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Spice Foods effects on Body Weight Reductions between Obese Animal Models

Nazeha A. Khalil [1*], Rasha R. Elmenshawy [2], Amira Sh. Soliman[2], Yahya M. Naguib[3, 4], Mohamed S. Abbas [2]

[1]*Nutrition and Food Sciences Department, Faculty of Home Economics, Menoufia University, Egypt.*
[2] *Natural Resources Department, Faculty of African Postgraduate Studies, Cairo University, Egypt*
[3] *Physiology Department - College of Medicine and Medical Sciences - Arabian Gulf University - Manama - Kingdom of Bahrain.*
[4] *Clinical Physiology Department - Faculty of Medicine - Menoufia University - Shebin Elkom - Menoufia Egypt.*

Corresponding author: Dr. Nazeha A. Khalil E-mail Nazih.khalil@hec.menofia.edu.eg

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Abstract

The aim of this study was determination and identification of phenolic and flavonoids fraction in addition to the antioxidant activities of used herbals (curcumin, black pepper and cumin) by HPLC in addition to evaluating the effects of such different spicy food consumptions on body weight reduction between obese animal models. Rats were randomly divided to ten groups fed; Black Papers, Cumin and Curcumin either alone or in different mixtures additionally to groups fed Orlistat (control body weight loss), Non-obese negative control group (C-ve) and Obese control positive group (C+ve). Blood glucose and body weight levels were measured at the beginning and end of the experimental in addition to rats' lipid profiles (total cholesterol; triglycerides;, high dense lipoprotein cholesterol; low dense lipoprotein cholesterol; and very low dense lipoprotein cholesterol). Results presented that obese models received (Cumin) Cu/(Curcumin) Cur mixture have the biggest effective significant treatment (about -80% body weight reduction) followed by both groups fed mixtures of (Curcumin) Cur/(Black Papers) Bp and (Curcumin) Cur/(Black Papers) Bp/(Cumin) Cu; decreased by -68.0 and -65.6g respectively. The study could be more valuable causing significant body weight reduction between obese models, however human studies are needed.

Key words: *Cumin, black pepper, turmeric and lipid profile.*

1. Introduction

The human health normally affected by daily food choices and intake so severe malnutrition leads to immune-deficiency and over nutrition also has been linked with diseases such as and obesity that are well known to affect immune functions [1-2-3]. Also, obesity is one of the most main health diabetes problem causing death worldwide because of its consequences; metabolic complications that reached about 2 billion Adults overweight and over 650 million obese [4]. Using prebiotics supplementations for controlling the human body weight is a new strategy within the lifestyle interventions (dietary intervention). E.g. recent studies have shown in particular that polyphenols intake (considered as nutraceuticals modulate physiological and molecular pathways involved in energy metabolism) can help to reduce the physiological weight gain occurs over time in the general population as promising therapeutic tool with limited side effects; act as antioxidant and anti-inflammatory agents by increasing energy expenditure and reducing oxidative stress, supporting progress towards weight loss and/or reduction depending on the amount consumed and their bioavailability [5].

The different polyphenols such as ones on black pepper and curcumin have been reported to increase lipolysis through modulation of hormone sensitive lipase. Also, many phytochemicals like in curcumin has anti-inflammatory activities; because of its main principal anti-inflammatory and healthful components (turmeric). Previous experimental data shows that curcumin promotes weight loss in order to reduce obesity incidence and its consequences with any related diseases in addition to limit the obesity adverse health effects [2]. The early clinical study treated obesity using a commercial formulation of curcumin supplementation between obese volunteers at 1 g/day (as recommended maximum daily usage; [4] for a month was conducted by (6). It only decreased the serum triglyceride levels significantly and insulin actions improvements with no changes in either their BMI (Body Mass Index) or body fat [7]. Again, another study by [8] illustrated that curcumin worked as anti-obesity and anti-inflammatory by declined adiposity in addition to lipid storage [9]. Moreover, cumin which is an aromatic plant included in the Apiaceae family and is being used daily worldwide to flavor foods, added to fragrances, and for medical preparation. However, some studies shown that cumin play an important role within the human health as it may have decreasing effects for blood lipids [10] while other studies have been shown an effective impact on body weight reduction [11]. Cumin seeds have been found to possess significant biological activities, such as antibacterial, antifungal, anti-carcinogenic and antioxidant properties [12].

