The effect of using pomegranate peel powder, ginger and cinnamon in the manufacture of low-calorie loaf bread for obese people

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Abstract

The study aimed to produce healthy bread for diabetics and obese people by adding medicinal herbs, including pomegranate peels, ginger and Cinnamon. The field experiment was conducted in the poultry field of the Department of Animal Production / College of Agricultural Engineering Sciences / University of Baghdad from 27/3/2021 to 5/5/2021 (35 days). To know the effect of adding the powder of some medicinal herbs and spices (pomegranate peel powder, ginger and Cinnamon) at an average of 7.5 g / kg feed for each of them separately (7.5% pomegranate peel powder + 7.5% ginger and 57% Cinnamon) g/kg fodder to broth in productive performance and some physiological traits. The 150 chicks of unsexed 308 Ross broilers were used and bred, with an average initial weight of 3 g 39.6/chick, prepared from the Al Shukr National Company hatchery for broiler products located in Abu Ghraib district. Chicks were randomly distributed into five treatments, each treatment containing three replicates (10 chicks/replicate). The replicates were randomly distributed among the pens since the first day of the chicks' age and the treatments were as follows:

(T1), the control group: giving a standard diet without any addition. (T2): The treatment containing barley at a percentage of 50% only. (T3): The treatment containing 50% barley + 7.5% g of pomegranate peel powder (T4): The treatment containing barley at a percentage of 50% + 7.5% g ginger powder T5: The treatment containing barley at a percentage of 50% + 7.5 g of Cinnamon powder .

The results showed significant differences when applying the treatments of types of feed to broiler chickens, where the nutrition of Cinnamon and ginger showed a decrease in cholesterol amounted to (26,45) respectively, while feeding with barley showed the lowest level of glucose, which averaged (211), compared to the treatment of normal feeding that It gave an average of (288) and a decrease of (36%). The treatment of barley, pomegranate peels, Cinnamon and ginger achieved an average of 178.53 / g (122.86) 26.310 g (314.20) respectively, in the fourth week, while the control treatment showed the highest rate of broiler weight at 35 days, which amounted to 2293.67. (g) compared with the feeding treatment of ginger (1394.33). We conclude from this study that ginger and barley have a role in lowering total cholesterol (T.C), LDL (T.G) and glucose.

INTRODUCTION:

Obesity and overweight are the most common and important health problems facing the global community today, and as a result of the abnormal or excessive accumulation of fat, about 3 million adults die around the world every year due to health and medical complications associated with cases of overweight (1) and these problems are widespread in developed and developing countries and in all categories of regions of the world, regardless of race, gender or age, and it is on the rise,As a report by the World Health

Organization indicates the high levels of obesity among adults and children in the Middle East countries, including Iraq 2), and intervention in the diet is the first step in reducing the prevalence of obesity, where weight loss in obese people can reduce Medical complications associated with being overweight, at the same time increasing physical performance and thus improving their quality of life (3).Bread products mainly contain a high percentage of dietary fiber, especially barley, which is vital in total food consumption due to its digestive benefits. Bread is one of the well-known products classified in functional foods that are beneficial to health (4). In view of the increase in the daily consumption of bread and the spread of health and nutritional awareness, interest has increased in the use of medicinal plants and herbs such as pomegranate peel powder, ginger, cinnamon, and others, which gave an effective positive effect in some food products, including bread (5)This is because it contains many biologically effective compounds that burn fat and reduce weight for obese people (6), which are added directly or indirectly to other ingredients without harmful side effects to human health, in addition to that they do not cause unwanted changes in properties. Product Features (7)Pomegranate peels have clear properties that contribute to increased immune activity, anti-atherosclerotic abilities, and antioxidants (8). Ginger also has an important role in lowering cholesterol and is considered one of the antioxidants and has the ability to burn excess fat than the body needs (9), and cinnamon contains an effective polyphenol substance similar in its effect to insulin, and thus works to reduce blood sugar, which leads This leads to a decrease in the insulin hormone secreted by the pancreas, and thus pushes the body to burn fat and regulate the entry of glucose into the blood sequentially and sequentially (10)Given the scarcity of applied studies in this regard in Iraq, this study aimed to:

1- manufacturing low-calorie bread by adding pomegranate peels.

