks and fissures in the hive and they line their front door with it to prevent contamination **(El-Kott and Owayss, 2008 & El-Sayed *et al.*, 2009)**. The chemical consistency of propolis contains at least 200 compounds that include fatty and phenolic acids, phenolic esters and flavonoids **(Marcucci *et al.*, 1996 & Bhadauria, 2011)**.

Diabetes mellitus is a metabolic disorder of multiple aetiology characterized by hyperglycemia with disturbances of the fat profile and protein metabolism resulting from defects in insulin secretion or insulin action or both. Hyperglycemia is accused as the main factor to cause diabetes chronic complications **(Yajing *et al.*, 2012)**. Diabetes can be produced in animals by drugs as alloxan and Streptozotocin (STZ) **(Oberley, 1988).**

Cardiovascular diseases as atherosclerosis and coronary heart diseases are the most common causes of mortalities in most countries. Hypercholesterolemia is among the remarkable aggravating factors **(Baroutkoub, 2010 & Pan** and **Zhang, 2008)**. According to the reported studies, the prevalence rate of hypercholesterolemia among individuals over 15 years of age is 11% **(Bruckert, 2006)**.

Numerous drugs that lower the cholesterol level have been used but there were many undesirable side effects. Thus, dietary therapy and food intervention are among the recommended treatments **(Baroutkoub, 2010 & Bruckert, 2006)**.

Many studies have been performed in experimental animals and humans to elucidate the effect of fermented dairy products on serum cholesterol (**St-Onge *et al.*, 2000)**.

Thus, the present study was designed to investigate the probable antidiabetic and hypolipidemic effects of yoghurt with propolis in STZ-induced diabetic rats.

MATERIALS AND METHODS

1-Materials:

A- Rats: Thirty-six rats (Male Sprague-Dawley) of 12 wk old were purchased from Helwan experimental animal station. All rats were housed individually in well-aerated cages and fed on basal diet for one week for adaptation, in animal house of Nutrition and Food Sciences department, Faculty of Home Economics, Minufiya University. The rats were divided into two groups (18 normal and 18 diabetic rats).

B- Basal Diet: The basal diet consists of casein (12.5%), corn oil (10%), choline chloride (0.2%), vitamin mixture (1%), cellulose (5%), salt mixture (4%), sucrose

(22%) and corn starch (up to 100%), **(Campbell, 1963 & (Hegested, 1941)**.

C- Bee propolis: honey bee propolis will be purchased from local farm of bee in El-Dakhlia Governorate of Egypt.

d- Yoghurt: yoghurt pillared with (10% and 25%) propolis (YPWP) were made in Nutrition and Food Science Department, Faculty of Home Economics Minufiya University.

e- Streptozotocin (STZ): Diabetes was induced in one group (18 rats) via intra-peritoneal injection of by 65 mg/kg of streptozotocin (STZ) administered i.p. in citrate buffer (pH 4.2) 10m molar or fresh saline **(Krishnakumar *et al*., 1999)**. After 7 days blood glucose levels were measured to confirm the induction of diabetes. Rats with glucose level above 200 mg/dl were selected as diabetic rats and were included in the experiment.

2-Methods:

a- Experimental Design: the two groups of rats were fed on basal diet + 10% of yoghurt pillared with 10% and 20% propolis. The diet was fed and water was provided for the experimental period.

Each group (18 rats) was divided into 3 subgroups. So, there were 6 groups:

1- Control negative: represent the normal rats fed on basal diet.

2- Normal rats fed on basal diet + 10% of yoghurt pillared with 10% propolis.

3- Normal rats fed on basal diet + 10% of yoghurt pillared with 25% propolis.

4- Control positive: represent the diabetic rats fed on basal diet.

5- Diabetic rats fed on basal diet + 10% of yoghurt pillared with 10% propolis.

6- Diabetic rats fed on basal diet + 10% of yoghurt pillared with 25% propolis.

During the experimental period (6 weeks), the diet consumed was recorded every day; body weight was recorded every week.

b. Biochemical study:

At the end of the experimental period, rats were fasted overnight before sacrificing. Blood samples were collected from the abdominal aorta, placed in sterile tubes, and centrifuged at 3000 rpm for 15 minutes at 4°C. The obtained serum samples were analyzed for:

1- Blood glucose test according to the method of Trinder (1969).

