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EFFECTS OF DIETARY INCORPORATION OF DIFFERENT LEVELS OF ROSELLE (*HIBISCUS SABDARIFFA*) SEEDS ON CARCASS CHARACTERISTICS AND MEAT PHYSIOCHEMICAL OF BROILERS

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ABSTRACT

The study aims to assess the effects of dietary Inclusion of different Levels of Hibiscus seeds on carcass characteristics, meat physiochemical and fatty acids profile of Broilers. The Roselle (*Hibiscus Sabdariffa*) seeds were incorporated in broiler rations at levels of k0 (0%), k3(3%), k5 (5%), and k7 (7%). The experimental diets were formulated iso –energetic and iso-nitrogenous to meet or exceed the requirements of broilers according to (NRC, 1994). The experiment was carried out in a complete randomized design. A total of 120 one day-old (Ross308) broilers were allocated to the four treatments K0 (control), K3, k5 and k7) and each treatment was further divided randomly into three replicates with ten birds each. At the end of the experiment, two birds from each experimental unit were selected according to their closeness to the average weight of birds in a particular pen and slaughtered. Carcass weight, weights of some internal organs and cuts were measured. Samples from pectorals muscle major and minor parts were used for assessing the chemical and physical properties of the meat. All data were statistically analyzed using ANOVA. The results showed that there was a significant difference ($P \leq 0.05$) of the final carcass weigh. There were no significant ($p > 0.05$) differences in the carcass cut traits among treatments. Chemical properties of meat were affected significantly ($p \leq 0.05$) by dietary incorporation of different levels of roselle (Hibiscus sabdariffa) seeds on in contrast, the physical properties were not affected. Dietary Inclusion of different Levels of Hibiscus Seeds improved thigh weight, Moisture, crud protein, Ash and NFE Therefor, it is recommended to include Roselle seeds up to up to 3% without negative effects in broiler ditets.

KEYWORDS: Roselle Seeds, Carcass Characteristics, Meat Physiochemical broilers.

INTRODUCTION

The poultry industry has important role to play in many parts of the world as the most economical source of protein. The white meat includes a great number of domestically produced birds as poultry, ostrich, ducks, turkeys, and geese.[1] Poultry production contributes human nutrition and food security by being a leading source of high quality protein form as meat and eggs.[2] Poultry feed costs about 65-70% of the total variable costs of the poultry industry. Feed additives are assuming a position of prime importance in poultry nutrition for promoting growth and production. Alternative protein sources could play a role in areas where conventional sources are scarce and expensive .A promising alternative crop that can be exploited for this purpose is Roselle (*Hibiscus Sabdariffa*) seeds are known as highly nutritional and antibacterial.[3] native to India and Malaysia, *H. sabdariffa* is also widely available and must have being carried to Africa in early times.[4] Roselle plants are suitable for tropical and sub-tropical climate.[5] Roselle seeds is so rich that in organic acids, minerals, amino acids, carotene, vitamin C.[6,7] Roselle, also know sorrel, Mesta and Kerkrade is a popular plant in Middle Eastern countries.[8,9]

Hibiscus sabdariffa L. (Roselle) belongs to the Malvaceae family which is widely grown in many countries [10] , hypocholesterolemic.[11] antioxidative.[12] effects in animals. Roselle seeds have been used as a source of protein for broiler chicken production by many researchers like.[13,14,15,16] who reported that Roselle seeds can be used in broiler rations without deleterious effect.[17] showed a linear increase in feed intake and suggested that Roselle seed has no effect on feed intake when fed (5, 10, 15 or 20%) level on layer performance.

MATERIALS AND METHODS

Experimental site

This experiment was carried out at Extension and Rural Development Centre, Faculty of Animal Production, University of Gezira Elmanagil, Gezira State, Sudan.