Finally, black pepper has been known by many beneficial effects such as sexual reproduction and obesity because of its main components, piperine and oleoresin [12]. In this study, the effect of different dietary polyphenol sources that all usually consumed as a spice; Curcumin (Cur), Black Pepper (Bp) and Cumin (Cu; Cuminum cyminum L.) either alone or in different combinations will be evaluated on the incidence of being obese or losing weight between obese animal models. Then the study wills to measure the effects of such spicy usages on the health status between used animal models (blood glucose and lipid profile levels). Different spices used in this study aimed to be used as dietary sources for controlling body weight reduction by their great potential prebiotics effects for weight loss strategy; could be achieved by modulating lipid metabolism due to their functional foods with their bioactive substances and biological properties [5].

Materials and methods

Materials and chemicals

Spices: all used spices (Curcumin, Black pepper and Cumin) were purchased from Pharmaceutical Science Laboratory, National Research Centre, Giza, Egypt.

Chemicals: all used chemicals used for feeding experimental animal models (starch, corn oil, sucrose, casein, cellulose and vitamins) were obtained from Morgan Company for Commerce and Chemicals. Additionally, Vitamins were obtained from Roch Vitamins and Fine Chemicals (U.S.A.), however, Cholic acid was purchased from Sigma Company. Kits used for serum blood analysis was purchased from Gama Trade Company for Chemicals, Cairo, Egypt.

Identification of chemical composition between different used spicy

Determination and Identification of Phenolic and flavonoids fraction in addition to the antioxidant activities of used herbals (curcumin, black pepper and cumin) have been determined by HPLC.

a) Phenolic and flavonoids fraction

Phenolic and flavonoids fraction compounds were identified using HPLC within all the used spicy by the method described by [13]. Separation and identification of main contents; determine the physicochemical properties, phenolic, flavonoids fraction and antioxidant contents of three used spices in triplicated samples were obtained.

b) DPHH (2, 2-diphenyl-1-picryl-hydrazyl-hydrate) radical scavenging activities:

The DPHH scavenging activities have been analyzed as described by [14] with three different concentrations. The used sample has been prepared as 0.1g spicy in 10 ml methanol. An aliquot of extract was added to DPPH RADICAL 0.2 TO 2% dissolved in methanol. The mixture was stirred and left for 15 min in dark. Then the absorbance was measured at 517 nm against a blank. Percentage scavenging effect was calculated as:

$(A0-A1)/A0)*100$ where: A0 is the absorbance of the control (without sample) and A1 is the absorbance in the presence of the sample.

Experimental animal models

A total of eighty male Albino rats have been obtained from Vaccine and Immunity Organization, Ministry of Health, Helwan Farm, Cairo, Egypt. Used rats fed basal animal's diets that were prepared according to our pervious published data for one week and were adapted on water free access before the initiation of the experimental [15]. Rats raised in the animal house with average weight of 200g + 0.5 g. Rats divided randomly into healthy non-obese negative control group (C-ve; n=8) and nine different sub-obese groups (n= 72) that were induced by high fat diet (HFD; 25) consumptions for about 4 weeks prior to the experimental start point. All rats were kept with normal healthy conditions fed the proper treatment for 30 days after being equally divided into ten groups of eight rats each randomly. The obese nine groups divided to positive obese group (C+ve) and eight obese groups as described within the experimental design section then all rats fed the proper treatment for 30 days as described previously within our published data (15).

The experimental design

All animals kept in normal healthy laboratory condition (temperature were adjusted at 25 ± 2 ºC for 12 hour light – dark) and adapted on free access of water and fed for one week basal (stander) diet before the initiation standard of the experimental (healthy and ethical conditions were applied after being approved ≠19-SREC-07-2021).