2- Total cholesterol test according to Allain, (1974).

3- High-density lipoprotein (HDL) cholesterol test according to the method of Fnedewaid (1972) & Gordon and Amer (1977), triglycerides test Young and Pestaner (1975).

4- Very low density lipoprotein (VLDL) and low density lipoprotein (LDL) will be carried out according to the method of Lee and Nieman (1996) as follows: very low density lipoprotein (VLDL = triglycerides /5) and LDL = (Total cholesterol – high density lipoprotein (HDL) – VLDL).

c- Statistical Analysis:

The obtained data will be presented as the mean and standard deviation, Dunnett's t-test for multi-comparison will be applied to determine the statistical significance of the difference between the two groups in the animal study, using the **(SPSS, 2008)**.

RESULTS

A- The effect of Streptozotocin (STZ):

Streptozotocin-induced diabetes rats showed the following results:

1- The blood glucose level was elevated up to 203.8±1.1 compared to 85.1±4.2 mg/dl in control negative rats.

2- The serum cholesterol level was elevated up to 130.8±8.4 compared to 83.6±4.3 mg/dl in control negative rats.

3- The serum triglycerides level was elevated up to 141.3±9.9 compared to 91.3±4.6 mg/dl in control negative rats.

4- The serum level of high density lipoproteins was reduced to 25.8±1.6 compared to 35.7±2.2 mg/dl in control negative rats.

5- The serum level of low density lipoproteins was elevated up to 76.74±2.5 compared to 29.64±3 mg/dl in control negative rats.

6- The serum level of very low density lipoproteins was elevated up to 28.26±1.9 compared to 18.26±2 mg/dl in control negative rats.

7- The LDLc/HDLc was elevated up to 2.97±0.5 compared to 0.82±0.02 in control negative rats.

8- The HDLc/TC% was reduced to 19.7±2.3 compared to 42.7±2.7 in control negative rats.

B- The effect of yogourt pillared with propolis (YPWP):

1- The effect of (YPWP) on blood glucose level: (Table 1)

In the control negative rats, the blood glucose level was reduced from 85.1±4.2 to 84.2±5.1 and 81.8±3.2 mg/dl in the rats fed with yoghurt pillared with 10% propolis and 25% propolis respectively. The reduction was not statistically significant.

In the diabetic rats, the level was reduced from 203.8±1.1 in the control positive group to 146±8.16 and 121±1.46 mg/dl in the rats fed with yoghurt pillared with 10% propolis and 25% propolis respectively. The reduction was statistically significant.

2- The effect of (YPWP) on the lipid profile: (Table 2)

A. The effect of (YPWP) on the serum cholesterol level:

It was reduced from 83.6±4.3 in the control negative rats to 78.4±3.8 and 75.4±3.5 mg/dl in rats fed with yoghurt with 10% and 25% propolis respectively. The decrease was statistically significant in the 25% propolis group.

In the diabetic rats, the level was reduced from 130.8±8.4 in the control positive rats to 118.3±8 and 104.7±6 mg/dl in rats fed on yoghurt with 10% and 25% propolis. The decrease was statistically significant in the 10% and 25% propolis groups.

B. The effect of (YPWP) on the serum triglycerides level:

The level was decreased from 91.3±4.6 in the control negative rats to 87.4±5.2 and 85.9±9.3 mg/dl in rats fed on yoghurt with 10% and 25% propolis respectively. The decrease was not statistically significant.

In the diabetic rats, the level was reduced from 141.3±9.9 in the control positive rats to 134.3±9.2 and 125.2±5.9 mg/dl in rats fed on yoghurt with 10% and 25% propolis respectively. The decrease was statistically significant in the 25% propolis group.

C. The effect of (YPWP) on the serum level of high density lipoproteins:

It was elevated from 35.7±2.2 in the control negative rats to 36.8±1.8 and 38.1±2.3 mg/dl in rats fed on yoghurt with 10% and 25% propolis respectively. The increase was not statistically significant.

In the diabetic rats, the level increased from 25.8±1.6 in the control positive rats to 29.3±1.1 and 33±1.7 in rats fed on yoghurt with 10% and 25% propolis respectively. The increase was statistically significant in 25% propolis group.