2- manufacturing low-calorie bread by adding cinnamon.

3- manufacturing low-calorie bread by adding ginger.

4- Identifying the sensory and chemical traits of the manufactured bread, and thus identifying the optimal treatment of each addition and indicating which is the best effect in traits of weight loss and lowering of cholesterol and lipoproteins in the blood.

5- Conducting a biological experiment on chicken meat chicks to study the effect of adding barley, pomegranate peel powder, ginger and cinnamon, and thus identifying the optimal treatment in reducing weight and studying the physiological traits.

Materials and methods

The field experiment was conducted in the poultry field of the Department of Animal Production/College of Agricultural Engineering/University of Baghdad from 27/3/2021 to 5/5/2021 (35 days), to know the effect of adding the powder of some medicinal herbs and spices (powder of pomegranate peels, ginger and Cinnamon) at a percentage of 7.5. g/kg of feed for each of them respectively(.57% pomegranate peel powder + .57% ginger and .57% Cinnamon) g/kg feed to the broth in productive performance and some physiological traits.

Chicks source

The 150 unsexed Ross 308 broiler chicks were used and bred, with an average initial weight of 3 gm 39.6/chick, prepared from the Al Shukr National Company hatchery for broiler products located in Abu Ghraib district.

Experiment design

Chicks were randomly distributed over five treatments, each treatment containing three replicates (10 chicks/replicate), and the replicates were randomly distributed among

the pens since the first day of chick life, and the treatments were as follows:

The first treatment (T1), the control group: giving a standard diet without any addition.

The second treatment (T2): The treatment containing barley at a percentage of 50% only.

The third treatment ((T3): The treatment containing 50% barley + 7.5% g of pomegranate peel powder

Fourth treatment (T4): The treatment containing barley at a percentage of 50% + 7.5% g ginger powder

Fifth treatment T5: The treatment containing barley at a percentage of 50% + 7.5 g of Cinnamon powder

Chick management

The chicks were reared on the ground in a hall divided into 15 kennels (Pens) and the area of each kennel is 1 x 2 m. The benches were spread with sawdust with a thickness of 3-5 cm, and the repetitions were distributed on them randomly. it followed the continuous lighting system for 23 hours of light per day with one hour of darkness. To accustom the chicks to the dark so that they are not disturbed when the power is suddenly cut off. The chicks were fed on a starter diet from the age of one day to the age of 21 days and a growth diet from the age of 22 until 35 days and at the age of seven days, they were gradually replaced by hand-held circular feeders, with a diameter of 45 cm. The feeders are raised weekly to the top to take into account that they are at the level of the bird's back to facilitate the intake of feed and reduce its scattering with its age, and the feed was provided in a free form (Ad libitum) during the duration of the experiment.Also, inverted plastic drinks with a capacity of 5 liters were used to provide drinking water freely, with one manhole / be. At the end of the first week, they were replaced by automatically suspended drinks that are at the level of the bird's back and are raised with age to make it easier for him to drink water freely and provided the appropriate environmental conditions for breeding in the different stages of growth. Birds on the first day of age in a room at a temperature of 34°C using gas incubators, and then the temperature was reduced weekly at a rate of 2°C down to a temperature of 20-22°C.

Bird feed

The powder of pomegranate peels, ginger, and Cinnamon was obtained from the local markets of Baghdad city. They were dried by a solarium and milled using an electric grinder, and the chemical analysis for them was conducted in the laboratories of the Ministry of Science and Technology. The chicks were fed on crushed feed for the duration of the experiment, and the starter diet was used from 1-10 days of age, which 23% crude protein 0003 contained kilocalories/kg feed as representative energy, then followed by the growth diet provided from 11-24 days of chicks age, which contained on 21% crude protein 3100 kilocalories/kg feed represented energy, and the final protein diet 19% and 3200 kilocalories/energy.