Birds housing and management

The birds were brought from commercial hatchery , birds were kept in an open-sided house situated on east west direction, making the long axis facing North and south wind. The housing system used was deep litter system. The dimensions of the house were length (21 meters), width (6 meters) and the height of each longitudinal side was (3meters) with an 80-centimeter height of bricks wall and the rest of the area was made of wire mesh. The roof and the walls were painted with white paint to reflect the solar radiation The floor was made of concrete and it was covered with thick layer of sawdust to remain always dried, the roof was made of corrugated iron sheets. The house was cleaned, burned and sprayed with Cypermethrin 10% E.C. (2ml/l). The feeder and drinker were also washed and disinfected three days before the arrival of the birds and they were cleaned daily throughout the experimental period. The house was divided into 12 pens. The dimensions of each pen were(100cm) length, (100 cm) width was (100cm and (90 cm) height. Each pen contained ten chicks, one metallic tubular feeder and one plastic drinker. Fresh water and feed were supplied throughout the experimental period. The drinkers were cleaned daily. The birds were exposed to natural light during the day and the light bulb lamp during the night. The lamp of 60 watts was used as a brooder to supply heat to the birds during the first two weeks by hanging them at 30 cm height, and then hanged at one-meter height to supply light during the night. The electrical appliance was checked and switched on few hours before the arrival of the birds. The house was covered with plastic curtains to remained warmth. One hundred and twenty (120) one- day old Ross308 classic strains of broiler chicks were selected from commercial broiler flock in the farm. The birds were mixed sexes

and the average weight for experimental birds about (45 ±2) gram. To protect birds against Newcastle disease (N.D.) and infectious bronchitis (I.B.) dual dose at seven and twenty-one days of age using I.B. Colon 30. The birds were vaccinated against Gambro using Gumbo Best vaccine at fifteen and twenty-eight days old. All vaccines were offered via drinking water.

Experimental diet

Collection and Preparation Roselle seeds were collected from Elmanagil market. Roselle seeds were cleaned and milled by electrical miller, and sample of Roselle seed flour (RSF) was taken for the Proximate analysis (Table 1). According to the results of the proximate analysis, four experimental diets were formulated to meet the requirements of broiler chicks according to NRC.[18]

Table 1: Proximate Analysis of Roselle Seeds.

Parameters%	Moisture%	Dry ater%	Crude protein%	Ash%	Ether extract %	Crude fibre%	NFE%
Roselle	7.4	92.6	29.67	4.4	16.67	15.27	26.06

Table 2: Chemical Analysis and Nutrients Composition of Rations Containing Deferent Levels of Roselle Seeds.

Parameters	Treatments			
	K0%	K3%	K5%	K7%
Dry matter (%)	96.50	94.50	95.50	96.75
Crude protein (%)	22.75	22.85	22.90	22.95
E.E (%)	3.35	3.25	3.35	3.30
NFE (%)	61.50	58.60	59.35	61.10
Crude fiber (%)	3.95	4.15	4.05	4.25
Ash (%)	4.75	5.65	4.05	4.25

Table 3: Composition of experimental diets (%As Fed) containing different levels of Roselle Seeds during starter period (1-3weeks).

Ingredients	Treatments			
	K 0%	K 3%	K 5%	K 7%
Sorghum	57.88	57.18	56.16	55.09
Groundnut meal	34.50	32.43	31.40	30.40
Wheat bran	0.10	0.00	0.00	0.00
Roselle seeds	0	3	5	7
Super concentrates	5.00	5.00	5.00	5.00
Di calcium	0.72	0.72	0.72	0.72
Grits	0.30	0.30	0.30	0.30
Na cl	0.25	0.25	0.25	0.25
Lysine	0.50	0.50	0.50	0.50
Methionine	0.10	0.10	0.10	0.10
Vegetable Oil	0.40	0.27	0.32	0.39
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Protein %	22.91	22.83	22.87	22.92
ME(Kcal/kg	3197.64	3190.38	3190.03	3198.64

Table 4: Composition of experimental diets (%As Fed) containing different levels of Roselle Seeds during Finisher period (3-6weeks).

Ingredients	Treatments			
	K 0%	K 3%	K 5%	K7%
Sorghum	57.88	57.18	56.16	55.09
Groundnut meal	26.50	24.70	23.40	22.40
Wheat bran	8.10	7.50	7.82	7.89
Karkade seeds	0	3	5	7
Super concentrates	5.00	5.00	5.00	5.00
Di calcium	0.72	0.72	0.72	0.72
Grits	0.30	0.30	0.30	0.30
Na cl	0.25	0.25	0.25	0.25
D-Lysine	0.50	0.50	0.50	0.50
L- Methionine	0.10	0.10	0.10	0.10
Vegetable Oil	0.40	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Protein %	20.57	20.53	20.50	20.56
ME(Kcal/kg	3229.02	3233.51	3231.51	3228.19