D. The effect of (YPWP) on the serum level of low density lipoproteins:

It was reduced from 29.64±3 in the control negative rats to 24.1±2.4 and 20.12±2.5 mg/dl in the rats fed on yoghurt with 10% and 25% propolis respectively.

The decrease was statistically significant in both groups.

In the diabetic rats, the level decreased from 76.74±2.5 in the control positive rats to 62.14±1.8 and 46.7±5.2 mg/dl in the rats fed on yoghurt with 10% and 25% propolis respectively. The decrease was statistically significant in the 25% propolis group.

E. The effect of (YPWP) on the serum level of very low density lipoproteins:

It was reduced from 18.26±2 in the control negative rats to 17.5±1.7 and 17.18±3.8 mg/dl in rats fed with yoghurt with 10% and 25% propolis respectively. The reduction was not statistically significant.

In the diabetic rats, the very low density lipoproteins were decreased from 28.26±1.9 in the control positive rats to 26.86±9.3 and 25±2.3 mg/dl in the rats fed with yoghurt with 10% propolis and 25% propolis respectively. The decrease was not statistically significant.

3- The effect of (YPWP) on atherosclerosis indices: (table 3)

Regarding LDL-C/HDL-C, it was reduced 0.82±0.02 in the control negative rats to 0.65±0.02 and 0.53±0.01 in the rats fed on yoghurt pillared with 10% and 25% propolis respectively. The reduction was statistically significant.

In the diabetic rats, the level was reduced from 2.97±0.5 in the control positive rats to 2.13±0.2 and 1.4±0.1 in the rats fed on yoghurt pillared with 10% and 25% propolis respectively. The reduction was statistically significant with the 25%propolis group.

Regarding HDL-C/TC%, the normal rats showed elevation from 42.7±2.7 in the control negative rats to 46.9±2.7 and 50.5±1.1 in the rats fed on yoghurt pillared with 10% and 25% propolis respectively. The difference was statistically significant with the 25%propolis group.

In the diabetic rats, it was elevated from 19.7±2.3 in the control positive rats to 24.8±2.7 and 31.5±0.6 in the rats fed on yoghurt pillared with 10% and 25% propolis respectively. The difference was statistically significant in both groups.

DISCUSSION

The modern technology of supplementing diet with herbal medicinal components has been increased to avoid the side effects of medicines in cases of immunocompromised individuals and some diseases as diabetes mellitus **(Shori and Baba, 2011)**. Diabetes may be induces in experimental animals by certain drugs as STZ and alloxan **(Oberley, 1988)**.

Regarding the effect of STZ on the blood glucose level, the present study showed that STZ induced diabetes mellitus with elevated blood glucose level.

STZ is an alkylating agent that experimentally produces diabetes due to beta cell death by DNA damage **(Yang and Wright, 2002)**. In diabetes, insulin signaling breaks down preventing the cells from absorbing sugar. Thus, the cells resort to other methods of energy production that are more likely to produce free radicals and reactive oxygen species (ROS) which are mediators of diabetes complications **(Bhadauria, 2011 & Vitaglione *et al*., 2004)**.

These free radicals initiate peroxidation of the fatty acids of cell membrane and damage of DNA and cell proteins that constitute enzymes. However, a condition of oxidative stress establishes due to decreased activity of antioxidant enzymes and insufficient defense capacities against ROS with the

progression of pancreatic beta-cell dysfunction **(Kajimoto and Kaneto, 2004 & Oberley, 1988)**.

El-Sayed *et al.* (2009) mentioned that there is marked elevation in pancreatic tissue content of MDA as well as serum NO level with significant reduction in the antioxidant parameters as GSH in STZ-induced diabetic rats.

GSH is considered the first line of defense against free radicals and it could be found in every cell of the body adding to their protection. GSH is a powerful combination of three amino acids, L-cysteine, L-glutamic acid and glycine. These three amino acids when combined produce the most powerful antioxidant known **(Bhadauria, 2011)**.

It was mentioned that antioxidants can help prevent complications of diabetes by converting the free radicals and ROS into non toxic compounds **(Bankova *et al.*, 1995 & Oberley, 1988).**

The present study showed that treatment with yoghurt pillared with propolis resulted in reduction of the blood glucose level in diabetic rats.

