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HYPOGLYCEMIC AND HYPOLIPIDEMIC EFFECT OF CHICORY (*Cichorium intybus L.*) HERB IN DIABETIC RATS

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ABSTRACT: ***The hypoglycemic and hypolipidemic effects of chicory herb in plasma rats were studied, with feeding on standard diet supplemented with 10 % chicory herb for diabetic rats. The data produced significant decreases for plasma glucose and total cholesterol in diseased rats compared to diabetic control. HDL-C showed a significant increase by 7.69 % in diseased rats after 50 days comparing with diabetic control. LDL-C and triglyceride showed significant decreases in diseased rats after 50 days comparing with diabetic control. AST and ALT enzymes activity showed a significant inhibition in diseased rats after 10 and 50 days comparing with diabetic control. The present study can be concluded that chicory herb has a good effects as hypoglycemic and hypolipidemic agent for diabetic animals.***

Key words: ***Hypoglycemic, hypolipidemic, chicory and diabetic.***

INTRODUCTION

Chicory (*Cichorium intybus L.*) is widespread as a winter weed in the fieldes of colover and wheat in Egypt. It is edible fresh as well as lettuce. Chicory has a long history of herbal use and is especially of great value for its tonic effects upon the liver and digestive tract. The root and the leaves are appetiser, cholagogue, depurative, digestive, diuretic, hypoglycemic, laxative and tonic. (Chopra *et al* 1958). Kok *et al* (1996) found that the effects of bioactive molecules of chicory extract influenced the lipid metabolism and the redox balance of pancreatic tissue of rats in experimental dislipidemia. Roberfroid and Delzenne (1998) discussed the potential application of chicory inulin in risk reduction of non-insulin dependent diabetes. Rasheeduz and Mujahid (1998) found that the increased levels of some enzymes (ALT and AST) in serum observed in rats treated with CCl_4 were very much reduced in the animals treated with natural root and root callus extracts of chicory and CCl_4. Bothayna (2000) noticed that feeding on chicory roots decreased the levels of plasma glucose, cholesterol, HDL-cholesterol and also reduced liver cholesterol, triglyceride and total lipids of streptozotocin diabetic rats. Khan *et al* (2006) found that chicory is one of three medicinal plants used for the treatment of cardiovascular diseases in the Unani system of medicine. Nessrien *et al* (2007) reported that the biological experiment of alcoholic extract of chicory leaf indicated a significant decrease in serum triglycerides and total cholesterol, while an

increase in high density lipoprotein (HDL) was detected when compared to the normal control (NC) and high-fat (HF) diet groups. Al-Wabel *et al* (2008) found that aqueous extract of chicory was mixed with stirred yoghurt estimated alanine and aspartate aminotransferase (ALT and AST) activities before and after alloxan –induced oxidative stress and diabetes in rats. They added that that ALT and AST activities of treated rats fed on aqueous extract of medicinal plant and stirred yoghurt filtrate mixture were nearest to the level of untreated rats fed basal diet (Negative control). Azorin *et al* (2009) found that chicory (inulin) effects on rats upon increase of HDL-C. This work was carried out to investigate the effect of chicory herb as hypoglycemic and hypolipidemic in diabetic rats.

MATERIALS AND METHODS.

Fresh plant of chicory was collected in winter (January and February 2008) from the agriculture fields of Minufiya, Egypt . The herb of chicory was dry and grounded into a powder.

1. Chemical reagents (Kits)

Kits of glucose, total cholesterol (TC), HDL-C, triglyceride (TG) were obtained from Spinreact Co. girona (Spain). Kits for ALT and AST enzymes activity were obtained from Diamond Company, Cairo, Egypt.

2. Biological experiment

Twenty four healthy and sexually mature male albino rats obtained from research institute of Ophthalmology, Giza, Egypt were used. The experimental animals were allowed to acclimatize under the laboratory conditions for 2 weeks. Rats were divided randomly into three groups each group include eight rats. The first group of the experiment continued was feeding on the standard diet as described by Campbell (1961) and saved as normal control. Two groups of rats were injected with a single dose of 4 % alloxan prepared freshly at a dose of 200 mg / kg body weight (Chen *et al* 2005 and Yang *et al* 2006). One group of diabetes rats was saved as diabetic control. The other one was given chicory 10 % with standard diet for 50 days as chicory group.