Different dietary treatments were monitored as following: H1; the control (C–ve) non-obese on normal control's basil diet, H2; obese on normal control's basil diet supplemented with Orlistat as medical treatment for body weight loss, H3; obese on only normal control's basil diet (C+ve), H4; obese rats administrated to Curcumin; (Cur; 2 g/Kg BW rat), H5; obese rats received black pepper (Bp; 20 mg/kg or 0.02 g/kg), H6; obese rats received Cumin (Cu; 3 mg/kg or 0.003 g/kg), H7; obese rats received a mixture of Curcumin: Black Pepper as 1:0.01%, H8; obese rats received a mixture of Cumin/Black Pepper as 1:0.01%, H9; obese rats received a mixture of Cumin+ Curcumin as 1:0.01%, H10; obese rats received a mixture of all the Curcumin: Black Pepper: Cumin (1:0.01:1%).

Body weight gain calculation (BWG)

Biological evaluations of the different diets were carried out by determination of body weight gain % (BWG), feed intake (FI) and Feed Efficiency Ratio (FER) have been calculated according to [16] through the experimental using the following formulas: BWG % = (Final weight – initial weight)/ initial weight 100.

Blood biochemical analysis

Blood samples were taken at the end of the experiment and chemical kits used for measuring blood glucose, lipid profile (Total cholesterol; TOCH, triglycerides; TG, high dense lipoprotein cholesterol; HDL-c, as described previously by [17-18] and [19] respectively while low dense lipoprotein cholesterol; LDL-c and very low dense lipoprotein cholesterol; (VLDL-c) were calculated by [20] as follows: HDL-c=Total cholesterol- (LDL-c + VLDL-c) while VLDL-c =TG/5.

Statistical analysis

Results were presented as means ±SE, statistical analysis using SPSS package ver.21 (ANOVA, P< 0.05, LSD and Tukey) for any significant changes using the standard analysis of variance as outlined by [21].

Results and discussions

1.1 Chemical compositions for used spicy foods

a) Phenolic and flavonoids compound levels of different used spicy

Phenolic and flavonoids have been determined and identified by HPLC within all the three used herbals (curcumin, black pepper and cumin) were recorded in Table 1.

Table (1): Phenolic and flavonoids levels obtained from used different spicy

	Cumin (mg/kg)	Black pepper (mg/kg)	Curcumin (mg/kg)
Pyrog1101	0	11.84	9.21
Quinol	0	6.77	1.50
Gallic acid	14.01	3.40	2.99
Catechol	0	0	0
p- Hydroxy benzoic zcid	0	77.80	52.54
Caffeine	909.06	0	0
Chlorgenic	0	64.36	58.18
Vanillic acid	21.34	15.30	0.00
Coffeic acid	38.32	4.37	2.25
Syringic acid	24.31	1.53	5.41

Vanillin	48.62	0.00	0.00
p-Coumaric acid	41.09	2.72	76.01
Ferulic acid	508.20	0.77	0.00
Benzoic acid	39.64	247.99	85.64
Rutin	17640.40	2.07	18.02
Ellagic	155.59	241.48	2.15
o-Coumaric acid	236.61	17.84	6.65
Salicylic acid	589.70	0	0
Cinnamic acid	987.13	0	0
Myricetin	50.35	73.88	68.25
Quercitin	0	23.08	0.00
Rosemarinic	0	0	0
Neringein	0	178.98	208.58
Kampherol	371.25	93.98	89.40
Total	21675.62	1068.17	686.79

It can be seen from Table (1) that the total phenolic and flavonoids levels were at the highest amount within cumin samples that reached 21675.62 mg/kg. On the other hand, data collected from curcumin shown the lowest phenolic and flavonoids levels (686.79 mg/kg). Finally, black pepper samples presented medium amounts; about 1068 mg/kg. The biggest phenolic components founded with the cumin samples are ranged as Rutin> Cinnamic acid> Caffeine> Salicylic acid> Ferulic acid> Kampherol and that were represented with levels of 17640.40>987.13>909.06>589.70>508.20>371.25 mg/kg. Regarding the black pepper samples; the collected data in Table (1) illustrated that Benzoic acid> Ellagic> Neringein> Kampherol and that were corresponding to the following amounts 247.99>241.48>178.98>93.98 mg/kg. Finally, curcumin samples presented different phenolic and flavonoid components as Neringein> Kampherol>Benzoic acid> p-Coumaric acid> Myricetin and Rutin as represented by 208.58 >89.40>85.64>76.01>68.25>18.02 mg/kg.

