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Hypoglycemic and Hypolipidemic Effect of *Cynara Scolymus* among Selected Type 2 Diabetic Individuals

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Abstract: Globe artichoke is a vegetable with medicinal value. The present investigation was carried out in 2 phases. In first phase, five different bakery products namely wheat biscuits, semolina biscuits, groundnut biscuits, salty biscuits and wheat bread were developed by incorporating 6 grams of processed globe artichoke powder. Among the five bakery products, the most accepted globe artichoke incorporated wheat biscuits was analyzed for their nutrient content and it was selected for supplementation. In second phase 30 type 2 diabetic individuals of both sexes and of age 35-45 years were divided into 2 groups, each group having 15 individuals. Group I (No:15) was kept as control group and Group II (No:15) was supplemented with 4 globe artichoke incorporated wheat biscuits for the period of 90 days. Results of the study showed that there was a significant ($P<0.01$) reduction at one percent level in fasting and post prandial blood glucose levels in Group II individuals. Results of the serum lipid profile showed a significant ($P<0.01$) reduction at one percent level in total cholesterol, serum triglyceride, Low Density Lipoprotein (LDL) and significant ($P<0.01$) increase in High Density Lipoprotein (HDL) levels of Group II individuals compared to Group I individuals. Thus the results of study recommended the type 2 diabetic subjects should use globe artichoke vegetable in their food preparation on regular basis which shows good hypoglycemic and hypolipidemic effect.

Key words: Globe artichoke, blood glucose, blood lipids, diabetic

Introduction

Diabetes mellitus is a chronic disorder of glucose metabolism resulting from dysfunction of pancreatic beta cells and insulin resistance (Safder *et al.*, 2004). Diabetes mellitus is one of the most common problem challenging the physicians in 21st century (Bailey, 2002; Nesto, 2003; Bennet, 2004 and Ramachandran and Pathak, 2002). Diabetes mellitus is defined as a chronic disease of carbohydrate metabolism, but lipid and protein metabolism are also affected. (Lusi *et al.*, 2000; Heffner, 2001 and Antonio, 2005). The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels. (Sato *et al.*, 2003; Uladimir, 2003 and Prakash, 2003). Dietary fiber has been one of the most enduring dietary interest of this decade world wide. It is a mixture of variety of polysaccharides, cellulose, hemicelluloses, pectins, gums, mucilages, algal polysaccharides and lignin has been found to have hypoglycemic effect (Lafrance *et al.*, 1998; Prased *et al.*, 1995)

Globe artichoke (*Cynara scolymus*) is a herbaceous perennial plant in the family composite and originated in the Mediterranean region. (Baroda Forms, 2004 and Linda, 2004). Globe artichokes are delicious and fit for a healthy life style (William, 2004). One large globe

artichoke contains only 25 calories, no fat, 170 mg of potassium and is a good source of vitamin C, folate, magnesium and dietary fiber (Pittler, 2002 and Marakis *et al.*, 2002). It is a medicinal plant rich in cynarin and orthophenole constituents (Parker, 1982). Hinou (1989) also identified other various phytochemicals in the globe artichoke and he termed it as cynaropicrin, sequiterpene lactones which shows both hypoglycemic and hypolipidemic activity. Vinik, (2002), have reported that globe artichoke is rich in fiber and low in fat. So its health benefits was due to its high fiber content. Current use of globe artichoke in natural medicine which includes its uses for all types of liver and gall bladder disorders, diabetes and high cholesterol diseases. (Bartram 1995; Mist, 2000; Wegenerf, 1999 and Emenderfer, 2005). Hence to prove the authenticity of globe artichoke action in hyperglycemia and hyperlipidemia, this study was designed to see the effect of globe artichoke powder on blood glucose and serum lipid profile in type 2 diabetic individuals.