[1]*Super concentrate contained 37% protein, 10% Moisture, 4% Fat, 28% Ash, 7% fiber.*

vitamin = mineral premix provided the following per kilogram of diet: vitamin (retinyle acetate), 10.000IU; cholecalciferol, 2.500IU;" tocopheryl acetate, 60 mg; mendione sodium bisulfide complex, 15mg; thiamine hydrochloride, 2 mg; riboflavin, 8 gram pyridoxine hydrochloride, 4 mg; cyanocobalamin., 04 mg; pantothenic acid 15 mg; nicotinic acid, 40 mg folic acid 1.5 mg;

biotin, mg; choline chloride, 200mg; iron, 50 mg; manganese, 50 mg; copper, 10 mg; zinc, 50 mg; calcium352 mg; iodine, 1.46 mg; cobalt. 5 mg; selenium. 2 mg; values and Metabolizable energy .

Experimental Deign

The experimental period was divided into starter and finisher phases. The first phase is starter (1-3 weeks) and finisher (4-6 weeks). In completely randomized design, four dietary inclusion of Roselle seedsk0 (0%), k3(3%), k5 (5%), and k7 (7%), were adopted as treatments and replicated three times with ten birds each. The experimental diets were formulated iso-energetic and iso-nitrogenous to meet or exceed the requirements of the Roselle according to 18. Tables (2)and(3) showed the diets composition of the starter and finisher periods.Three levels of Roselle seeds were incorporated with other ingredients as an alternative protein source as follows: k0 diet was 0% (control), k3 diet was 3%, k5 diet was 5%, and k7 diet was 7%. The birds had free access for feed and water throughout the experimental period.

Slaughter performance

At the end of the experimental period two birds from each experimental unit (replicate) were selected according to their closed average weight to their respective group. Birds were subjected to overnight feed withdrawal. They were slaughtered according to the Islamic traditions by Jugular veins serving. The slaughtered birds were dipped into hot water (70ºC-80ºC), manually scalded (de-feathering) and eviscerated. The head and legs were removed and hot carcasses weighted was obtained and then stored one bird at 1Cº. Each other bird was eviscerated and the weight of carcass cuts (chest, thigh, drum stick and wing).

Meat Characteristics

Water Holding Capacity (WHC)

The water holding capacity was determined according to the method described with.[19]

Cooking Loss

Cooking loss was determined according to the method described with.[20]

Chemical composition

Proximate analysis of Roselle seeds and pictorials muscle

Samples of Roselle seeds, thigh and pictorials muscle were subjected to proximate analysis at laboratory of Animal nutrition for the International Laboratory Centre in Soba. Dry matter, (D.M.), crude protein (C.P.), fat, crude fiber (C.F.) and ash content were determined according to.[21] Accordingly, were included to form experimental diets.(Table1).

RESULTS

Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler Live Body Weight and Cut Carcass

Table 5 showed the effect of inclusion of different dietary levels of Roselle by 3%, 5% and 7% as a source of protein on broiler final body weight, weight of carcass and cuts. The weights of body and the carcass of birds fed on diets contained Roselle were lower than those fed on control diets (P≤0.05) of the final carcass body weight.

Table 5: Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler live weight, the body weight of the carcass and the commercial parts.

Parameter	Treatment				SE	Sig
	K0%	K3%	K5%	K7%		
Live weight (%)	2950.83[a]	2880.83 [a]	2468.33[b]	2429.17 [b]	106.97	*
Carcass	2335.00[ab]	2045.00 [a]	1830.00 [b]	1790.00 [b]	97.40	*
Carcass(%)	75.50	75.50	75.50	73.28	1.59	NS
Drumstick%	10.41	9.26	10.64	11.30	0.87	NS
Thigh%	13.21	12.12	12.74	10.87	1.06	NS
Breast%	26.39	29.91	27.00	25.50	1.43	NS
Wings(%)	8.13	6.65	7.44	7.85	0.38	NS
Back(%)	14.24	13.18	13.68	14.42	1.30	NS
Neck(%)	2.88	3.49	3.76	3.34	.21	NS
Head& feet(%)	6.09	5.36	6.06	6.74	.59	NS

*a-b means values within rows with no common superscripts are significantly different (P≤0.05). *: significantly. NS= not significant.*

Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler Meat characteristics

The result of the physical properties of different samples of poultry pictorials muscles which collected from different treatments, 3%,5% and 7% and Control (0%) was shown in Table 6.