Antioxidant activities by DPHH (2, 2-diphenyl-1-picryl-hydrazyl-hydrate)

DPPH is a common abbreviation for the organic chemical compound 2,2-diphenyl-1-picrylhydrazyl. It is a dark-colored crystalline powder composed of stable free-radical molecules that well known as an antioxidant assay based on electron-transfer that produces a violet solution in ethanol so can be used for measuring the antioxidant activity as radical scavenging. All collected results are recorded in the following Table (Table 2).

Table (2): The antioxidant levels obtained from used different spicy

Spicy foods	% DPPH radical – scavenging activity		
	0.2%	0.4%	2%
Cumin	25.00	62.50	68.21
Black pepper	41.00	62.86	75.36
Curcumin	51.43	75.36	86.43

Table (2) illustrated that curcumin had the highest DPPH levels within all the % DPPH levels (0.2, 0.4, 2%) between all the three used herbs. It shows 51.43, 75.36 and 86.43% for 0.2, 0.4 and 2% respectively. Black pepper samples show the second herbier that has effective antioxidant activities; DPPH levels. It was 41.7g, 62.86 and 75.36% responses on 0.2, 0.4 and 2% respectively. Finally, cumin came to last effective antioxidant (DPPH levels) activities that were 25, 62.5 and 68.21% corresponding to 0.2, 0.4 and 2% respectively. It also can be notice that both Cumin and black pepper have the same scavenging activities at 0.4 % that is about 62.5 % for both of them.

Changes in the body weight feed intake and feed efficiency ratio levels

All model's body weight (BW) were measured before and after running the experimental and the body weight gain (BWG) or changes of body weight, FI and FER were calculated (Table 3).

Table (3): Effects of different spicy supplementations on changes of the body weight feed intake and feed efficiency ratio levels between used rats

Animal groups	Initial BW (g)	Final BW (g)	BWG (± %)	FI (g/day/rat)	FER
Non-obese (C-ve; H1)	134.7±1.49b	160±1.77d	18.75	12.5	0.033±0.019a
Obese on Orlistat (H2)	219.75±1.03a	158±1.58d	-28.09	13.0	-0.079±0.021e
Obese ND*(C+ve; H3)	222.75±2.28a	276±3.47a	24.01	24.0	0.037±0.015a
Obese on Cur; H4	222.25±1.60a	187±2.27b	-15.85	17.0	-0.034±0.025b
Obese on Bp;H5	223.50±1.84a	194±4.32b	-13.04	17.5	-0.027±0.052b
Obese on Cu;H6	221.37±0.94a	187±3.01b	-15.28	16.0	-0.035±0.039b
Obese on Cur/Bp;H7	222.50±2.10a	169±2.56c	-23.93	14.2	-0.062±0.018d
Obese on Cu/Bp;H8	220.75±1.65a	175±1.55c	-20.49	14.0	-0.053±0.010c
Obese on Cu/Cur;H9	220.00±1.77a	155±1.75d	-29.32	13.0	-0.082±0.011ef
Obese Cur/Bp/Cu;H10	224.50±0.86a	152±2.38d	-32.29	13.4	-0.090±0.026f

Values are mean ± SE; n=8. Means under the same column bearing different superscript letters are different significantly ($P<0.05$). * ND means that group rats fed on normal diet.

