J. Agric. Sci. Mansoura Univ., 30 (10): 6335 - 6355, 2005

HYPOCHOLESTEROLIMIC ACTIVITY OF CORIANDER AND CUMIN FRUITS OR THEIR ESSENTIAL OILS WITH OR WITHOUT TURMERIC POWDER.

Badee, A. Z. M.[1] ; S. A. Helmy[1]; A. A. Atia[2] and A.S. Abd El Azim[2]
1- Food Tech. Dept., Fac. of Agric., Cairo Univ. ,Giza ,Egypt.
2- Food Tech. Res. Inst. , Agric. Res. Center, Giza, Egypt.

ABSTRACT

The present investigation was carried out to study the effect of feeding with diet supplemented with coriander and cumin in either powder or essential oil form with or without turmeric on hypercholesterolemic rats for 45 days. Data emphasized that rats given different experimental diets exhibited significant decrement in serum total cholesterol and low density lipoprotein compared with a group of rats given hypercholesterolemic diet while the level of high density lipoprotein was increased during experimental period. Also, feeding with diets supplemented with coriander essential oil (0.05%) or powder (11%) with or without turmeric (0.25%) from the diet were responsible for decreasing serum triglycerides while cumin powder (5%) as well as essential oil (0.07%) had lower activity in this concern. Likewise, both serum creatinine and uric acid (kidney function) were decreased as a result of feeding with all tested spices. The sameness result was recorded for either ALT or AST (liver function enzymes). Concerning serum glucose, results ascertained that dietary coriander and cumin in powder form or essential oil with or without turmeric decreased serum glucose compared with that of rats fed with hypercholesterolemic diet. It could be concluded that, remarkable beneficial could be obtained by using these spices in their powder or essential oil forms especially in hypercholesterolemic case.

Keywords: Coriander, cumin, turmeric, powder, essential oil, hypercholesterolemic activity , cholesterol, LDL, HDL

INTRODUCTION

Hypercholesterolemia is a high risk factor and it may lead to coronary heart disease and atherosclerosis, leading to death. Many studies have established the relationship between plasma cholesterol concentration and increasing risk factor of atherosclerosis [Sodium *et al.*(1984) and Grundy, 1986]. The development of atherosclerosis is a complex and multi step process. There are a number of genetic, metabolic and environmental factors involved in the formation and evaluation of the atherosclerotic plaque. Lipoprotein oxidation and oxidative processes in general play an important role in the pathogenesis of atherosclerosis. Studies have identified damaged (LDL)as an atherogenic agent. Oxidized (LDL) exert a multitude of potentially atherogenic effects *in vivo* and *in vitro* and lipoprotein like particles with oxidative damage have been isolated from atherosclerotic lesions [Steinberg *et al.* (1989) and Witztum and Steinberg 1991)] Feeding rabbits with cholesterol supplemented diet produced hypercholesterolemia and vascular atherosclerotic lesions as well as caused increasing lipid peroxidation that exposed the animals to oxidative stress (Mahfouz and Kummerow, 2000). Food and medicine are in fact, two sides of the same coin and man has been

proved with these both materials by plants from very early times, spices are believed to play an important role in Ayurvedic (Indian system of medicine) preparations (Chithra and Leelamma, 1999). The use of spices as food additives also has been practiced widely since ancient time to enhance the flavor of food beside prolong its shelf life, Coriander (*carindrum sativum* L., *Umbelliferae*) is widely distributed and mainly cultivated for the seeds. The fruits of coriander are mainly responsible for its medical use as a drug for indigestion against warms, rheumatism and pain in the joints (Wichtl, 1994) Recent studies have also demonstrated the hypoglycemic action by its effects on carbohydrate metabolism [Chithra and Leelamma, 2000 and Gray and Flatt. 1999] Also coriander plays a protective role against the deleterious effects in lipid metabolism in experimental colon cancer (Chithra and Leelamma, 2000), besides, the essential oil from both seeds and leaves which inhibit lipid peroxidation (Tanabe *et al.*, 2002). Regarding cumin (*Cuminum cyminum L., Umbelliferae*) besides being extensively used as a condiment in many spices mixes and curry powders and for flavoring soups pickles...etc., it also used for seasoning bakery products such as bread and biscuits . Furthermore, it is considered as stimulant and carminative agents besided stomachic and astringent effect so it is useful in dyspepsia and diarrhea [Chopra *et al.*, 1958, Nadkarin, 1976 and Farrell, 1985] Cumin also exhibited hypolipidemic activity which is associated complication activity of diabetes mellitus besides .its ability to reduce blood glucose (Dhandapani *et al*, 2002).

Turmeric (*Curcuma longa L.* and *Zingiberaceae*) is a native southern Asia and it is cultivated extensively throughout the warmer parts of the world in large scale. It is used to same extent as a stomachic tonic and blood purifier, also the essential oil of turmeric is used as carminative appetizer and antispasmodic Gupta and Balasubrahmanyam, (1998). Curcumin is a fat soluble yellow pigment presented in turmeric (Sowbhagya *et al.*, 2005). Also curcumin has been used to help prevention and treating patients with Alzheimer's disease by reducing oxidative damage plaque burden and specific inflammatory factors Lim *et al* (2001). It has also antioxidant, anticarcinogenic and hypercholesterolemic activities (Asai and Miyazawa, 2001). Like wise, the toxicity studies with curumin in animals indicated no histopathological changes when it was fed to rats, dogs, guinea pigs or monkeys (from 0.5 to 2g/kg bw for 8 – 60 wks) [Bille *et al.* (1985) and Jaruga *et al.*, 1998]. Curcumin is also belongs to curcuminoids. The tetrahydrocurcumin (THC) is an antioxidative substance which is derived from curcumin by hydrogenation and it could be useful as a function food factor (Naito *et al.*, 2002).

This investigation aims to study the effect of coriander and cumin spices and their essential oils with or without turmeric powder on body weight, serum cholesterol level, serum lipid profile, serum glucose, kidney function and liver function enzymes on hypercholesterolemic rats compared with normal rats.

MATERIALS AND METHODS

Materials:-

Spices: coriander fruits cumin fruits and turmeric rhizomes were purchased fromherb stores Giza, Egypt.

Adults male albino rats: were obtained from Food Technology Research Institute, Agricultural Research Center, Giza, Egypt.

Starch used: for feeding experiments was obtained from Maize Products Company, Cairo, Egypt.

Casein and cellulose, minerals: were obtained from Edwic, Co, Egypt.

Cholesterol powder : was obtained from El-Alamoa Company Cairo, Egypt.

Vitamins :were obtained from Roch vitamins and fine chemicals (USA),

Kits: (Total cholesterol, high density lipoprotein, creatinine and lactate dehydrogenase) were obtained from Randox, Laboratories LTD. Diamond Roeal Crumlin. Co. Antrim, United Kingdom, BT 294.

Kits: (Total lipid, triglycerides, uric acid, aspartate transaminase (AST), alanine transaminase (ALT) and were obtained from El-Nasr Pharmaceutical Chemical Co., Abozabal, Egypt.

Sunflower oil: Refined sunflower oil was obtained from Arma Food industry 10th of Ramdan, Egypt.

Methods:-

Preparation of spice powders : The used spices were cleaned and milled to pass through a 50 mesh sieve.