Studied traits:

productive traits

The average live body weight

The chicks were weighed on the first day of age, and at the end of each week they were weighed collectively with an electronic scale, and then the average body weight was calculated according to the following equation (Al-Fayyad and Naji, 1989):



Weekly weight gain

The weekly increase for the total period, according to what is between them (11), is expressed in the following equation: -

Weekly weight gain (g) = live body weight at the end of the week (g) - body weight at the beginning of the week (g)

Amount of feed consumed

The amount of feed consumed weekly is calculated for the total period by recording the amount of feed provided at the beginning of the week and the remaining feed at the end, and the difference between them is extracted according to the following equation as indicated by (12) the amount of feed consumed weekly = the feed provided at the beginning of the week (g) - the remaining feed at the end of the week (g)

Chemical properties of blood:-

Triglycerides + H₂O

After collecting the blood in the syringe, the blood is placed in glass tubes containing gel tubes with a capacity of 6 ml, and these tubes are placed in a centrifuge at a speed of 4000 revolutions/minute and for 10 minutes. Then the following tests were conducted:

Lipid profile

Determination of the concentration of triglycerides

Determination of serum triglycerides concentration

A ready-made assay kit (Kit) from the French company Biolabo, which is based on the enzymatic method, was used to analyze the triglycerides into glycerol, which enters into a chain reaction of a complex product in the end with a pink color, as shown in the equations below:

Glycerol + Fatty acids

Lipoprotein lipase

Glycrol + ATP Glycerol Kinase	
Glycerol-3-phosphate + ADP	- -
GPC)
$Glycrol-30$ -phosphate + O_2	$D_{ihydroxy}$ acetone phosphate + H_2O_2
$2H_2O + 4$ -aminoantipyrine + ADP	POD quinoneimine + $4H_2O$
Then the color intensity of the compl resulting from the reaction was read by	ex and the concentration of triglycerides was calculated as shown in the following equation:
spectrophotometer at a wavelength of 500 r	Im Sample absorbance Standard solution
concentration (200 mg/100 mL)	osorbance of standard solution × Standard Solution

Determination of cholesterol serum concentration

The concentration of total cholesterol in the blood serum was calculated using a kit from the French company Biolabo, which is based on the enzymatic method of converting cholesterol and cholesterol esters into the cochineal red quinoneimine dye, as in the reactions below: -

Cholesterol esters ► Cholesterol + free fatty acid **Cholesterol Oxidase** Cholesterol + free fatty acid Cholesterol $+ O_2$ peroxidase $2H_2O_2 + phenol + 4$ -Amino-antipyrine Quinoneimine $+ 4H_2O$

Then the intensity of the scarlet red color of the resulting complex was measured using a spectrophotometer at a wavelength of 500 nm,

Sample absorbance

Cholesterol concentration= $\frac{sample \ absorbance}{absorbance \ of \ standard \ solution} \times$ Standard solution concentration (200 mg/100 mL)

Results and discussion

Effect of types of nutrition on some types of triglycerides and glucose in broiler chickens.

The results of the statistical analysis (1-1) in broiler chickens showed that diabetes mellitus led to a significant increase at the probability level (5%) in the concentration of total cholesterol (TC) in the serum of the chicken group (normal feeding of chickens) where the arithmetic mean of this The group (80) compared with the barley feeding group, whose arithmetic mean was (29), The reason for the high concentration of cholesterol in chicken blood serum is due to the fact that the chicken body has the ability to convert glucose sugar into energy for the body to benefit from in decomposing accumulated fats as well as free fatty acids that lead to raising the concentration of cholesterol in the blood (13). The results also showed that feeding with students and ginger also reduced total cholesterol (TG) in chicken serum (26) and (45), respectively. The use of these foods is due to their containing phenols and active compounds that have the ability to remove free radicals (Reactive oxygen species =ROS), Thus, it inhibits the oxidation process of some active compounds, leading to a decrease in the cholesterol concentration in the chicken blood serum. The Cinnamon work to increase the effectiveness of the insulin hormone in ridding the body of the largest possible amount of glucose from the bloodstream, thus protecting the body from the accumulation of harmful glucose (14). It was clear from the results of the same table that the treatment of chicken feeding with Cinnamon gave a higher concentration of triglycerides (TC), which amounted to (120), compared with the normal feeding (MD), which gave an average of (109). The Cinnamon contain some antioxidant compounds that work to rid the body of free radicals and thus reduce fats in chicken blood serum (15), fed barley to chickens reduced triglycerides in chicken blood serum by (10.09%). Also, feeding with ginger also reduced the HDL coefficient,