The changes of body weight with all the animal models at about 223g while the control non-obese group (C-ve; H1) was started at about 135g. Also, all the rats fed high fat diet had significant ($P<0.05$) increase in the initial body weight as compare to the C-ve group (H1) while the rats fed all other treatments significantly ($P<0.05$) decreased the final body weight (FBW). Also, groups H1 and H2 (fed Orlistat) were used as obese control-positive groups and nearly have the same difference levels on their body weight levels at the started point. Regarding the lowest obtained %BWG, it can be noticed that rat groups consumed the mixture of curcumin/black pepper /cumin (H10) had the highest effective treatment with obese rats among all treated groups (-32.29). The second effective treatment group was seen with both groups H2 and H9; rats were consuming Orlistat and cumin mixed with curcumin (Cu/Cur) respectively. Both groups were followed by rats group (H7; Cur/Bp) consumed curcumin mixed with both black pepper. Additionally, the body weight levels with both groups H4 and H6 (fed Cur & Cu) were at similar effective reduction levels (declined by about 16%). However, group H5 that consumed Bp were the lowest effective group of their body weight reduction (about -13.04 BWG).

Regarding the feed efficiency ratio (FER), It was cleared that a significantly decreased for all treated groups compared to both non-obese and positive control group (H1 & H3). However, the lowest reduction of FER was observed at the groups H9 & H10 fed either Mix (Cu/Cur) or the mixture (Cur/BP/Cu) respectively compared to the other treated groups. The final body weight clearly presented with obese rats was decreased for all treated groups more than the group consumed orlistat due to lower feed intake and decrease the FER. Also the mixture between the spices decreased the final body weight more than used a single one. In conclusion, most used treatment indicated BWG reduction at the different levels after being added either alone or with/without mixing it with cumin or curcumin. However, consuming mixture of all used spicy together (H10; Cur/Bp/Cu) showed the most effective. The results was agreed with [12] whom stated that cumin have high levels of dietary fibers in addition to its antioxidant activities that may help for body weight reduction. Additionally cumin supplementation, the obtained findings are in accordance with [22] who found that cumin powder supplementation in a weight reduction diet showed improvement in body weight and biochemical parameters in overweight/obese women.

Blood glucose levels

Data in Table (4) representing the effects of different spicy additions to obese rats on blood glucose levels.

The control positive group (H3), the obese group fed normal diets showed significant ($P\leq0.05$) high serum glucose levels (218.5 ±0.9 mg/dl). However, the blood glucose level after all the used treatments recorded the biggest declined levels between rats in group H10 fed their diets supplemented with mixture of curcumin, black pepper and cumin (Cur/Bp/Cu; -52%). Meanwhile, the same decreased levels were observed again nearly with non-obese control group H1 (C–ve; 51% reduction).

Table (4): Effects of different spicy supplementations on blood glucose levels between used rats

Animal groups	Glucose level (mg/dl)	Differences from control (+); mg/dl	% Relative change of control (+)

Non-obese (C-ve;H1)	106.0±0.51g	-113	-51
Obese on Oriostat; H2	103.0±0.55g	-116	-53
Obese (C+ve; H3)	218.5±0.42a	0	0
Obese on Cur; H4	140.5±0.50b	-78	-36
Obese on Bp;H5	128.7±2.63d	-90	-41
Obese on Cu;H6	132.7±1.43c	-86	-39
Obese on Cur/Bp;H7	114.1±0.60f	-104	-48
Obese on Cu/Bp;H8	123.8±1.24e	-95	-43
Obese on Cu/Cur;H9	129.5±1.47cd	-89	-41
Obese-Cur/Bp/Cu;H10	104.3±0.34g	-114	-52

Values are mean ± SE; n=8. Means under the same column bearing different superscript letters are different significantly (P<0.05). * ND means that group rats fed on normal diet.