Materials and Methods

Phase I

Processing of globe artichoke: Globe artichoke was obtained in the fresh vegetable form. It was made into powder after proper processing. The processing steps

was given below



Globe artichoke



Keep inside the pressure cooker for 5 minutes



Wash globe artichoke under cold running water



Remove it after cooking



Pull of lower petals which are small and discolored

Gently spread leaves until centre cone is reached



Scrape out the purple tipper leaves and fuzz present in the centre



Cut stems close to base



Pullout petals and spread in plate



Cutoff top quarter and tips of petal which is thorny in nature



Dry and make it in to powder and store it



Plunge into acidified water (lemon juice)

Selection and standardization of recipes: Five different bakery product namely wheat biscuits, semolina biscuits, groundnut biscuits, salty biscuits and wheat bread were developed by incorporating 5 percent globe artichoke powder that is 6 grams in the standardized formula. The developed recipes were standardized for quality and quantity using the factor method (Khan, 1987). Acceptability tests were conducted to rate the sensory quality attributes of the recipes namely

Table 1: Mean organoleptic scores of the bakery products

Characteristics	Wheat biscuits	Semolina biscuits	Groundnut biscuits	Salty biscuits	Wheat bread
Appearance	3±0	2.7±0.64	3±0	2.2±0.49	2.8±0.4
Colour	2.1±0.83	2.3±0.9	2.7±0.46	1.5±0.67	2.2±0.4
Texture	3±0	2.7±0.46	2.5±0.5	2.9±0.3	2.6±0.6
Flavor	3±0	2.8±0.6	2.6±0.8	2.8±0.6	2.7±0.4
Taste	2.9±0.3	2.5±0.5	2.7±0.46	2.6±0.66	2.6±0.6
Overall acceptability	14.0±0.9	13.0±0.63	13.5±1.20	12.4±1.79	13.3±1.0
Percentage of overall acceptability	93.33%	86.67%	90%	82.67%	88.07%

Note : Overall acceptability score range. 0-5 - not acceptable, 6-10 - acceptable, 11-15 -highly acceptable

Table 2: Nutritive value of the developed wheat biscuits (one serving)

Nutrients	Quantity
Protein (g)	5.12
Fat (g)	3.13
Fiber (g)	1.34
Carbohydrate (g)	29.70
Energy (k.cal)	176.75
Calcium (mg)	19.90
Iron (mg)	1.86
Thiamin (mg)	0.16
Riboflavin (mg)	0.12
Vitamin C (mg)	0.75

appearance, colour, texture, flavour, taste, overall acceptability and percentage of overall acceptability, by an expert panel of 12 members using a three point score card. Among the five bakery products, globe artichoke incorporated wheat biscuits were analyzed for their nutrient content, and the same was selected for the supplementation.

Phase II

Selection of sample: Thirty type 2 diabetic individuals of both sexes in the age group of 35-45 years, who were not on insulin therapy, were not taking medicine for other health conditions and whose fasting blood glucose level above 160mg/dl and post prandial blood glucose level above 250 mg/dl with elevated lipid profile values were selected for the present study.

Conduct of the study: The study was conducted for 90 days. The 30 type 2 diabetic individuals were divided into 2 groups. Group I (No:15) was assigned as control group i.e no supplementation and Group II (No: 15) was supplemented with 4 globe artichoke wheat biscuits containing 6grams of globe artichoke powder and distributed for each individual daily [morning (2) and evening (2)] as a snack till the end of the study period.

Biochemical analysis: For both control and experimental group their fasting and post prandial blood glucose levels were estimated at the start of the study, 30th, 60th

and 90th day of supplementation. Total cholesterol, serum triglyceride, Low density lipoprotein (LDL) and High density lipoprotein (HDL) values were tested at the initial and final stage of supplementation and the results were compared to find out the efficacy of globe artichoke powder among the selected diabetic individuals.

Results and Discussion

Mean acceptability scores of the bakery products: Five different bakery products namely wheat biscuits, semolina biscuits, groundnut biscuits, salty biscuits and wheat bread were developed using globe artichoke powder. These recipes were standardized and evaluated for acceptability. The mean scores of the preparation are presented in Table 1.

Results of the sensory analysis revealed that though the mean overall acceptability score was in highly acceptable range for all five formulated and standardized products, wheat biscuits attained the highest percentage (93.33%) of overall acceptability. So wheat biscuit was chosen for supplementation.

Nutritive value of the developed wheat biscuits: Table 2 gives the nutritive value of the developed wheat biscuits. Results showed that one serving of globe artichoke wheat biscuits contributed 176.95 k.cals, 5.12g of Protein, 1.34 g of fiber, 19.96 mg of calcium, 1.86 mg of iron and 0.75mg of vitamin C.