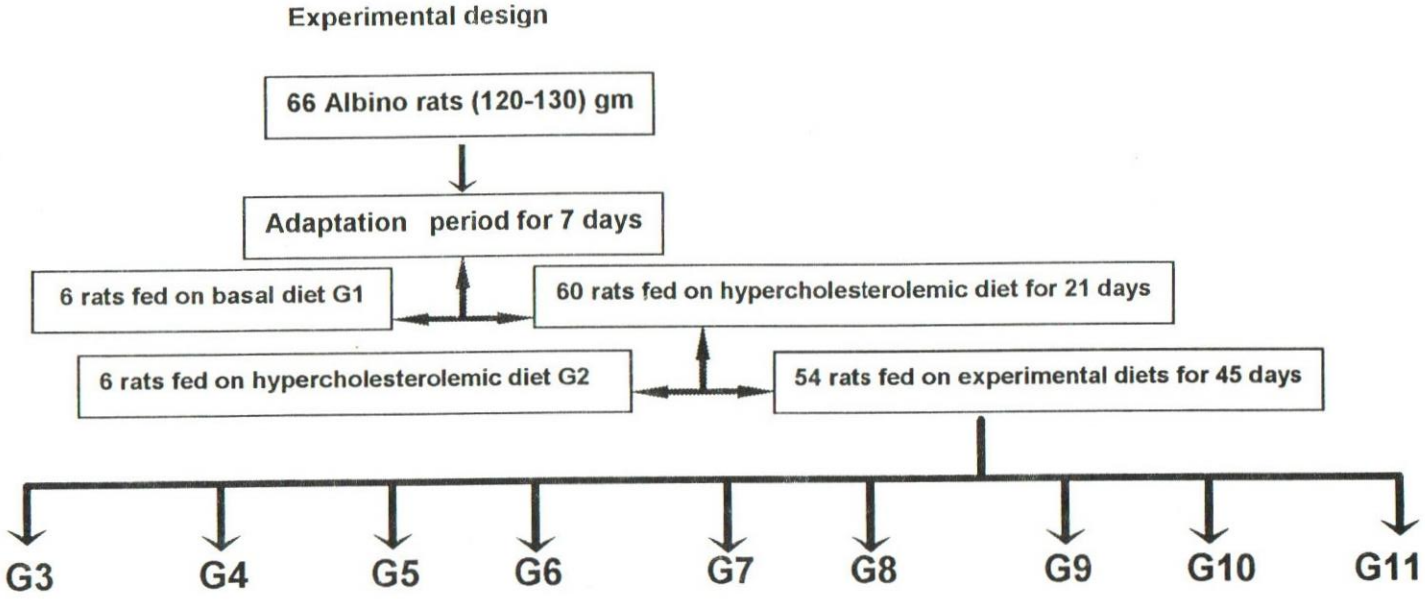
Extraction of essential oil: The essential oil of coriander and cumin were obtained by water distillation according to *Guenther, (1961).*The separated essential oils were dried over anhydrous sodium sulphate, bottled held in 25 glass bottles and kept at -20°C till used.

Experimental animals' design:

A total of 66 male albino rats, *Sprague dewley* with an average weight of 120 – 130 g were housed indivially in well aerated cages with screen bottoms and fed with basal diet as recommended by Tebib *et al.* (1994). While salt mixture and vitamin mixture were formulated as recommended by the American Institute of Nutrition (AIN, 1977). Rats were fed with basal diet one week as adaptation period. Temperature and humidity were maintained as 25°C and 60%, respectively and water were provided *ad libitum*.

Rats were randomly divided into two main groups negative control group (6 rats) which were fed on basal diet while the other sixty rats were fed on a hypercholeseterolemic diet (HCD) (containing 1% cholesterol + 0.2% bile salts)to raise serum cholesterol level after 21 days serum cholesterol of the sixty rats increased to 151 – 156 mg/dl then the rats were randomly divided into 10 groups (6 rats each) as shown in scheme (1). The different groups were fed with diets containing different tested spices and essential oils for 45 days as recommended in Table (1).

Scheme (1)



G1: rats fed on the basil diet for 73days (Negative control)
G2: rats fed on hypercholesterolemic diet for 66 days (positive control)
G3: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 11% coriander fruits for 45 days
G4: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 11% coriander fruits + 0.25% turmeric powder for 45 days
G5: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 5% cumin fruits for 45 days
G6: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 5% coriander fruits + 0.25% turmeric powder for 45 days
G7: rats fed on hypercholesterolemic diet for 21days and then fed with basil diet containing 0.25% turmeric powder for 45 days
G8: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 0.05% coriander essential oil for 45 days
G9: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 0.05% coriander essential oil +0.25% turmeric powder for 45 days
G10: rats fed on hypercholesterolemic diet for 21days and then fed with basil diet containing 0.07% cumin essential oil for 45 days
G11: rats fed on hypercholesterolemic diet for21days and then fed with basil diet containing 0.07% cumin essential oil with 0.25% turmeric powder for 45 days

Table (1): Composition of different tested diets (g/100 g):-

Ingredient of the diet (g/100 g)	Animal Groups										
	G1	G2	Groups of rats fed on hypercholesterolemic diet then with experimental diets								
			G3	G4	G5	G5	G7	G8	G9	G10	G11
Casein*	21.70	21.7	20.07	20.0°	20.76	20.74	21.68	21.7	21.68	21.7	21.68
Corn starch	54.65	44.65	39.00	40.87	41.24	41.20	44.96	44.60	44.91	44.58	44.89
sucrose	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
DL-Methionine	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Cellulose powder	5.00	5.00	3.27	1.54	4.49	4.46	4.48	5.00	4.48	5.00	4.48
Vegetable oil	8.00	2.00	0.01	0.00	1.95	1.7	1.98	2.00	1.98	2.00	1.98
Vitamin mixture	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mineral mixture	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Sheep tail fat	0.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
cholesterol	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bile slate	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fruit with or without turmeric powder 0.25%											
Casein*	0.00	0.00	11.0	11.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn starch	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00
Essential oil with or without turmeric powder 0.25%											
Coriander	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00
Cumin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Turmeric powder .25%	0.00	0.00	0.00	0.25	0.00	0.25	0.25	0.00	0.25	0.00	0.25

***Casein contained 90%protein**

G1: rats fed on the basil diet for 73days

G2: rats fed on hypercholesterolemic diet for 66 days ,

G3: rats fed on hypercholesterolemic diet for 21 days and then fed with basal diet containing 11% coriander fruits for 45 days

G4: rats fed on hypercholesterolemic diet for 21 days and then fed with basal diet containing 11% coriander fruits + 0.25% turmeric powder for 45 days•

G5: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 5% cumin fruits for 45 days

G6: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 5% cumin fruits + 0.25% turmeric powder for 45 days

G7: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 0.25% turmeric powder for 45 day

G8: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 0.05% coriander essential oil for < days

G9: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 0.05% coriander essential oil +0.25% turmeric powder for 45 days

G10: rats fed on hypercholesterolemic diet for 21 days and then fed with basal diet containing 0.07% cumin essential oil for at days

G11: rats fed on hypercholesterolemic diet for 21days and then fed with basal diet containing 0.07% cumin essential oil with 0.25% turmeric powder for 45 days

Body weights were recorded at two weeks intervals. Blood samples were taken at the beginning of the experiment and then every two weeks from retro orbital (Schermer, 1967).

At the end, feed efficiency ratio was calculated according to Chapman *et al.* (1959) as the following:

$$\text{Body weight gain (B.W.G)\%} = \frac{(\text{Final weight} - \text{initial weight}) \times 100}{\text{Initial weight}}$$

$$\text{Food efficiency ratio (F.E.R)} = \frac{\text{Body weight gain (g)}}{\text{Consumed Food (g)}}$$

At the end of the experimental period 45 days rats were sacrificed and the blood was collected in tubes and centrifuged to obtain serum.

Blood biochemistry:-

Serum total cholesterol, high density lipoprotein, triglycerides, total lipids, glucose, kidney function (creatinine and uric acid), liver function enzymes (AST and ALT) and lactate dehydrogenase (LDH) were determined according to the methods of Roeschau *et al.* (1974), Assmann, (1979); Young and Pestaner,(1975); white *et al.* (1970)[a] Tietz, (1986),Bartles etal. (1972), Barham and Trinder (1972) , White *et al.*(1970)[b] White *et al.* (1970)[c] and Rec (1972), respectively. While low density lipoprotein (LDL) was calculating according to the following equation as reported by (Assmann, 1979):-

$$\text{LDL (mg/dl)} = \text{Total cholesterol} - (\text{Triglycerides}/5 + \text{HDL})$$

Statistical analysis:-

The collected data of biological examination were statistically analyzed by the least significant difference (LSD) at the 5% level of probability procedure according to Snedecor and Cochran. (1980).