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then the total cholesterol concentration was calculated according to the following equation: -

which amounted to (85) compared to the treatment of normal nutrition, which reached (81), While the barley feeding treatment of chickens gave the lowest average glucose (211), compared to the feeding treatment, which gave an average (288) and a reduction

rate of (36%). The reason for the increase in HDL acts as a catalyst in the increase in the activity of some enzymes (ADP), which works to transfer energy between muscles and store it, which is called the energy reservoir in the body of the organism (16).

(1-1)Effect of diets to which pomegranate, ginger and cinnamon peels were added on triglycerides and glucose in broiler chickens.

Parameters Groups	TG Mg/dl (mean+SD)	T.chole Mg/dl (mean+SD)	HDL Mg/dl (mean+SD)	Glucose Mg/dl (mean+SD)
barley	29	96	85	211
DM	80	109	81	288
pomegranate	23	79	83	232
Cinnamon	26	120	85	232
Ginger	45	104	82	219
P-value	0.008	1.005	0.0002	0.64
LSD	4.55	23.43	2.45	5.03

Productive traits results

Body weight average results

Table (1-2) shows the effect of adding some medicinal including herbs. barley. pomegranate peels, ginger, and Cinnamon, to the diet of broilers on the average weekly body weight, where it is noted that there is a significant difference in the average body weight in the first week of the pomegranate peels treatment compared with the control treatment, and the control treatment was the highest value of 178.53) g, followed by barley treatment, which amounted to 122.86 g, but in the second week only, a significant difference (p<0.01) was observed for the control treatment with ginger treatment, and the lowest value was 310.26), followed by the pomegranate treatment of and Cinnamon(312.10) (314.20).)Where there was a significant difference in all treatments compared with the control treatment. It was in the third week, where the treatment of students and ginger had the lowest value (696.67) (714.00) compared with the control treatment (1116.67). In the average body weight in the third week, the highest values were recorded in the fourth and fifth week of the control treatment (1544.10) (2293.67) compared with other treatments were 1423.33, 1445.10, 1400.67 and 1394.33, respectively, and the ginger treatment was the least valuable (1394.33).

Average weekly body weight ± standard error (gm)							
Treatments	7 days	14 days	21 days	28 days	35 days		
control treatment	178.53 ±4.71 a	511.46 ±12.18 a	1116.67 ±16.01 a	1544.10 ±14.16 a	2293.67±80.25 a		
barley treatment	122.86 ±0.82 b	413.46 ±62.77 b	764.60 ±52.70 b	1054.10 ±44.35 b	1423.33 ±51.34 b		
pomegranate peel treatment	116.40 ±1.66 b	312.10 ±2.96 c	722.13 ±19.23 b	1035.33 ±9.27 b	1445.10 ±4.37 b		
Cinnamon treatment	122.40 ±1.74 b	314.20 ±6.93 c	696.67 ±23.58 b	1024.53 ±2.44 b	1400.67 ±13.38 b		
ginger treatment	122.26 ±1.31 b	310.26 ±12.18 c	714.00 ±25.61 b	1034.00 ±47.10 b	1394.33 ±41.53 b		
significant level	**	**	**	**	**		
The averages with different letters within the same column differ significantly between $them(**P<0.01)$							

(1-2) The effect of the studied treatments on the rate of weekly weight gain

weight gain

Table 3-1 shows (statistical analysis data and the effect of some medicinal herbs, including pomegranate peels, ginger, and broilers' diet of broilers on the weekly and cumulative weight increase rate, as it was found that there was a significant difference (P<0.01). In the control treatment (2254.07) g/bird compared with treatments on the respectively 1383.73, 1405.5, 1405.5, 1361.07, and 1354.73 g/bird. The reason for the significant decrease in the average body weight in birds fed on a diet containing medicinal plants, including on barley, pomegranate peels, ginger, and Cinnamon. lipolytic starch and lipase (17)In addition to the fact that these substances contain effective compounds, which may be due to the presence of high percentages of steroidal saponins, which leads to loss of appetite and a decrease in the rate of food consumption as a result of the bitter and stinging taste of these compounds, which causes a decrease in the weight of the bird (18). It also has a role in lowering the form of fat in the blood of poultry, due to its ability to curb free radicals (19) and ginger has a direct role in fat metabolism and preventing high cholesterol by increasing the speed of the body's disposal of it with a decrease in the level of free fatty acids (20).