Shori and Baba, (2011) and Kim *et al.* (2005) proved the hypoglycemic effect of yoghurt. This was attributed to its inhibitory effect on α-glucosidase in milk. This enzyme is essential to enhance glucose absorption. Thus, fermented milk products as yoghurt through this inhibitory effect may decrease glucose absorption and reduce hyperglycemia **(Bijyoet *et al.*, 1996 & Ramchandran and Shah, 2008)**. Another mechanism is that yoghurt formation and milk fermentation increase the antioxidant activities and the defense capacities against ROS with the regain of pancreatic beta-cell function **(Shori and Baba, 2011 & Kajimoto and Kaeto, 2004)**.

Regarding propolis, **Abo-Salem *et al.* (2009), El-Sayed *et al.* (2009), Bhadauria, (2011) and Matusi *et al.* (2004)** reported that propolis had a hypoglycemic effect.

Giugliano *et al.* (2008) reported that islet dysfunction and peripheral insulin resistance are both present in diabetes mellitus and are both necessary for the development of hyperglycemia **(Giugliano *et al.*, 2008)**. Propolis could be effective in reducing hyperglycemia through preventing the development of insulin resistance and improving insulin sensitivity **(Zamami *et al.*, 2010)**. Another role mentioned by **El-Sayed *et al.*, (2009)** is the antioxidant activity of propolis by increasing the GSH level and reduction of the pancreatic tissue content of MDA with amendment of the beta-cells capacity.

Regarding the effect of STZ on the lipid profile, the present study showed that STZ induced diabetes mellitus with elevated serum levels of cholesterol, triglycerides, LDL and VLDL while the serum level of HDL was reduced. Moreover, the LDL-C/HDL-C was elevated and the HDL-C/TC was reduced. This brings about the risk of cardiovascular diseases as atherosclerosis.

Cholesterol is transported in the plasma by specific lipoproteins. In healthy individuals, about thirty percent of blood cholesterol is carried by HDL. Low density lipoprotein cholesterol (LDL-C) is the serum cholesterol carried on low density lipoproteins. It represents approximately 60 to 70 per cent of the total cholesterol **(Toth, 2005 & Rosenson *et al.*, 2002)**.

HDL particles are able to remove cholesterol from within artery atheroma and transport it back to the liver for excretion or re-utilization, which is the main reason why the cholesterol carried within HDL particles (HDL-cholesterol) is sometimes called good cholesterol. It also

scavenges and removes LDL-C or the bad cholesterol **(Kwiterovich, 2000)**.

Therefore, those with higher levels of HDL-C seem to have fewer problems with cardiovascular diseases as atherosclerosis than those with low HDL-C.

The more small dense LDL particles lead to a higher risk factor for atherosclerosis than do the larger particles of HDL This is because the smaller particles are more easily able to penetrate the endothelium lining the blood vessels as most LDL particles are very close in size to the normal gaps in the endothelium. Thus, LDL particles also transport cholesterol into the arterial wall where they are retained and start the formation of atheromatous plaques with proliferation of the vascular endothelial cells. Over time vulnerable plaques rupture, activate blood clotting and produce arterial stenosis **(Rosenson *et al*., 2002)**.

Moreover, the protein and lipid constituents of HDL help to maintain the endothelium of the blood vessels and help to inhibit oxidation, inflammation, activation of the endothelium, coagulation, and platelet aggregation. All these properties may contribute to the ability of HDL to protect from atherosclerosis, as the endothelial damage is the first step in the process of atherosclerosis **(Toth, 2005 & Kwitervich *et al*., 2000)**.

The present study showed that consumption of yoghurt pillared with propolis reversed the effects of STZ by reducing the serum levels of cholesterol, triglycerides, LDL and VLDL while increasing the serum level of HDL with improvement of the LDL-C/HDL-C and HDL-C/TC and therefore, reducing the risk for atherosclerosis.

This agrees with **Ejtahed *et al*. (2011-a)** who found that yoghurt consumption in cases of type 2 diabetes caused a decrease in total cholesterol and LDL-cholesterol. The total cholesterol:HDL-cholesterol ratio and LDL-cholesterol: HDL-cholesterol ratio as atherogenic indices significantly decreased with yoghurt consumption **(Ejtahed *et al*., 2011-b).**

Similar results were obtained by **Sadrzadeh-Yeganeh *et al*. (2010), Kiessling *et al*. (2002) and Ataie-Jafari *et al*. (2009)** who found a decrease in total cholesterol: HDL-cholesterol ratio and an increase in HDL-cholesterol and an increase in the serum level of HDL-cholesterol with improvement of LDL-C:HDL-C ratio

The mechanism of serum lipid improvement have been suggested as the lactic acid bacteria inhibit exogenous cholesterol absorption from the intestine by binding and direct breakdown of cholesterol **(Begley *et al*., 2006)**.