RESULTS AND DISCUSSION

Effect of feeding with different experimental diets on body weight gain and food efficiency ratio . The effect of dietary coriander , cumin in either powder or essential oil forms with or without turmeric is illustrated in Table (2) Body weight gain (BWG) after feeding period (45 days) was (75.34g) for the negative control group (given basal diet) while it was (63.77g) for the positive control group given hypercholesterolemic diet (HCD) .This result is inline with that obtained by Badee *et al.* (2005) .Meanwhile a decrease in body weight gain for group of rat fed on hypercholesterolemic diet (HCD) was recorder compared with that of negative control group as presented in the same table . Feeding with cumin fruits with or without turmeric led to an increment in BWG (%) where it was 77.94 and 78.25 % resp.,. Also addition of 0.25% turmeric to coriander fruit gave an increment in BWG % (85.81 %) this increment is non significantly different compared to the negative control group (given basal diet) which recorder (75.34%) . while it is significantly different than the positive control group (given H C D) . These results are in line with those obtained by Platel and Srinivasan (2000) who showed that cumin (1.25%) improved BWG by enhancing bile flow rate in rats which probably contribute to the digestive stimulant action Also Wijatgamuwa *et al.* (1998) reported an improvement in body weight of diabetic animals after feeding on 1.25% cumin powder for 8 weeks.

Table (2): Effect of feeding with different experimental diet on body weight gain(BWG)and food efficiency ratio of rats (FER) .

Animal group diet	Feeding period(days)								
	zero	15	30	45	B.W.G	B.W.G %	B.W.G (days)	*FI	**FER
G1	a 125.96 ±7	a 150.66±4.10	ab 180.86±5.08	ab 220.86±3.82	b 94.90 ±1.26	ab 75.34±9.69	abc 1.67±1.44	b 13.2±	A 0.13
G2	a 125.50±7.86	a 145.53±4.5	c 170.53±4.76	e 205.53±20.93	cb 80.03 ±2.51	bcd 63.77±12.23	bcde 1.44±1.44	a 17.7	d 0.08
Spices with or without turmeric powder 0.25%									
G3	a 124.53±7.71	a 149.33±9.00	abc 179±6.00	d 196.83±3.32	d 72.3 ±3.32	d 58.05±9.11	e 1.29±1.29	bd 12.81	c 0.101
G4	a 131.6±8.19	a 156.6±4.53	a 186.53±4.84	a 244.53±4.88	a 112.93 ±3.5	a 85.81±10.36	a 1.911±1.91	a 17.0	b 0.112
G5	a 130± 8.54	a 150.3±5.29	a 185±2.00	ab 231.73±10.35	ab 101.73±2.51	a 78.25±5.38	ab 1.73±1.73	b 14.11	b 0.12
G6	a 129± 6.08	a 154±3.60	a 184±3.60	b 229.55±6.34	ab 100.55 ±4.5	a 77.94±4.63	ab 1.74±174	b 14.01	ab 0.124
G7	a 128± 2.00	a 42.6±26.28	bc 172.6±2.51	bc 220.64±6.00	b 92.64 ±2.56	abc 72.38±6.80	abcd 1.61±1.61	cd 12.5	ab 0.129
Essential oils with or without turmeric powder 0.25%									
G8	a 127.16±4.48	a 152.9±3.60	a 182.9±7.74	d 203±3.00	d 75.84 ±1.25	Cd 59.64±6.30	de 1.32±1.32	bd 12.9	c 0.102
G9	a 125.96±9.57	a 140.58±6.02	ab 180.53±5.46	d 195.51±3.74	dc 69.55 ±3.25	D 55.21±8.78	e 1.23±1.23	cd 11.25	bc 0.109
G10	a 126.46±3.92	a 151.66±10.21	a 181.86±7.68	d 199.96±5.51	d 73.50 ±2.45	d 58.12±0.59	e 1.28±1.28	cd 12.22	c 0.105
G11	a 128.16±2.36	a 154±5.29	a 184.81±5.95	cd 209±3.00	cb 80.84 ±3.32	bcd 63.07±5.31	cde 1.39±1.39	cd 13.75	cd 0.1
L.S.D	11.23	16.56	9.07	13.83	2.78	13.28	0303	1.26	0.056

***FI : Food intake(g) **FER: food efficiency ratio**

Small letters refer to compared within each treatment at with each time (column).

SD: standard deviation. Each value represents the mean of 6 rats at 0.05%

Meanwhile, feeding with either coriander or cumin essential oils gave significant decrement in BWG % compared to that of negative control group, while addition of turmeric to cumin essential oil enhanced BWG. Taip (2004) observed a significant increment in BWG of rats fed with biscuits containing 1.5 and 3% cumin essential oil.

Regarding food intake, data presented in Table (2) showed that rats fed (HCD) recorded the highest food intake (g) compared to all other groups of rats (17.7g / day) followed by the group of rats given coriander fruit with turmeric powder (17g / day) while other groups of rats including negative control group recorded lower food intake with significant differences compared to the positive control group. Concerning food effectively ratio (FER), it could be noticed that no significantly difference was recorded for group of rats given cumin fruit with or without turmeric as well as turmeric powder alone compared to that of negative control group . Moreover, the other experimental diets had lower FER values .

Serum total cholesterol (STC): Data presented in Table (3) indicated that, STC for rats given basal diet was constant during experimental period (45 days), while feeding with positive control (HCD) led to an increment in STC from 154.00 mg / dl at the beginning of he experiment to 168.50 mg/dl after 45 days and this increment was significantly different compared with that of negative control group (rats given basal diet) . These result are agree with that obtained by Mahfouz and Kummerow (2000). Concerning supplementation with coriander fruits (11%) with or without turmeric powder (0.25 %), it exhibited significant decrement in STC during experimental period, where it was 80.3 and 82.3 mg/dl resp., compared with that group of negative control (84.5 mg/dl).The same results were observed for groups of rats given cumin fruit(5%) with or without turmeric powder . Also feeding hypercholesterolemic rats with turmeric powder only led to significant decrement in (STC) compared to rats given (HCD) .Furthermore, there is no significant differences in (STC) between these groups and group of rats given basal diet. Concerning (HDL-C) data in Table (4) showed that there was significant decrease in (HDL -C) of rats fed with (HCD) from 45.3 at the beginning of the experiment to 35.3 mg/dl after 45 days. This decrement was also significant compared with that of rats fed with basal diet where (HDL-C)which reached 54. 2 mg/dl at the end of the experiment .Also an increment in (HDL-C) of group of rats fed with cumin and coriander fruits or essential oils with of without turmeric was recorded. These increments in (HDL-C) were significantly different compared with that of rats given (HCD) as shown in Table (4). On The contrary (LDL-C) level reached the highest value for the rats fed with (HCD) , where it was 85.85 mg /dl at the beginning of experiment while it reached 107 mg /dl at the end of the experiment , this results are in the same line with that obtained by Mahley and Holcombe (1977), who observed an increase in (LDL-C) and decrease in HDL- C by the same treatment .

Table (3): Effect of feeding with coriander, cumin fruits or their essential oils with or without turmeric powder (0.25%) on serum total cholesterol level (mg/dl) in hypercholesterolemic rats during feeding periods.

Animal groups diet	Feeding periods (days)				
	Zero	15	30	45	L.S.D
G_1	Ac 86.90±2.67	Ah 83.50±3.50	Ae 84.70±1.47	Ae 84.50±11.62	11.80
G_2	Bab 154.00±4.58	Ba 156.66±4.16	ABa 160.5±2.50	Aa 168.5±5.26	8.00
Spices with or without turmeric powder 0.25%					
G_3	Aab 153.00±2.64	Bfg 107.13±2.50	Bcd 96.37±11.62	Ce 82.3±3.01	11.81
G_4	Aa 156.00±3.00	Bg 102.87±1.80	Cde 92.12±5.36	De 80.3±7.92	9.23
G_5	Aab 153.33±1.52	Bc 123.00±2.00	Cb 116.23±1.66	Db 105.54±10.62	10.39
G_6	Aab 151.30±2.85	Bde 114.53±2.83	Ccd 96.32±5.49	Dde 86.11±3.83	7.36
G_7	Aab 151.99±2.63	Bc 125.10±5.15	Cc 103.126±6.00	Dcde 90.25±10.18	12.47
Essential oils with or without turmeric powder 0.25%					
G_8	Aab 154.00±3.46	Beg 110.65±6.08	Ccd 98.19±5.90	Dde 87.44±3.85	9.35
G_9	Ab 151.10±1.01	Bf 106.89±2.00	Ccd 97.01±6.57	De 84.19±6.71	9.09
G_{10}	Aab 152.00±2.00	Bb 131.56±3.53	Cb 113.75±2.69	Dbc 101.38±6.67	7.78
G_{11}	Aab 153.00±2.64	Bde 116.65±1.52	Cc 102.17±1.16	Cbcd 98.89±9. 89	10.51
L.S.D	4.73	5.90	9.47	13.12	

Capital letters refer to the compared within each treatment (row)
Small letters refer to compare within each treatment at each time (column).
SD: standard deviation.
Each value represents the mean of 6 rats at 0.05%

Moreover, Steinberg (1983) and Goldstein and Brown (1987) reported that (LDC-C) was a redisposing factor for atherosclerosis and cardiovascular disease, while (HDL-C) exerts protective effect. Elsewhere, group of rats given fruits of cumin and coriander or their essential oils exhibited, significant decrement in (LDL-C) compared to rats fed with (HCD). These results are in line with that obtained by Chithra and Leelemma (1997) who noticed that, the levels(LDL), and (VLDL-C) cholesterol was decreased ,while (HDL) cholesterol was increased in rats received coriander seed, This effect may be due to the increase in beta- hydroxyl and beta methyl glutaryCoA reductase and cholesterolacyl transferase activity, this activity my be enhanced hepatic bile acid synthesis. Ramirez – tortosa *et al.* (1999) emphasized that, an ethanol aqueous extract from turmeric protected (LDL) from lipid oxidation and this could be useful in the management of cardiovascular disease in which a atherosclerosis is important. Also Almeida *et al.* (2003) observed that, etheric extract from coriander had superior antioxdative activity in both liver and plasma.