Also both groups (H10 & H1) were about the same declined levels as seen with group H2; obese rats fed oriostat as control supplemented for weight reduction (-53%). Additionally, the blood glucose levels between groups H5, 6 & 9 were similarly declined by approximately -40% comparing to the control group (C+ve; H3). To conclude up, all the different treatments have got positive declined effects on blood glucose levels between all obese group rats. However, the best effective treatment was seen between all the treatments were after consuming a mixture of all the used substances together (curcumin, black pepper and cumin; H10) and that was nearly to the oriostat effect (H3). On the other hand, the lowest effect was seen with curcumin alone and that was followed with rats fed no black pepper additions. For instant, [23] suggested that curcumin is an effective anti-diabetic agent. Also it has been suggested that curcumin's role in glucose homeostasis is mediated through its activation of glycolysis, inhibition of hepatic gluconeogenesis, and reduction of lipid metabolism [24]. Another recent study performed with high-fat-fed hamsters established that curcumin improved insulin sensitivity, as illustrated by lower insulin resistance index values [25].

Lipid profile levels

Regarding the lipid profiles; all collected blood samples from all the experimental animal models were used for measuring the effects of different treatments on their lipid profiles; TCHO, TG, LDL-c, HDL-c and vLDL-c and all results were presented on the following (Table 5). Diet supplemented with (Curcumin, pepper, cumin and/or their mixture) or Drug significantly decreased the mean value of serum TCHO, TG, LDL-c, and vLDL-c. However, serum HDL-c levels were increased significantly compared to the positive control group.

Table (5): Effects of different spicy supplementations on lipid profile levels between used rats.

Animal groups	TCHO (mg/dl)	TG (mg/dl)	LDL-c (mg/dl)	HDL-c (mg/dl)	vLDL-c (mg/dl)
Non-obese (C-ve; H1)	99.5± 2.66e	62.8±2.89e	25.26±2.24f	61.6±2.89a	12.56±0.57e
Obese on Oriostat; H2	100.0 ±0.51e	60.4±1.18e	27.7±1.36ef	60.1±1.18a	12.09±0.23e
Obese ND*(C+ve; H3)	255.0±0.51a	111.0±3.51a	207.2±2.60a	25.6±2.02d	22.20±0.70a
Obese on Cur; H4	155.3±3.37b	91.0±0.51b	100.6±3.33b	36.5±0.51c	18.20±0.10b
Obese on Bp;H5	137.1±2.89c	85.4±2.35bc	81.9±0.47c	38.1±2.89c	17.08±0.47bc
Obese on Cu;H6	151.1±2.89b	86.6±0.84bc	95.0±0.51b	38.8±3.23c	17.33±0.16bc
Obese on Cur/Bp;H7	105.3±1.97e	62.0±0.51e	32.4±2.49e	60.5±0.63a	12.40±0.10e
Obese on Cu/Bp;H8	129.6±0.92d	70.6±0.90d	68.0±0.94d	47.5±0.83b	14.13±0.18d
Obese on Cu/Cur; H9	134.1±2.89cd	83.1±2.89c	74.7±3.13d	42.8±3.37bc	16.63±0.57c
Obese; Cur/Bp/Cu; H10	105.5±0.51e	61.5±0.51e	34.6±3.11e	58.6±2.75a	12.30±0.10e

Values are mean ± SE; n=8. Means under the same column bearing different superscript letters are different significantly (P<0.05). * ND means that group rats fed on normal diet.