Another mechanism is deconjugation of bile acids. Bile plays an essential role in fat digestion. Bile salts are synthesized mainly from cholesterol and conjugated with proteins **(Begley *et al*., 2006 & Batta *et al*., 1990)**.

Deconjugated or free bile acids are excreted more rapidly from the intestinal tract than are conjugated bile salts. Thus, the synthesis of new bile salts from cholesterol can reduce the total cholesterol concentration in the body. The enzyme responsible for the deconjugation activity is bile salt hydrolase. Lactic acid bacteria stimulate the activity of bile salt hydrolase **(Begley *et al*., 2006 & Batta *et al*., 1990)**. Propolis has a beneficial effect in diminishing the risk of cardiovascular diseases. **Yu *et al*. (2011), El-sayed *et al*. (2009) and Kolankaya *et al*. (2002)** found that the extracts of propolis are beneficial in increasing HDL-C and decreasing the levels of LDL-C and triglycerides.

Vascular smooth muscle cells are critically involved in the onset of atherosclerosis. The caffeic acid phenethyl ester; one of the main constituents of honeybee propolis, has an antiproliferative effect by interfering with cell cycle progression leading to growth arrest **(Roos *et al*., 2011)**.

Daleprane *et al*. (2011) found that Propolis improved plasma lipids and reduced the atheromatous lesion areas by modulating and down regulating the expression of the angiogenic gene factors which have a role in the pathogenesis of atherosclerosis; VCAM, MCP-1, FGF, PDGF, VEGF, PECAM and MMP-9.

Free radicals and reactive oxygen species have been implicated in the pathogenesis and complications of degenerative diseases as diabetes mellitus and atherosclerosis **(El-sayed *et al*., 2009 & Mercury *et al*., 2000)**. There will be disruption of cellular functions with oxidative damage to the endothelial cell membranes with enhancement of their susceptibility to lipid peroxidation. These may have a role in endothelial dysfunction and inflammation **(Cam *et al*., 2003 & Kajimoto and kaneto, 2004)**.

Propolis reactivated the antioxidant enzymes and restored GSH level, which in turn increased the detoxification of active metabolites of STZ and ROS. Flavonoids and their esters are the pharmacologically active molecules of propolis and have been hypothesized to influence the antioxidant activity of propolis. At least 38 flavanoids have been found in propolis **(Bhadauria, 2011& Bankova *et al*., 1995)**. Propolis also is proved to inhibit the generation of thiobarbituric acid which is a marker of lipid peroxidation indicating a cell membrane stabilizing effect probably by scavenging free radicals and reversal of peroxidation of the fatty acids **(Bhadauria, 2011& Liu *et al*., 2004)**.

CONCLUSION

This study proved that yoghurt pillared with propolis constitutes a diet that could be manufactured and offers a promising therapeutic value regarding the hyperglycemic and dyslipidemic effects in cases of diabetes. Further studies are recommended to study this effect on humans and to get this product manufactured and distributed on a wide scale.

Table (1): Effects of (YPWP) on blood glucose (mg/dl):

Groups Serum glucose	Normal Rats			Hyperglycemic Rats		
	Control (-)	Yoghurt with bee propolis		Control (+)	Yoghurt with bee propolis	
		10%	25%		10%	25%
Mean	85.1	84.2	81.8	203.8	146	121
SD	4.2	5.1	3.2	11	8.6	14.6
Sig		NS	NS		*	**

*Differences are significant at 5% (P<0.05). **Differences are significant at 1% (P<0.01).
*** Differences are significant at 0.1% (P<0.001).