Water Holding Capacity (WHC)

Table 6 shows that there were no significant (P>0.05) differences among treatments in WHC and the highest values were given by 3% (1.66), followed by Control 0% (1.53) and7% (1.43). However, (5%) shows the lowest value (1.30). recorded numerically increase of percentage, compared to the chicks fed control diet and the other tested groups.

Cooking Loss

The table (6) shows that there were no significant (P<0.05) differences among treatments in cooking loss and the highest values were given by 3% (22.00), followed by 7% (21.00) and5% (20.00). However, Control 0% shows the lowest value (17.80).

pH

The table (6) shows that there were no significant (P<0.05) differences among treatments in PH and the highest values were given by 7% (6.6), follow by 3% (6.5), follow by 5% (6.4). However, Control 0% shows the lowest value (6.3).

Table 6: Effect of Dietary Inclusion of Different Levels of Hibiscus (Karkade) Seed on Broiler Meat characteristics.

Parameters	Treatments				S.E	Sig
	K0%	K3%	K5%	K7%		
WHC	1.53	1.66	1.30	1.43	0.14	Ns
Cooking loss	17.80	22.00	20.00	21.00	0.91	Ns
pH	6.3	6.5	6.4	6.6		Ns

NS= not significant,

Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler MeatChemical Composition

The result of the chemical properties of different samples of poultry thigh, major Pictorials and minor Pictorials muscles which collected from different treatments, 3%,5% and 7%and Control (0%) with different cuts were shown in table(7).

Moisture

The average values of Moisture percentage shown in Table (7) This study showed significant *P≤0.05* differences among the treatments for moisture content. The highest value of moisture recorded with 3%(72.833), followed by Control 0% (75.500), followed by 7% (72.017). However, 5% shows the lowest value (69.167). while Moisture percentage in Thigh, major pictorials muscle and minor Pictorials were significant *P≤0.05* the highest value of moisture recorded with Thigh (74.750), followed by major Pictorials (72.638). However, shows minor Pictorials had record the lowest value (67.500).

Protein content

The average values of CP percentage shown in Table (7) This study showed significant *P≤0.05* differences among the treatments for CP content. The highest value of CP recorded with 5%(18.950), followed by Control 0% (18.633), followed by 3% (18.350). However, 7% shows the lowest value (18.317). while CP percentage in Thigh, major Pictorials and minor Pictorials were significant *P≤0.05* the highest value of CP recorded with Thigh (19.000), followed by major Pictorials (18.625). However, shows minor Pictorials had record the lowest value (18.063).

Ether extract content

The average values of EE percentage shown in Table (7) This study showed significant P*≤0.05* differences among the treatments for EE content. The highest value of EE recorded with Control0% (5.150), followed by 5% (5.017), followed by 7% (4.867). However, 3% shows the lowest value (4.783). while EE percentage in Thigh, major Pictorials and minor Pictorials were significant *P≤0.05* the highest value of EE recorded with major Pictorials (5.325), followed

by minor Pictorials (4.863). However, shows Thigh had record the lowest value (4.675).

Ash

The average values of Ash percentage shown in Table (7) This study showed significant P≤*0.05* differences among the treatments for Ash content. The highest value of Ash recorded with5% (2.083), followed by Control 0% (1.963), followed by 3% and 7% both the lowest value (1.917). while Ash percentage in Thigh, major Pictorials and minor Pictorials were significant *P≤0.05* the highest value of Ash recorded with Thigh (2.275), followed by major Pictorials (2.125). However, shows minor Pictorials had record the lowest value (1.525).

Dry matter

The average values of DM percentage shown in Table (7) Thisstudy showed significant P≤*0.05* differences among the treatments for DM content. The highest value of DM recorded with 5%(30.833), followed by 7% (27.833), followed by Control 0% (27.500). However, 3% shows the lowest value (27.167). while DM percentage in Thigh, major Pictorials and minor Pictorials were significant *P≤0.05* the highest value of DM recorded with minor Pictorials (32.500), followed by major Pictorials (27.250). However, shows Thigh had record the lowest value (25.250).