Impact of supplementation on blood glucose levels: The impact of globe artichoke powders on mean fasting and post prandial blood glucose levels of the diabetic individuals is given in Table 3.

From the Table 3, it was seen that the diabetic individuals in Group I did not show a marked difference, between their initial and final values of fasting and post prandial blood glucose levels. The mean values showed an almost negligible decrease with the fasting blood glucose mg/dl varying from 160.92±3.77 to 160.68±3.63 and post prandial from 261.72±5.22 to 261.45±5.05. The results of the Group II diabetic individuals showed a positive impact of globe artichoke in the reduction of fasting and post prandial blood glucose level. The mean

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Table 3: Impact of administration of globe artichoke powders on mean blood glucose levels (mg/dl) of the diabetic individuals

Groups		Initial	30 days	60 days	Final	't' test
Fasting blood glucose	Group I	160.92±3.77	160.62±3.39	160.16±3.64	160.68±3.64	1.02 ^{ns}
	Group II	163.40±4.39	157.77±4.23	150.26±4.06	138.80±3.90	39.3*
Post prandial blood glucose	Group I	261.72±5.31	261.63±5.22	261.54±5.24	261.45±5.05	0.93 ^{ns}
	Group II	262.22±3.82	258±3.72	251±3.61	241.72±3.46	3.98*

ns - Not significant at 1 percent level. * - Significant 1 percent level

Table 4: Impact of administration of globe artichoke powder on mean lipid profile (mg/dl) of the diabetic individuals

Lipid profile	Group I		't' value	Group II		't' value
	Initial	Final		Initial	Final	
Total cholesterol	237.7±7.96	237.76±8.07	0.61ns	236.7±7.03	225.95±1.12	77.89*
Serum triglyceride	164.02±7.44	164.13±5.53	1.18ns	163.27±7.39	146.33±7.20	69.5*
LDL	161.16±4.62	161.16±4.62	0.73ns	161.58±5.51	143.20±5.39	157.9*
HDL	35.26±3.09	35.62±3.27	0.81ns	34.36±3.16	43.37±3.24	52.83*

ns - Not significant at 1 percent level * - Significant 1 percent level

values decreased from 163.4 ±4.39 to 138.8 ±3.9 mg/dl for fasting blood glucose (P<0.01) and from 262.22±3.82 to 241.75±3.46 mg/dl for post prandial blood glucose (P<0.01). Thus the study revealed that significant change in blood glucose among Group II diabetic individuals may be due to the hypoglycemic effect of globe artichoke powder.

Impact of supplementation on serum lipid profile values:

The Impact of globe artichoke powder on total cholesterol, serum triglyceride, LDL and HDL of the diabetic individuals is given in Table 4. The findings showed that the initial and final values of lipid profile in the Group I diabetic individuals did not have any marked variation. Contrarily the Group II showed a distinctive change in the mean final values of lipid profile which was statistically significant at one percent level. The mean values were significantly decreased from 236.69±7.03 to 225.95±1.21mg/dl for total cholesterol (P< 0.01), from 163.27±7.39 to 146.33±7.2 mg/dl for serum triglyceride (P< 0.01), from 161.58±7.39 to 146.33±7.2 mg/dl for serum triglyceride (P<0.01), from 161.58±5.51 to 143.2±5.39 mg/dl for LDL (P< 0.01) and mean values were increased significantly from 34.36±3.16 to 43.37±3.24 mg/dl for the HDL level (P< 0.01). Hence globe artichoke was found to have a positive effect on the serum lipid profile values and blood glucose levels in accordance with a study by Mangola, 1990 and Easwaran *et al.*, 1991).

Conclusion: The research study was undertaken to find the acceptability on the developed bakery products using globe artichoke powder and impact of administering globe artichoke powder on blood glucose levels and serum lipid levels for a period of 90 days.

The globe artichoke was processed to made into powder. The acceptability study of the five developed recipes revealed that all the recipes were acceptable with wheat biscuits scoring the highest score followed by groundnut biscuits and wheat bread. Administration

of 6 grams of globe artichoke powder in the form of biscuits caused statistically significant reductions in blood glucose levels and serum lipid profile values. Hence the investigators opine that the use of under exploited vegetable with immense therapeutic use should be facilitated.

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