Table (4): Effect of feeding with different experimental diets on serum high density lipoprotein and low density lipoprotein of rats during 45 days .

Animal groups diet	High density lipoprotein(mg/dl) Feeding periods (days)					Low density lipoprotein(mg/dl) Feeding periods (days)				
	Zero	15	30	45	L.S.D	Zero	15	30	45	L.S.D
G_1	Aa 56.33±2.02	Aa 57.1±3.09	Aa 55±0.70	Aa 54.2±4.15	5.27	Ab 23.25±2.94	Ae 21.646±2.2	Af 24.48±1.50	Bg 20.24±3.5	5.03
G_2	Ab 45.3±6.80	Acd 46.2±2.70	ABe 41.01±2.98	Bc 35.3±4.20	7.72	Ba 85.854±5.2	Ba 86.40±5.16	Ba 94.152±5.2	Aa 107.1±5.6	9.86
Spices with or without turmeric powder 0.25%										
G_3	Ab 46.8 ± 1.58	Abc 49.6 ± 4.92	Aed 47.1 ± 3.15	Aab 49.56 ± 4.86	7.33	Aa 85±4.58	Bcd 49.775±4.2	Bcde 43.04±2.77	Cfg 24.50±4.76	7.86
G_4	Bbc 45.4 ± 1.44	Bef 40.6 ± 4.27	Bde 42.8 ± 2.70	Aa 52.9 ± 2.15	5.35	Aa 88±3.60	Bcd 53.46±4.10	Ccd 43.56±3.09	Df 21.10±3.58	6.7
G_5	Ab 46.5 ± 1.32	Bef 40.81±1.05	Ce 38 ±2.00	Ab 40.1±1.07	2.66	Aa 83.8 ±4.01	Bb 70.51±5.07	Bb 67.39±5.71	Cb 52.37±3.19	8.66
G_6	45.44 ±2.68[Abc]	Ab 51.3±2.46	Abc 48.46 ± 6.075	Aab 50.7 ± 5.07	8.20	Aa 83.66±2.08	Bd 45.56±6.49	Cde 35.61±4.88	Defg 25.93±3.40	8.52
G_7	44.23 ±3.22[Abc]	Abc 49 ± 3.60	Acd 46.24 ± 3.06	Aab 49.53 ± 2.15	5.76	Aa 83.25±3.09	Bb 69.55±3.94	Cc 49.32±5.12	Dde 32.67±3.22	7.39
Essential oils with or without turmeric powder 0.25%										
G_8	Cbc 43.1±2.12	Bbcd 47.6±1.21	Aab 52.3±2.46	Aa 48.56±2.88	4.25	Aa 88.3 ±3.51	Bcd 49.88±8.75	BCde 38.89±5.10	Cde 28.12±7.9	12.59
G_9	Cc 41.5±2.78	Bbcd 48.39±1.213	Bbcd 46±2.351	Aa 51.25±3.907	5.15	Aa 86.00 ±4.00	Bcd 48.24±4.21	Ce 35.23±5.01	Df 23.91±3.4	7.43
G_{10}	Abc 44.1±1.85	Bf 35.8±2.65	Be 39.3±1.57	Ab 46.6±1.4421	3.64	Aa 85.6±8.19	Aa 84.43±3.09	Bb 59.74±4.26	Cc 43.75±3.5	10.34
G_{11}	Bc 41.00±2.00	Bce 43.4±2.62	Abc 48.166±1.45	Aab 49.26±2.40	4.07	Aa 89.4±9.22	BDc 55.73±4.98	Cde 37.55±7.19	Ccd 37.38±6.0	12.26
L.S.D	4.95	5.01	4.92	5.43		8.550963	8.526	8.281	7.831	

Capital letters refer to the compared with in each treatment (row).
Small letters refer to the compared with in each treatment compared with each time (column) .
SD: stander deviation and each value represent the mean of 6 rats at 0.05%

Serum total lipid and triglycerides: The serum triglycerides (STG) level of rats given different experimental diets under investigation are shown in Table (5) The data showed a significant increment in serum total lipid (STL) for group of rats fed with (HCD) compared with that fed with basal diet. Also an increment in (STG) level in all groups of rats given different experimental diets while this increment was not significant for groups of rats given coriander essential oils alone or with turmeric powder, where (STG) level recorded 23.83 and 28.5 mg /dl resp., comparing with control group given basal diet 20.3 mg /dl. Also Babu and Srinivasam (1997) observed a significant decrease in blood TG in rats given 0.5% curcumin for 8 weeks. As general, the bygone results upholded the results of Platel and Srinivasam (2000) who ascertained that both cumin (1.25%) and coriander (2%) could stimulate bile acid production by the liver and secretion in to bile acid rate in fat digestion and absorption. The serum total lipid (STL) values of rats, fed with different experimental diets are presented in table (5). The data showed the significant increase in (STL) in positive control group (given HCD) as compared with negative control group (given dasal diet). Also a significant decrease was appeared in (STL) for groups of rats fed in different experimental diets compared with that of positive control group .Dhandapani *et al.* (2002) studied the role of cumin supplementation, on plasma tissue lipids in diabetic rats (0.25 mg/kg body weight) for 6 weeks, they stated that the hypolipidemic effect of cumin could be explained as a result of direct reduction in blood glucose concentration because of antioxidant properties of cumin. It could be also mentioned that, the highest decrement in (STL) was in group fed with coriander essential oil and fruit with of without turmeric powder. on the other hand significant difference was found in group given turmeric powder alone (STL) during experimental period (45 days). The obtained results are in agreement with those obtained by Stark and Madar (1993), Hassanin and Hassan(1997),Taip (2004), and Badee *et al* . (2005).

Liver function enzymes: Effect of feeding on cumin and coriander powder or essential oils with or without turmeric depicted in Table (6). Both serum AST and ALT levels were approximately stable for group of rats fed with basal diet during experimental period. There was a progressive increment for rats given (HCD) Meanwhile giving rats cumin or coriander in both spices or essential oils forms with or without turmeric exhibited diminishing in serum AST after 15 days (The decrements were significantly different). the decrements were gradually for serum along the experimental period. It is well known that the increment in both ALT and AST levels is related to hepatic disease as reported by Klauning (1992). Regarding serum lactic dehydrogenase (SLDH), results presented in Table (7) showed that, the level of (SLDH) was decreased in all groups given experimental diets during 45 days compared with positive control. The highest decreases were found in groups given coriander essential oil (0.05%), cumin fruit 5% and coriander fruit (85.90, 94.61, and 96.62 I.U/l) resp., compared with the positive control (208.44 I.U/l) .It could be observed that the groups given cumin or coriander fruit had lower values than groups given cumin or coriander fruit with turmeric powder.As general,all groups given experimental diet had decrement in (SLDH) during feeding period (45 day). These results are in agreement with Gagandeep *et al* .(2003).

Table (5): Effect of feeding with different experimental diets on serum tri glycosides level (mg/dl) and total lipid level (mg/L)of rats during 45 days .