NFE

The average values of NFE percentage shown in Table (7) This study showed significant P≤*0.05* differences among the treatments for NFE content. The highest value of NFE recorded with 3% (47.783), followed by 7% (47.067) and Control 0% (46.733). However, 5% shows the lowest value (43.117). while NFE percentage in Thigh, major Pictorials and minor Pictorials were significant *P≤0.05* the highest value of NFE recorded with Thigh (48.800), followed by major Pictorials (46.675). However, shows minor Pictorials had record the lowest value (43.050).

Table 7: Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler meat cuts chemical composition.

Parameter	Treatment												SE	Sig
	Thigh				Major Pectorals				Mine Pectorals					
	K0	k3	k5	k7	K0	k3	k5	k7	K0	k3	k5	k7		
Moisture	75.50 ^{a}	76.50 ^{a}	72.50 ^{a}	74.50 ^{a}	73.50 ^{b}	75.50 ^{b}	70.50 ^{b}	71.05 ^{b}	68.50 ^{c}	66.50 ^{c}	64.50 ^{c}	70.50 ^{c}	.315	**
CP	19.10 ^{a}	18.75 ^{a}	19.35 ^{a}	18.80 ^{a}	18.70 ^{b}	18.35 ^{b}	19.05 ^{b}	18.40 ^{b}	18.10 ^{c}	17.95 ^{c}	18.45 ^{c}	17.75 ^{c}	.043	**
EE	5.05 ^{c}	4.75 ^{c}	4.65 ^{c}	4.25 ^{c}	5.55 ^{a}	5.10 ^{a}	5.35 ^{a}	5.30 ^{a}	4.85 ^{b}	4.50 ^{b}	5.05 ^{b}	5.05 ^{b}	.038	**
Ash	2.25 ^{a}	2.25 ^{a}	2.35 ^{a}	2.25 ^{a}	2.15 ^{b}	2.05 ^{b}	2.25 ^{b}	2.05 ^{b}	1.55 ^{c}	1.45 ^{c}	1.65 ^{c}	1.45 ^{c}	.029	**
DM	24.50^{c}	23.50 ^{c}	27.50 ^{c}	25.50 ^{c}	26.50 ^{b}	24.50 ^{b}	29.50 ^{b}	28.50 ^{b}	31.50 ^{a}	33.50 ^{a}	35.50 ^{a}	29.50 ^{a}	.284	**
NFE	49.10 ^{a}	50.75 ^{a}	46.15 ^{a}	49.20 ^{a}	47.10 ^{b}	50.00 ^{b}	43.85 ^{b}	45.75 ^{b}	44.00 ^{c}	42.60 ^{c}	39.35 ^{c}	46.25 ^{c}	.264	**

*a-b means values within rows with no common superscripts are significantly different (P≤0.05). **=high significantly*

DISCUSSION

According to the results mentioned in table (5)

The current results agreed with the findings of.[22,13] who reported that the weight of the chickens (expressed as percentage of live weight and carcass cut) was significantly affected by the dietary treatments Head, Feet, Neck weight, Back, Wings, Drumstick, Breast and Thigh were not significant (P> 0.05) affected by Roselle seed inclusion in broiler rations. The current results agreed with the findings of.[13] who mentioned that there were no significant (p >0.05) differences observed among the treatments for feet, back, wings, drumstick and breast. And disagree with same author when reported that there were significantly (p<0.05) for head weight, thigh weight and Neck weight.

As the results in table (6) showed physical properties the Cooking loose results agree to.[13] who reported the cooking loss of the meat samples was not significantly ($p<0.05$) different between dietary treatment containing Roselle seeds and control diet

The Effect of Dietary Inclusion of Different Levels of Hibiscus Seeds on Broiler meat cuts chemical composition as the results in table (7) showed generally meat chemical composition is shown in (moisture, dry matter crude protein, ether extract a n d a s h) there was significant ($P\leq 0.05$). This result dis agreed to.[23], who reported that there was not significant deference among dietary treatment containing Roselle seeds and control diet. On the other hand significant($P\leq 0.05$) deference in meat cuts result agree with [13] who observed that weight yield of carcass and cut-up parts were significantly affected by the dietary treatments particularly in terms of thigh weight.

CONCLUSIONS

Dietary Inclusion of different Levels of Hibiscus Seeds improved Thigh weight, Moisture, crud protein ,Ash and NFE Therefore, it recommended Roselle seeds can be used in broiler rations without deleterious effect up to 3% in broiler diets.

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