Weekly weight gain ± standard error (gm)							
Treatments	7 days	14 days	21 days	28 days	35 days	Total	
control treatment	±138.93 4.71	±332.93 7.58	±605.20 4.74	±427.43 23.20	±749.57 94.36	2254.07 80.25	
barley treatment	±83.26 0.81	±290.60 63.41	±351.13 100.79	±289.50 19.06	±369.23 12.71	1383.73 51.34	
pomegranat e peel treatment	±76.80 1.66	±195.70 2.88	±410.03 16.62	±313.20 22.58	±409.76 11.84	±1405.50 4.37	
Cinnamon treatment	±82.80 1.74	±191.80 8.55	±382.46 21.90	±327.86 26.00	±376.13 12.38	1361.07 13.38	
ginger treatment	±82.66 10.31	±188.00 11.91	±403.73 13.65	±320.00 22.17	± 360.33 6.11	±1354.73 41.53	
significant level	**	**	**	**	**	**	
The averages with different letters within the same column differ significantly between them(**P<0.01)							

 Table3: The effect of the studied treatments on the rate of weekly weight gain

feed consumption

Table (1-4) shows that there are significant differences at the level (P<0.01) about the effect of adding medicinal plants, including pomegranate and ginger peels, and those studying to the broiler diet on the average of weekly and cumulative feed consumption of birds in the experimental treatments and for weeks 5,4,3,2, 1 While there was a significant decrease (P<0.01) in the value of this trait at the fourth week of age in favor of the addition treatment of Cinnamon, which amounted to (1256.53 g / bird compared to the

control treatment, which amounted to (1367.5)g / bird As for the cumulative feed consumption, significant differences are noted in all treatments, compared to the control treatment for all weeks, compared to the control treatment. The decrease in the average of feed consumption in the fifth week of the ginger treatment was consistent with (21) which showed the reason for the decrease in the average of feed consumption when using ginger compared with the control treatment. The researcher (22) pointed out that ginger root belongs to the widespread medicinal herbs that are used to treat gastro-intestinal which include indigestion, disorders,

flatulence, dizziness and diarrhea. The antiseptic properties of ginger are very useful for gastro-intestinal disorders, including types of food poisoning (23). It was shown (24) that the oily plant extracts have a stimulating effect on the digestive system of animals and poultry in particular, as it improves the nutrients inside the small intestine, especially the ileum and works to increase the secretory activity of the pancreas to secrete the enzymes lipase, amylase.

Table 4	: The	effect of	of the s	studied	transa	ctions of	on the	weekly	feed	consumed	rate

Average amount of feed consumed, standard error (gm/bird)							
Treatments	7 days	14 days	21 days	28 days	35 days	Total	
control	±156.66	±630.80	±683.20	1367.5±	±1860.07	±4698.27	
treatment	0.08	10.28	2.27	5.36	8.14	15.63	
barley	±132.86	±630.80	±464.93	±1292.60	±1464.40	±3985.60	
treatment	1.44	12.79	13.00	28.98	21.53	44.86	
pomegranat	±142.63	±609.80	±425.73	±1317.73	±1492.47	±3988.37	
e peel treatment	3.90	17.50	39.99	16.28	7.53	56.70	
Cinnamon	±141.56	±602.73	±376.27	±1256.53	±1480.00	±3857.10	
treatment	7.21	3.90	53.78	8.53	4.91	54.56	
ginger	±155.46	±585.13	±368.33	±1258.60	±1480.53	±3848.07	
treatment	0.27	34.30	25.26	23.33	13.33	19.30	
significant level	**	N.s	**	**	**	**	
The averages with different letters within the same column differ significantly between them(**P<0.01)							

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