Animal groups diet	Tri glycosides level (mg/dl) Feeding periods (days)					Total lipid level (mg/L) Feeding periods (days)				
	Zero	15	30	45	L.S.D	Zero	15	30	45	L.S.D
G_1	Ab 36.6±6.37	Bh 23.27±3.41	Be 26.1±6.36	Bi 20.3±4.96	8.94	Ab 221.53 ±3.65	Af 224.06 ±11.42	Af 223.53±3.23	Ac 222.33 ±6.80	13.33
G_2	Ca 114.2±6.28	BCa 120.3±5.45	ABa 126.7±3.27	Aa 130.5±3.96	9.18	Aa 411.5 ±19.21	ABa 426.66±10.40	Aa 439.5 ±3.67	Aa 445.63 ±12.04	21.10
Spices with or without turmeric powder 0.25%										
G_3	Aa 111±5.291	Bfg 38.8±3.70	Cde 31.13±3.55	Bde 43.65±4.99	7.93	Aa 400.1±12.11	Be 251.3 ±4.51	Cef 219.7 ±5.51	Dde 202.3 ± 4.43	13.87
G_4	Aa 113±4.58	Bef 44.03±2.66	Ce 27.13±4.96	Cfgh 31.5±5.76	8.72	Aa 405.9 ±9.53	Be 243.2 ±4.53	Cf 210.3 ±5.02	De 198.33 ±11.71	15.35
G_5	Aa 113.5±4.27	Bcd 60.05.39±5.65	Bc 54.23±7.99	Cefg 37±4.58	10.94	Aa 400.1 ±13.82	Bbc 296.1 ±6.53	Cc 278.4 ±7.28	Db 243 ±3.60	16.30
G_6	Aa 112±9.16	Bb 88.36±8.05	Cc 61.90±8.14	Ccd 47.42±6.04	14.93	Aa 395.9 ±5.24	Bb 302.9 ±8.35	Cd 243.8 ±3.53	Dcd 212.1 ±5.00	10.92
G_7	Aa 112.6±3.143	Bg 32.75±5.95	Bd 37.76±2.54	Bdef 40.116±9.08	10.86	Aa 393.5 ±12.85	Bcd 279.6 ±22.21	Cd 239.5 ±8.26	Db 238.1 ± 8.02	26.48
Essential oils with or without turmeric powder 0.25%										
G_8	Aa 113±3.00	Cc 65.85±5.54	Bb 82.23±5.19	Dhi 23.83±2.27	7.96	Aa 402 ± 18.35	Bd 276.7 ±9.31	Ce 226.7 ±4.18	Dcd 210.5 ±5.29	20.00
G_9	Aa 112.5±3.50	Bde 51.23±6.24	Bc 60.91±7.69	Cghi 28.5±4.92	11.99	Aa 393.6 ±5.71	Be 257.8 ±7.51	Cd 245.1 ±7.5	De 193.2 ±4.2	12.03
G_{10}	Aa 111.5±2.17	Cd 56.61±5.72	Bb 73.5±3.96	Cbc 55. ±9.16	11.03	Aa 396.6 ±22.17	Bb 310.8 ±5.18	Bb 295.3 ±5.02	Cb 249.2 ±6.23	22.72
G_{11}	Aa 112±2.64	Bb 87.59±4.39	Cb 72.25±7.50	Db 61.23±3.28	9.09	Aa 398.9 ±7.37	Bb 307 ±9.84	Cc 276.1 ±5.91	Db 248.9 ±9.69	15.76
L.S.D	8.016	9.08	10.34	9.71		22.39	17.14	9.96	11.71	

Capital letters refer to the compared with in each treatment (row).
Small letters refer to the compared with in each treatment compared with each time (column) .
SD: stander deviation and each value represent the mean of 6 rats at 0.05%

Table (6): Effect of feeding with different experimental diets on serum alanine transaminase (ALT) level (IU/L)and aspartate transaminase level (AST) (IU/L) of rats during for 45 days .

Animal groups diet	Alanine transaminase (ALT) (IU/L) Feeding periods (days)					Aspartate transaminase (AST) (IU/L) Feeding periods (days)				
	Zero	15	30	45	L.S.D	Zero	15	30	45	L.S.D
G_1	Ab 19.53 ±1.61	Ae 18.55 ± 1.85	Ae 19 .20 ± 3.70	Af 18.93 ± 2.051	4.60	Aa 36.76±2.41	Ae 35.26±0.75	Ah 37.43±2.90	Ah 35.43±1.00	3.74
G_2	Ba 36.33 ±2.51	ABa 39.00 ± 3.27	ABa 40 .33 ± 1.52	Aa 42.33 ± 2.51	4.77	Aa 87.89±6.81	Aa 90.73±6.31	Aa 91.55±7.35	Aa 93.88±5.02	12 11
Spices with or without turmeric powder 0.25%										
G_3	Aa 33.00 ± 3.00	Abcd 32.63 ± 4.12	Abc 30.66 ± 3.35	Bdef 22.16 ± 3.56	6.88	Aa 87.98 ±3.64	Bc 59.66±3.05	Cfg 45.94 ±2.90	Dfgh 39.85±3.01	5.96
G_4	Aa 33.16 ± 3.01	ABd 28.54 ± 1.35	ABbcd 27.00 ± 5.50	Bcde 25.00 ± 2.00	6.33	Aa 88.06±9.81	Bc 58.83±4.31	BCdefg 49.66 ±6.50	Cdef 43.46±2.83	12.10
G_5	Aa 36 .00±2.64	Aab 37.00 ± 1.70	Bbcd 28.33 ± 2.08	Bcd 25.60 ± 2.16	4.09	Aa 87.46 ±7.76	Bc 64.93±4.65	Bcd 56 ±4.00	Cefg 41.18±5.06	10.47
G_6	Aa 34 .06 ±2.09	ABcd 31.6 ± 2.51	ABbc 30.66 ± 4.93	Bbc 28.00 ± 2.00	5.88	Aa 88.413±6.50	Bc 63.33±4.50	BCcd 58.18 ±2.02	Cc 53.35±3.25	8.28
G_7	Aa 35.66 ± 3.05	Aabc 36.5 ± 2.88	Bbcd 27.20 ± 1.70	Bdef 21.8 3 ± 3.78	5.56	Aa 88.53±2.57	Bd 51.53±3.55	Cgh 43.26 ±2.61	Dfh 37.5 ±2.50	5.35
Essential oils with or without turmeric powder 0.25%										
G_8	Aa 34.33 ±3.78	Abcd 33.00 ± 3.78	Bcd 26.16 ± 2.75	Bdef 22.33 ± 2.51	6.04	Aa 88.79±9.99	Bc 63 ±2.78	Cefg 47.71 ±2.22	Cdef 43.08±2.76	10.32
G_9	Aa 35 .00 ±3.60	Aabc 34.66 ± 4.16	Ab 32.7 0 ± 2.15	Ab 30.50 ± 2.95	6.22	Aa 88.126±4.11	Bb 77.35±4.65	Bb 75.60 ±3.62	Cb 67.27±1.85	6.99
G_{10}	ABa 33.00 ±3.01	Abcd 33.83 ± 4.01	ABbc 30.21 ± 2.70	Bbc 27.50 ± 2.78	5.97	Aa 87.90±6.33	Bb 71.83±2.87	Cdef 50.83 ±1.17	Cde 45.67±3.19	7.29
G_{11}	A a 35.33 ±1.52	Abcd 32.66 ± 2.51	Bde 23.23 ± 3.30	Bef 20.66 ± 4.04	5.64	Aa 88.12±6.01	Bc 59.8 ±3.37	BCcde 53.46 ±3.55	Cd 47.79±2.34	7.63
L.S.D	4.73	5.27	5.58	4.82		11.00	6.69	6.70	5.41	

Capital letters refer to the compared with in each treatment (row).
Small letters refer to the compared with in each treatment compared with each time (column) .
SD: stander deviation and each value represent the mean of 6 rats at 0.05%

Table (7): Effect of feeding with coriander and cumin essential oil and fruit with or without turmeric powder (0.25%) on serum lactic dehydrogenase (L. D. H) (I.U. /l) in hypercholesterolemic rats during feeding periods