3. Blood sampling and analysis

Blood samples were collected at zero time, 10 and 50 days (Schalm 1986) and centrifuged to obtain plasma, which was kept frozen until analysis.
Blood glucose was determined according Tinder (1969). Plasma total cholesterol was determined according to Allain *et al* (1974). Plasma HDL-C and LDL-C were determined according to Lopez *et al* (1977). Plasma triglycerides were determined according to Fossati and Prencipe (1982). AST and ALT enzyme activity were measured according to the method described

by Retiman and Frankel (1957). Statistical analysis was done using analysis of variance (Gad and Weil 1989).

RESULTS AND DISCUSSION

Data in Table (1) represented the plasma glucose in diabetic rats. The data showed that at zero time of the experiment I non-significantly different between normal control, diabetic control, and rats feed on normal diet supplemented with 10 % of chicory. After 10 and 50 days chicory feeding showed a significant decrease in plasma glucose of diseased rats group compared to diabetic control. These results are in agreement with Kim and Shin (1998) who found that water-soluble extract of chicory reduced glucose uptake from the perfused jejunum in rats.

Table (1): Effect of chicory herb on plasma glucose in diabetic rats.

Groups	Zero time		10 days		50 days	
	mg / dl	%	mg / dl	%	mg / dl	%
Normal control	82.875±9.92 [a]	100	82.125±6.55 [c]	100	89.000±6.26 [d]	100
Diabetic control	86.125±14.75 [a]	104	344.125±71.58 [a]	419	305.625±16.03 [a]	343
Chicory group	76.750±9.30 [a]	93	277.250±13.94 [b]	338	173.625±10.46 [c]	195

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Data in Table (2) showed the plasma total cholesterol of the experimental groups. At zero time there was non-significant different in plasma total cholesterol between normal control, diabetic control and chicory group. Total cholesterol after 10 and 50 of the experimental period days showed a significant decrease in diabetic rats treated with chicory diet which amounted of 122 % and 91 % respectively. Comparing with normal control. These data are in line with Nessrien *et al* (2007) who found that the alcoholic extract of chicory leaf indicated a significant decrease in serum total cholesterol.

Table (2): Effect of chicory herb on plasma total cholesterol in diabetic rats.

Groups	Zero time		10 days		50 days	
	mg / dl	%	mg / dl	%	mg / dl	%
Normal control	110.375±9.96[a]	100	132.000±13.53 [c]	100	130.375 ± 5.18 [b]	100
Diabetic control	130.500±6.39[ba]	118	171.625 ± 6.07 [a]	130	170.375 ± 5.29 [a]	131
Chicory group	126.125±7.32[a]	114	161.625 ± 4.78 [b]	122	118.875±13.76 [c]	91

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Data in Table (3) demonstrated the plasma HDL-C concentration. There was non-significant for HDL-C amounts between chicory group comparing with normal control or diabetic control at zero time and 10 days. After 50 days of the experimental period the HDL-C was significantly increased comparing with normal control. These results are agreement with Nessrien *et al* (2007) and Kim and Shin (1998) they found that serum HDL-C was significantly higher in rats fed chicory extract than controls.

Table (3): Effect of chicory herb on HDL-C in diabetic rats.

Groups	Zero time		10 days		50 days	
	mg / dl	%	mg / dl	%	mg / dl	%
Normal control	39.750±1.49[a]	100	38.50 ± 1.41 [a]	100	39.000±1.51 [b]	100
Diabetic control	40.375± 3.4 [a]	102	41.25 ± 4.33 [a]	107	40.125±2.47 [ab]	103
Chicory group	41.750±4.10[a]	105	40.00 ± 2.32 [a]	104	42.500±2.62 [a]	109

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Data in Table (4) represent the results of plasma LDL-C of rats fed standard diet control and diabetic groups, and diet supplemented with 10 % chicory. At zero time there is non-significantly differences between chicory group and normal or diabetic controls. After 10 days there was a significant effect for chicory herb on LDL-C comparing with normal controls. After 50 days chicory herb produced a significant decrease for LDL-C comparing with normal and diabetic control.

Table (4): Effect of chicory herb on LDL-C in diabetic rats.