Table (2): Effects of (YPWP) on lipids profiles (mg/dl):

Groups Variables	Normal			Hyperglycemic		
	Control (-)	Yoghurt with bee propolis		Control (+)	Yoghurt with bee propolis	
		10%	25%		10%	25%
Cholesterol	83.6±4.3	78.4±3.8	75.4±3.5*	130.8±8.4	118.3±8*	104.7±6**
Triglyceride	91.3±4.6	87.4±5.2	85.9±9.3	141.3±9.9	134.3±9.2	125±25.9*
HDLc	35.7±2.2	36.8±1.8	38.1±2.3	25.8±1.6	29.3±1.1	33±1.7*
LDLc	29.64±3	24.1±2.4*	20.12±2.5*	76.74±2.5	62.14±1.8	46.7±5.2**
VLDLc	18.26±2	17.5±1.7	17.18±3.8	28.26±1.9	26.86±9.3	25±2.3

*Differences are significant at 5% (P<0.05). **Differences are significant at 1% (P<0.01).
*** Differences are significant at 0.1% (P<0.001).

Table (3): Atherogenesity indices for control positive and different groups of rats fed on (YPWP):

Groups Variables	Normal			Hyperglycemic		
	Control (-)	Yoghurt with bee propolis		Control (+)	Yoghurt with bee propolis	
		10%	25%		10%	25%
LDLc/HDLc	0.82±0.02	0.65±0.02*	0.53±0.01*	2.97±0.5	2.13±0.2	1.4±0.1**
HDLc/TC%	42.7±2.7	46.9±2.7	50.5±1.1*	19.7±2.3	24.8±2.7*	31.5±0.6**

*Differences are significant at 5% (P<0.05). **Differences are significant at 1% (P<0.01).
*** Differences are significant at 0.1% (P<0.001).

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الملخص العربى

تأثير الزبادى المدعم بصمغ العسل على الفئران المصابة بارتفاع سكر الدم

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ينصح حاليا بزيادة القيمه الغذائيه للزبادى بإضافة مواد غنيه بمضادات الأكسده مثل صمغ العسل وهو ماده لزجه يتم إفرازها من النحل. وتهدف هذه الدراسه إلى بحث التأثيرالوقائى للزبادى المدعم بصمغ العسل ضد ارتفاع نسبة السكر والدهون في الفئران المصابه بداء السكرى.

وقد أُجريت الدراسه على 36 فأر حيث تم تقسيمهم إلى مجموعتين: 18 فأر سليم و 18 مصاب بداء السكرى وتم قياس نسبه السكر والكوليسترول والدهون الثلاثيه عالية الكثافه ومنخفضة الكثافه وذات الكثافه المنخفضه جدا.

وقد أظهرت الدراسه أن الزبادى المدعم بصمغ العسل يخفض من مستوى السكر والكوليسترول والدهون الثلاثيه منخفضة الكثافه وذات الكثافه المنخفضه جداً مع ارتفاع مستوى الدهون الثلاثيه عالية الكثافه وقد ترتب على ذلك تحسن فى مؤشرات مرض تصلب الشرايين بانخفاض نسبة الدهون الثلاثيه منخفضة الكثافه إلى الدهون الثلاثيه عالية الكثافه وارتفاع نسبة الدهون الثلاثيه عالية الكثافه إلى القيمه الكليه للكوليستيرول. وترجع القدره على خفض مستوى السكر بالدم الى انخفاض كمية الجلوكوز الممتصه وتثبيط الفا جلوكوزيداز بالإضافه إلى نشاط المضاد للأكسده مع استعادة قدرة خلايا بيتا للبنكرياس. أما القدره على خفض مستوى الدهون وبالتالى الوقايه ضد مرض تصلب الشرايين ترجع إلى قدرة الزبادى المدعم بصمغ العسل على تكسير وتقليل امتصاص الكوليستيرول بالإضافه إلى النشاط المضاد للأكسده.

وقد يلعب تثبيط التعبير الجينى للعوامل الوراثيه لاستحداث أوعيه دمويه دوراً بارزاً فى التأثير على العوامل المسببه لمرض تصلب الشرايين.

ونستخلص من ذلك أنه يمكن رفع القيمه الغذائيه للزبادى وتصنيعها واستخدامها فى خفض مستوى السكر والدهون فى الدم فى حالات الإصابه بداء السكرى.

الكلمات المفتاحية: الزبادى – صمغ العسل – مرض السكر – ارتفاع دهون الدم – الكوليستيرول – مضادات الأكسدة.