Animal groups diet	Feeding periods (days)				
	Zero	15	30	45	L.S.D
G_1	Bb 81.193±1.70	Ae 95.511 ±2.16	Af 91.17 ±6.50	Ae 94.996 ±3.37	7.37
G_2	Ca 93.513±9.11	Ba 179.416 ±5.57	Aa 196.473±11.043	Aa 208.449 ±8.79	16.53
Spices with or without turmeric powder 0.25%					
G_3	Ca 92.726±6.47	Ad 118.416 ±2.23	ABe 108.060±12.146	BCe 96.623 ±2.02	13.26
G_4	Dab 90.393±8.02	Aa 176.166 ±3.02	Bb 159.873 ±6.118	Cb 144.510 ±3.83	10.554
G_5	Ca 93.79 ±4.53	Ac 137.266 ±5.72	Bd 124.153 ±3.037	Ce 94.613 ± 3.87	8.29
G_6	Ca 94.393±4.63	Ab 161.6867±3.47	Abc 154.543 ±5.70	Bc 128.533±15.73	16.67
G_7	Cab 91.250±8.63	Ab 151.242 ±8.00	ABc 141.413±14.89	Bc 129.196±10.44	20.39
Essential oils with or without turmeric powder 0.25%					
G_8	B Ca 92.903±5.84	Ae 103.523 ±3.25	ABef 96.595 ±3.87	Ce 85.901 ±5.30	8.82
G_9	Dab 90.23 ±5.34	Ac 140.716 ±3.74	Bd 127.766 ±2.49	Cd 115.116 ±9.19	10.87
G_{10}	Cab 90.393±4.98	Ac 132.753 ±8.85	Ad 126.146 ±4.54	Bd 111.2434±4.33	11.24
G_1	Ca 92.790±5.01	Ab 159.243±11.26	Abc 147.963 ±6.25	Bd 114.366 ±6.55	14.40
L.S.D	10.48465	10.06826	13.4045	13.00062	

Capital letters refer to the compared within each treatment (row)
Small letters refer to compare within each treatment at each time (column).
SD: standard deviation. Each value represents the mean of 6 rats at 0.05%

Kidney function: Data presented in Table (8) indicated a progressive increment in serum creatinine level (SCR) in groups of rats fed with (HCD), while gradual decrement was recorded for groups of rats given different experimental diet especially, groups giving cumin and coriander spices .The same results were observed in Table (8) for serum uric acid (SUA) level. It is known that plasma urea is produced from amino acid breakdown in the liver where it is derived from either protein diet or endogenas catabolism. These results are in agreement with those obtained by willatgamuwa *et al.* (1998) who observed a decrement in creatinine and urea secretion by rats as a result of feeding on cumin 1.25% . Also Taip (2004) revealed the same results. Ganesh *et al.* (1984) , in the same mannea assigned this result to curcumine.

Serum glucose : After feeding on either cumin ,coriander spices or their essential oils with or without turmeric powder, serum glucose was decreased by comparison between groups of rats given cumin and coriander fruits 5 % and 11% resp.,) .Where the serum glucose recorded 112.66 and 119.71 mg/dl resp., in group of rats given (HCD) 176.20 mg/dl. It could be noticed that addition of cumin and coriander essential oil to the diets at levels of 0.07%and 0.05% resp., also resulted in decreasing in serum glucose . with turmeric powder(0.25 %) as shown in the same Table (9).

Table (8): Effect of feeding with different experimental diets on serum creatinine level (mg/dl) and serum uric acid level (mg/dl) level of rats during for 45 days .

Animal groups diet	Creatinine level (mg/dl) Feeding periods (days)					Uric acid level (mg/dl) Feeding periods (days)				
	Zero	15	30	45	L.S.D	Zero	15	30	45	L.S.D
G_1	Ab 0.45±0.0010	Ae 0.47±0.002	Af 0.48±0.004	Af 0.47±0.0043	0.00643	Ab 3.56±0.47	Ag 3.39 ± 0.60	Af 3.48±0.43	Af 3.23±0.76	1.104
G_2	Aa 0.87±0.1086	Aa 0.85±0.0085	Aa 0.89±0.0085	Aa 0.91±0.0080	0.1706	Aa 7.60±0.60	Aa 7.678±0.89	Aa 7.84±0.84	Aa 8.03±0.86	1.30
Spices with or without turmeric powder 0.25%										
G_3	Ab 0.45±0.0010	Ae 0.47±0.0022	Af 0.48±0.004	Af 0.47±0.0043	0.0064	Aa 7.30±0.87	Befg 4.52 ± 0.69	Bdef 4.37±0.57	Bdef 3.90±0.60	1.31
G_4	Aa 0.87±0.1086	Aa 0.85±0.0085	Aa 0.89±0.0085	Aa 0.91±0.0080	0.1706	Aa 7.49±1.63	Bfg 4.15±1.48	Bef 3.97±0.29	Bef 3.61±0.35	2.12
G_5	Ab 0.45±0.0010	Ae 0.47±0.0022	Af 0.48±0.004	Af 0.47±0.0043	0.0064	Aa 7.44±0.68	Bdef 4.82±0.32	Bcde 4.69±1.05	Bcde 4.02±0.38	1.27
G_6	Aa 0.87±0.1086	Aa 0.85±0.0085	Aa 0.89±0.0085	Aa 0.91±0.0080	0.1706	Aa 7.53±0.49	Aabc 6.58±0.32	Bcde 4.84±0.26	Bcde 4.17±0.86	1.01
G_7	Ab 0.45±0.0010	Ae 0.47±0.0022	Af 0.48±0.004	Af 0.47±0.0043	0.0064	Aa 7.30±0.87	Befg 4.52 ± 0.69	Bdef 4.37±0.57	Bdef 3.90±0.60	1.31
Essential oils with or without turmeric powder 0.25%										
G_8	Aa 0.82±0.0062	Bc 0.61±0.0047	Bbc 0.67±0.0051	Bb 0.65±0.0055	0.1022	Aa 7.46±1.15	Aab 6.99±0.73	ABb 6.39±0.45	Bb 5.16±0.73	1.35
G_9	Aa 0.85±0.0070	Bcd 0.57±0.0025	Bbcd 0.65±0.0055	Bbc 0.63±0.0056	0.1023	Aa 7.38±0.99	Bbcd 5.84±0.31	Bbcd 5.35±0.71	Cbcd 4.16±0.001	1.18
G_{10}	Aa 0.82±0.212	Bcd 0.57±.0032	Bcdef 0.58±0.0058	Bcde 0.56±0.030	0.2115	Aa 7.71±1.47	Bcde 5.49±1.22	Bcde 4.76±0.53	Bcde 4.38±1.18	2.17
G_{11}	Aa 0.80±0.195	Bde 0.52±0.0026	Bef 0.55±0.0056	Bef 0.53±0.0055	0.1944	Aa 7.12±0.75	ABabc 6.42 ±.001	Bbc 5.56±0.61	Cbc 4.21±0.20	0.93
L.S.D	0.182	0.00716	0.00952	0.00823		Aa 7.63±1.34	Bdef 4.75±0.67	Bef 4.23±0.85	Bef 3.78±0.43	1.67

Capital letters refer to the compared within each treatment (row)
Small letters refer to compare within each treatment at each time (column).
SD: standard deviation.
Each value represents the mean of 6 rats at 0.05%

Table (9): Effect of feeding with of coriander and cumin essential oil and fruit with or without turmeric powder (0.25%) on serum glucose (mg/dl) in hypercholesterolemic rats during feeding periods.