Groups	Zero time		10 days		50 days	
	mg / dl	%	mg / dl	%	mg / dl	%
Normal control	53.325± 8.530 [a]	100	77.625 ±15.70 [b]	100	75.000 ± 4.76 [b]	100
Diabetic control	73.475 ±9.150 [a]	138	108.600 ±4.85 [a]	140	112.025±4.12 [a]	149
Chicory group	67.250 ±8.460 [a]	126	99.900 ± 3.89 [a]	129	60.550±14.20 [c]	81

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Data in Table (5) represented the mean values of plasma triglycerides. After 10 and 50 of the experimental period days the triglyceride levels were significantly elevated in the diabetic control as compared to the normal ones. The supplementation with chicory herb appeared a significant decrease in triglycerides levels at 50 days comparing with diabetic control.

Table (5): Effect of chicory herb on plasma triglycerides in diabetic rats.

Groups	Zero time		10 days		50 days	
	mg / dl	%	mg / dl	%	mg / dl	%
Normal control	85.125 ± 3.27 [a]	100	84.500 ± 3.96 [b]	100	81.875±3.83 [b]	100
Diabetic control	83.250 ± 5.80 [a]	98	108.875± 9.34 [a]	129	91.125±5.67 [a]	111
Chicory group	85.375 ± 4.75 [a]	100	108.625±11.12 [a]	129	79.125±5.25 [b]	97

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Data in Tables (6 and 7) represents the AST and ALT enzymes activity. At zero time there was non-significant between chicory herb and both controls (normal and diabetic).After 10 and 50 days there was a significant inhibition for chicory group comparing with diabetic control for the activity of AST and ALT activates. These data were agreed with Al-Wabel *et al* (2008).

Table (6): Effect of chicory herb on AST activity in diabetic rats

Groups	Zero time		10 days		50 days	
	U / L	%	U / L	%	U / L	%
Normal control	10.625±1.19 [a]	100	9.875 ± 0.83 [c]	100	8.750 ± 0.46 [c]	100
Diabetic control	9.875 ± 1.64 [a]	93	34.000 ± 3.02 [a]	344	33.500 ± 2.56 [a]	383
Chicory group	8.750 ± 1.03 [a]	82	26.250 ± 1.18 [b]	266	25.375 ± 3.02 [b]	290

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

Table (7): Effect of chicory herb on ALT activity in diabetic rats.

Groups	Zero time		10 days		50 days	
	U / L	%	U / L	%	U / L	%
Normal control	4.750 ± 0.88 [a]	100	5.625 ± 0.74 [c]	100	8.000 ± 0.92 [c]	100
Diabetic control	6.375 ± 0.51 [a]	134	21.375 ± 2.07 [a]	380	15.875 ±1.46 [a]	198
Chicory group	5.250 ± 0.7 [a]	111	20.125 ±1.80 [ab]	358	9.500 ± 1.19 [b]	119

Values in a colum with different superscripts are significantly different, P ≤ 0.01
Each value represent a mean of (8) samples ± standard deviation

From the above data it could be seen that chicory herb diet can increase HDL-C and decrease total cholesterol, LDL-C , triglycerides and AST and ALT

enzymes activity in diabetic rats. It can be concluded that chicory herb can be used as hypoglycemic and hypolipidemic agent for diabetic animals.

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التأثير الخافض للجلوكوز والدهون لعشب الشيكوريا في الفئران المصابة بمرض البول السكرى

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الملخص العربى

تم تغذية الفئران المصابة بمرض البول السكرى على علائق قياسية مضاف إليها ١٠ % من عشب الشيكوريا . وذلك لدراسة تأثير التغذية بعشب الشيكوريا على خفض نسبة الجلوكوز والدهون فى بلازما دم الفئران وقد أظهرت النتائج ما يلى .

* **وجد أن التغذية على عشب الشيكوريا أدت إلي إنخفاض نسبة الجلوكوز والكوليستيرول الكلى فى بلازما دم الفئران المصابة .**
* **كذلك أدت التغذية على عشب الشيكوريا إلي زيادة معنوية في كمية الفئران المصابة HDL-C بعد ٥٠ يوم من بداية التجربة.**
* **كان هناك نقص فى كمية LDL-C والجلسريدات الثلاثية الفئران المصابة بعد ٥٠ يوم من بداية التجربة.**
* **لوحظ أن هناك نقص معنوى فى نشاط إنزيمات الكبد ALT, AST الفئران المصابة بعد ٥٠ يوم من بداية التجربة.**

ويمكن القول بأن نبات الشكوريا له تأثير جيد كخافض لجلوكوز وكوليستيرول الدم فى الحيوانات المصابة بمرض البول السكرى.