Table (5) shows that TCHO levels were the lowest effective levels significantly between groups H2, H7 and H10 (100.0±0.51, 105.3±1.97 and 105.5±0.51 mg/dl) response for rat groups consumed oriostat or curcumin added to black pepper in addition to diets supplemented with mixture of curcumin , black pepper and cumin respectively. Such effect was compared to H1 group, the control non-obese models (C-ve; 99.5±2.66 mg/dl). Also all the other treatments were positively reduced significantly (P<0.05) their TCHO levels, e.g. group fed cumin alone (H6; 151.1±2.89 mg/dl) and that was seen similarly on TCHO levels between obese rats fed Cur as medical treatment (H4; 155.3±3.37 mg/dl). Regarding the triglycerides (TG) levels, it can be noticed that TG levels were decreased significantly with group H7 and H10 to similar levels (about 62 mg/dl) as in H1 and H2 groups (C-ve & Oriostat fed group respectively) that were very close. Both animal groups were consuming mixture of curcumin/black pepper and curcumin/black pepper/cumin respectively. Also all obese groups H5, H6, and H9 showed an effective reduction on TG levels (they reached about 85 mg/dl) in comparison to the control obese group fed normal diet (C+ve; H3). Such reduction was significantly ($P<0.05$) after group H8 that was at TG levels of 70.6±0.90 mg/dl. So all the three animal groups H7, H8 and H10 were consuming Cur/Bp, Cu/Bp and/or Cur/Bp/Cu respectively have similar TG levels obtained from control (C-ve; H1) and rat group on medical treatment (H2; oriostat feeding). Additionally, the LDL-c levels between all the experimental groups. It can be seen that both groups H7 and H10 (Cur/Bp & Cur/Bp/Cu respectively) significantly ($P<0.05$) have got the best effective treatments. Their LDL-c levels were decreased to about 32.4 mg/dl and that is very close to data obtained with rat group fed oriostat supplemented diets (H2; 27.7 mg/dl). Moreover, both groups H8 and H9 were in the second effective levels (approximately 70 mg/dl) and that were consumed Cu/Bp and Cu/Cur respectively. On the other hand, group rats with the lowest effective treatment were seen with H4 and H6 (fed Cur & Cu respectively); their LDL-c levels were at about 100 mg/dl and that were the highest significant ($P<0.05$) LDL-c levels obtained between all the treated groups comparing to all control groups (H1, H2 and H3). Also, vLDL-c levels were presented at not significant ($P<0.05$) differences with animal models of group H7 and H10 fed mixtures of Cur/Bp and Cur/Bp/Cu comparing to the control groups H1 and H2 (C-ve & Oriostat respectively; about 12 mg/dl). Finally results showed the HDL-c levels between all the animal groups. It can be predictable an increase HDL-c levels between all treated groups in contrast to declined LDL-c levels. Indeed, such HDL-c levels were at the lowest on groups fed Cur, Bp and Cu that represented H4:H6 with about 37 mg/dl. On the other hand, HDL-c levels were increased significant with groups H8 and H9 consumed diets supplemented with Cu/Bp and Cu/Cur (about 45 mg/dl) and that effect was seen again as it raised up to about 60 mg/dl with H7 and H10 on Cur/Bp and Cur/Bp/Cu supplementations and that was nearly the same effect that have been noticed with animals in both H1 and H2 groups fed normal control diet and orlistat drag (about 60 mg/dl). In conclusion, the measured lipid profile levels with all rats consumed either curcumin alone or with being added to black pepper and cumin were the best effective treatments for controlling the blood lipids levels between obese rats. The best effective treated rats were seen in both groups H7 and H10 presented the best treatment over all the lipid profile collected data. the results was agreed with by [26] suggested that piperine protects against obesity and improves lipid metabolism in mice fed with a HFD and that was as the same results were also obtained previously by [7] and [27] . Additionally, [28] suggested that feeding piperine for 8 weeks decreased insulin resistance and LDL-C level in overweight adults while [29] demonstrate that piperonal significantly attenuated HFD-induced body weight. Alternatively, it has been determined to transform into foamy cells in animal studies, which can reduce fat accumulation in the arterial wall [30]. Moreover, cumin shown to decrease the lipid levels in alcohol and thermally oxidized oil induced hepatotoxicity [31] These results were in the same line with the obtained results for all collected data.

Conclusion

In conclusion, many healthy supplemented dietary foods show to have promoted health benefits to the host gastrointestinal especially after consuming different combinations of spicy foods which mainly attributed to their high content of antioxidant in association to colonic microbiota composition and activities. Consuming black pepper declined the BWG at the different levels after being added with/without mixing it with cumin or curcumin. Moreover, both cumin and curcumin reduced the obese rats' body weight either single or mixed doses but with big reduction levels. However, the mixture between the spices decreased the final body weight reduction more than used a single one. They show to reduce obesity risk with its complications; unidentified mechanisms to be involved but further human studies in this direction are required to elucidate novel mechanisms or pathways.

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