Animal groups diet	Feeding period (days)				
	Zero	15	30	45	L.S.D
G_1	Af 91.59±2.41	Ag 89.5±0.75	Ah 90.39±2.90	Ai 89.97±1.00	5.80
G_2	Dbcd 144.43±6.81	Ca 163.56±6.31	Ba 169.6±7.35	Aa 176.2±5.02	5.61
Spices with or without turmeric powder 0.25%					
G_3	Ae 137.6±3.64	Bf 123.46±3.05	Be 125.83±2.90	Bef 119.71±3.01	6.98
G_4	Aa 149.43±9.81	Ac 146.26±4.31	Ac 143.17±6.50	Bbc 135.6±2.83	8.06
G_5	Acde 141.93±7.76	Bf 119.66±4.65	Ad 136.53±4.00	B h 112.66±5.06	7.16
G_6	Aabc 145.76±6.50	Acd 142.63±4.50	Bd 136±2.05	Ccd 130.6±3.25	4.53
G_7	Bab 148.43±2.57	Ab 154.56±3.55	ABb 151.66±2.61	Cb 141.02±2.50	5.90
Essential oils with or without turmeric powder 0.25%					
G_8	Ade 138.4±9.99	Bf 123.3±2.78	Bf 117.73±2.22	B fg 119.2±2.76	5.74
G_9	Acde 141.23±4.11	Bf 119.33±4.65	Cg 112.12±3.65	BC gh 115.66±1.85	6.6
G_{10}	Acde 142.63±6.33	Ae 135.46±2.87	Ce 127.63±1.17	C ef 123.9±3.19	5.89
G_{11}	Abcd 143.4±6.01	Ade 139.84±3.37	B e 127.13±3.55	B de 125.1±2.34	5.91
L.S.D	5.75	6.06	4.93	5.74	

Capital letters refer to the compared within each treatment (row)
Small letters refer to compare within each treatment at each time (column).
SD: standard deviation. Each value represents the mean of 6 rats at 0.05%

These results agree with that obtained by Chithra and Leelemma (1999), Srinivasan (2005) and Taip(2004) . Many investigation have been discussed the link between diabetes and oxidative stress which has been extensively discussed for years Dandona *et al.* (1996) demonstrated that the production of relative oxygen species and lipidperoxidation were increased in diabetic patients, suggesting that oxidative stress is responsible for the pathophysilpgy of diabetes other possible oxidative source includes elevated plasma lipid levels leading to increased lipid oxidation and reduced levels of the antioxidant defense systems. [Oberley (1988). Laigt *et al.* (2002) and West (2000)]. These results also were agreement in with Ali (2003) who found that some essential oils such as dill, basil ,celery and cumin decreased serum glucose level. Also, EL- Malky *et al.* (2003) found that antioxidant such as phenolic and flavonoids decreased glucose and lipid profile as well as they histopathological effect in liver tissues of rats fed on hypolipidemic on diets .In general, feeding coriander or cumin fruits or their essential oils with or without turmeric powder is useful than feeding with turmeric powder

alone. The results are in agreement with Farag *et al.* (1991) ,Chithra and Leelemma (1999), Taip (2004), Badee (2005) and Srinivasan (2005).

From the above mentioned and discussed results, it is interested to note that both coriander and cumin in either spice or essential oil forms with turmeric have a potent hypocholesterolemic effect on rats. therefore, they could be used in food products as seasoning besides their biological activity

REFERENCES

AIN.(1977) . American Institute of Nutrition Recommended Dietary allowances , Rev. Ed., 6, Washington, D. C.

Ali, S. H. M. (2003). Biochemical studies on some Egyptian Plants. M.SC. Thesis, Fac. of Agric ., Biochem., Dep., Cairo.Univ, Egypt.

Almeida, E. de. ; F. Martins-Bion ; J.Mancini-Filho and N . Barbosa-Guerra (2003) In *vivo* antioxidant effect of aqueous and etheric coriander (*Coriandrum sativum L.*) extracts .European-Journal-of-Lipid Sci. and Tech. ,105 (9): 483-487

Asai,A.; and T. Miyazawa (2001). Dietary curcuminoids prevent high-fat diet-induced lipid accumulation in rat liver and epididymal adipose tissue. J -Nutr., 131(11): 2932-5 .

Assmann, G. (1979). Determination of high density lipoprotein enzymatic colorimetric method internist 20: 559.

Babu, P. S.; and K. Srinivasan (1997). Hypolipidemic action of curcumin, the active principle of turmeric (Curcuma longa) in streptozotocin induced diabetic rats. Mol-Cell-Biochem., 166(1-2): 169-75 .

Badee, A. Z. M.; A. T. M. El Akel; S. A Hafez; K. A. Ahmed, and N. H. M. Hassanen, (2005). Biochemical and histopathological effects of cinnamon. Clove and Ginger. 3rd International Conference for Food Science and Technology. 125 – 144.

Barham, D. and P. Trinder(1972) . Enzymatic determination of serum uric acid analyst, 97; 142.

Bartles ,H.; M. Bohmer and C. Heirli (1972) . Creatinine standard and measurement of serum creatinine with picric acid . Clin . Chem., Aceta., 37:193

Bille, N. ; J.Larsen ; E.V. Hansen and G. wurtzen (1985) . Subchronic oral toxicity of turmeric oleoresin in pigs . Food. Chem. Toxicol. 23,967-973.

Chapman, D. G.; R. Castilla and J. A. Cambell (1959). Evaluation of Protein in foods I a method for the determination of protein efficiency ratio. Conh. Bioch. Phys. 37: 679 - 689.

Chithra, V. and S. Leelamma (1997). Hypolipidemic effect of coriander seeds (Coriandrum sativum): mechanism of action. Plant-Foods-Hum-Nutr.; 51(2): 167-72 .

Chithra, V. and S. Leelamma, (1999). Cariandrum sativum mechanism of hypoglycemic action. Food Chem.,87:299 – 231.

Chithra, V. and S. Leelamma, (2000). *Coriandrum sativum*, effect on lipid metabolism 1, 2-dimethyl hydrazine induced colon cancer. J. of Ethnopharmacology 71: 457 – 463.

Chopra, R. N.; I. C Chopra ; K. L. Handa and L. D. Kapur, (1958) Chopra's indigenous Drugs India. 2nd Edn. Calcuta. Dhur and Sons,.India.

Dandona, P.; K.Thusu; S. Cook; B. Snyder; J. Makowski; D. Armstong and T. Nicotera (1996) . Oxidative damage to DNA in dibetes . Diabetes , 48; 1-9

Dhandapani, S.; V.R. Subramanian; S. Rajagopal and N. Namasivayam (2002). Hypolipidemic effect of Cuminum cyminum L. on alloxan-induced diabetic rats .Pharmacol .Res.; 46(3): 251-5.

EL- Malky ,W.A.; L.F. wahmanad and H. A. Gouda (2003). Biochemical and histophatholagical studies on the infusion and decoction green and black tea as antioxidants source . proc. The 1st international Conf ." food for better health" NRC, 8-20 october, Cairo Egypt 149-155 .

Farag, R.S.; S.R. Abu Raiia ; N. M. Abdelmoein (1991). the essential oils of coriander , Common Dill and better fennel and their on diabetic rats . Bull. Fac. of Agric., Cairo,. 43,1:31-44

Farrell, K .T. (1985) .Spices, condiments, and seasonings second edition An AVI book , New York.

Gagandeep; S. Dhanalakshmi; E. Mendiz; A.R. Rao; and R.K.Kale (2003). Chemopreventive effects of *cuminum cyminum* in Chemically Induced Forestomach andUterin cervix tumors in murine Model systems Nutr.Cancer., 47(2): 171-80.

Ganesh, B. B.; M. R. Srinivasan, and N. Chandrasekhara (1984). Influence of curcumin and capsaicin on the composition and secretion of bile in rats. J. Food Sci. Technol., 21: 225 – 227.

Goldstein, J. L. and M. S. Brown (1987). The low density lipoprotein pathway and its relation to atherosclerosis. Ann. Rev. Biochem. ,46: 897 – 930.

Gray, A. M. and P. R. Flatt (1999). Insulin relasing and insulin like activity of the traditional antidiabetic plant *Coriandrum sativum* (coriander). British J of Nutr. 81: 203 – 209.

Grundy, M. S. (1986). Cholesterol and coronary heart disease. A new era JAMA, 256: 2849 – 2858.

Guenther, E.S.(1961) ."The essential oils" vol.I and IV, 4th Ed.D. Van Nostrand Company, Inc. Princeton ,New Jersey, Toronto, New York, London.

Gupta, R. K. and L. Balasubrahmanyam (1998). The turmeric effect. World Patient Information 20: 185 – 191.

Hassanin, N. I. and F. M.Hassan, (1997). Assessment of the use of *Nigella sativa* L. seeds and seed oil on hypolipidemia and other parameters in guinea pigs. Egyptian Journal of Food Sci. 25(1): 1 – 20.

Jaruga, E.; A .Sokal; S.Churl; and G.Bartosz (1998) Apoptosis independent alteration in membrane dynamics induced by curcumin . Exper. Cell Res; 245,303-312 .

Klauning, J. E. (1992). Chemopreventive effects of green tea component ion hepatic carcinogenses preventive medicine. Nutr-Cancer 15 ,5, 297 – 281.

Laigt ,D .W; M. D. Carrier and J. Kanner (2002) .Antioxitant diabetes and endothelial dysfunction Cardiovascular Res., 47:457-464.

Lim, G .P.; T. Chu ; F. Yang; W. Beech; and S.A. Frautschy; G.M. Cole (2001). The curry spice curcumin reduces oxidative damage and amyloid pathology in an Alzheimer transgenic mouse. J. Neurosci. 1; 21(21): 8370-7

Mahfouz, M. M. and F. A. Kummerow (2000). Cholesterol rich diet have different effects on lipid peroxidation, cholesterol oxidase, and antioxidant enzymes in rats and rabbits. J. Nutr. Biochem. 17: 293 – 302.

Mahley, R. W. and k. S. Holcombe (1977). Alteration of the plasma lipoproteins and apoproteins following cholesterol feeding in the rat. J. Lipid Res. 18: 314 – 324.

Nadkarin , A. K. (1976). Indian Materica, popular praskashan Put. Ltd. Mumbai. 961 – 964.

Naito,M.; X. Wu; H. Nomura; M. Kodama; Y. Kato; and T. Osawa, (2002). The protective effects of tetrahydrocurcumin on oxidative stress in cholesterol-fed rabbits. Journal--Atheroscler-Thromb, 9 (5): 243-50

Oberley , L.W. (1988) Free radicals and diabetes . free Radical Biol. Med ., 5: 113-124 [C.F.J. Agric. Food Chem. , 50 (19) : 5485-5489.2002].

Platel, K. ; and K.Srinivasan (2000) Stimulatory influence of select spices on bile secretion in rats. J. Nutrition Res, 20 (10) :1493-1503.

Ramirez-Tortosa, M.C.; M.D Mesa ; M.C. Aguilera; J.L. Quiles ; L. Baro ; C.L Ramirez-Tortosa; S. Martinez; E. Victoria; and A.Gil (1999). Oral administration of a turmeric extract inhibits LDL oxidation and has hypocholesterolemic effects in rabbits with experimental atherosclerosis .Atherosclerosis. 147(2): 371-8 .

Rec, G.(1972) .Determination of lactate dehydrogenase by enzymatic colorimetric methods . J Clin. Biochem. 10:182 .

Roeschau, P.; E.Bernt and W. J. Gruber (1974). Enzymatic of determination of total cholesterol. Clin. Biochem. 12: 403.

Schermer, S. (1967). The blood morphology of laboratory animals longmans green and Co. Ltd. Pp. 350.

Snedecor, G.W. and W.G Cochran (1980)."Statistical methods" Oxford and J.b.H publi ing Co . 7 th edition

Sodium, O.; P. K. Joseph and K. T. August (1984). Certain biochemical effects of garlic oil in rats maintained on high fat – high cholesterol diet. Experiential, 40(1): 78 – 80.

Sowbhagya ,H.B ; S. Smitha; S. R. Sampath ; N. Krishnamurthy and S. Bhattacharya (2005). Stability of water soluble turmeric colorant in an extruded food product during storage. J . of Food Engineering. 67,3,367-371.

Srinivasan, K. (2005). Spices as influencers of body metabolism an overview of three decades of research. Food Res. Inter. ,38: 77 – 86.

Stark, A. and Z. Madar (1993). The effect of an ethanol extract deried from fenugreek (*Trigonella foenum graecum*) on bile acid absorption and cholesterol level in rats. Br. J. Nutr. ,69: 277 – 287.

Steinberg , D.; S. Parthasarathy ; T. E. Carew; A. Khoojc and J. L. Witztum (1989). Beyond cholesterol: modification of low density lipoprotein that increases it's a therogenicity. Eng. J. Med. 320: 915 -924.

Steinberg, D. (1983). Lipoprotein and atherosclerosis. A look back and look ahead. Atherosclerosis 3: 283 – 301.

Taip, E. A. M. (2004). Biochemical studies on some Egyptian Foods. M.Sc. thesis, Biochem Dep. ,Fac. of Agric., Cairo Univ., Egypt.

Tanabe, H.; M. Yoshida and ; N.Tomita (2002). Comparison of the antioxidant activities of 22 commonly used herbs and spices on the lipid oxidation of pork meat. Animal Science Journal, 73, 389–393.

Tebib , K. ; P. Besancon ; L. Bitri and J.M. Rouanet (1994) polymeric grape seed tannins prevent plasma in cholesterol changes in high cholesterol diet rats . Food Chem., 49, 1, 403-406.

Tietz, N. W. (1986). (Textbook of clinical chemistry) W. B. Saunders Co. London Philadelphia. P (796).

West , I.C. (2000). Radicals and oxidative stress in diabetes . Diabetic med., 17:171-180 [C.F.J. Agric. food chem. , 50 (19) : 5485-5489.2002].

White, B. A.; M. M.; Erickson; S. S. C. Steven (1970) [a]. Chemistry for medical technologists 3rd Ed. C.V. Mosby Company Saint Louis. P (293 – 296).

White, B. A.; M. M.; Erickson; S. S. C. Steven (1970) [b]. Chemistry for medical technologists 3rd Ed. C.V. Mosby Company Saint Louis. P (662).

White, B. A.; M. M.; Erickson; S. S. C. Steven (1970) [c]. Chemistry for medical technologists 3rd Ed. C.V. Mosby Company Saint Louis. P (52).

Wichtl, M. W. (1994). Herbal drugs and phytopharmaceuticals Stuttgart:. Med. Pharm. Gmblt Scientific Publishers. UK, London .

Willatgamuwa S.A ; K. G. Platel ; H.Saraswathi, and K.Srinivasan (1998).Antidiabetic influence of dietary cumin seeds (*Cuminum cyminum*) in streptozotocin induced diabetic rats Nutr., Res., (18) 1 ,131-142.

Witztum J. L.; D.Steinberg (1991). Role of oxidized low density lipoprotein in atherogenesis. J. Clin. Invest. 88: 1785 – 1792.

Young, D.; L. Pestaner (1975) Clin. Chem., *21*, 5

التأثير المخفض للكولستيرول لتوابل الكزبرة و الكمون وزيوتها العطرية مع أو بدون مسحوق الكركم .

عادل ذكى محمد بديع[1] – شاهيناز أحمد حلمي[1]– عفاف عبد الحميد عطية[2] و عبد العظيم سيد عبد العظيم[2]

[1]قسم الصناعات الغذائية – كلية الزراعة – جامعة القاهرة الجيزة جمهورية مصر العربية .

[2]معهد بحوث تكنولوجيا الأغذية – مركز البحوث الزراعية الجيزة جمهورية مصر العربية .

يهدف هذا البحث إلى دراسة تأثير التغذية على كل من الكزبرة والكمون سواء فى صورة مسحوق أو في صورة زيوت عطرية باضافة أو بدون إضافة مسحوق الكركم وذلك على فئران التجارب مرتفعة المحتوى من الكوليسترول و ذلك لمدة ٤٥ يوم .

و قد اكدت النتائج على انخفاض محتوى كل من الكوليسترول الكلى و الليبوبروتين منخفض الكثافة وارتفاع محتوى الليبوبروتين عالي الكثافة في سيرم الدم لفئران التجارب المغذاة على مختلف الوجبات المستخدمة في الدراسة مقارنة بالمجموعة الضابطة الموجبة (المغذاة على وجبة مرتفعة الكولسترول حتى نهاية التجربة) كما لوحظ ان استبدال جزء من العليقة بزيت الكزبرة العطرى (٠,٠٥ %) او مسحوقها (١١ %) باضافة او بدون اضافة مسحوق الكركم (٠,٢٥ %) ادى الى انخفاض الجليسريدات الثلاثية في السيرم بينما لوحظ انخفاض هذا التأثير في حالة استخدام مسحوق الكمون بسبة (٥ %) او الزيت العطري بنسبة (٠,٠٧ %) .

كما دلت نتائج الدراسة على انخفاض انزيمات وظائف الكبد AST , ALT و كذلك وظائف الكلى و منها الكرياتنين و حامض اليوريك كما وجد ايضا ان التغذية اليومية على كل من الكزبرة و الكمون سواء في صوره مسحوق او زيت عطري بإضافة أو بدون إضافة مسحوق الكركم ادى الى خفض مستوى الجلوكوز في السيرم مقارنة بفئران عالية المحتوى من الكولسترول .

و لهذا فإنة يمكن استخدام هذه التوابل أو زيوتها العطرية خاصة في حالة ارتفاع مستوى الكولسترول لما لها من مميزات .