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THE EFFECT OF EARLY FEED DILUTION WITH HAY POWDER ON SOME PRODUCTIVE TRAITS OF BROILERS

Ibrahim F.B. Al-Zamili[1], Hassan F.A. Al-Ziyadi[2], Ahmed A.G. Attia[3] and Jassim K.M. Al-Gharawi[1]

[1]Animal Production Department, Agriculture College, Al-Muthanna University, Iraq.
[2]Al-Muthanna Agriculture Directorate, Ministry of Agriculture, Iraq.
[3]Dhi Qar Agriculture Directorate, Ministry of Agriculture, Iraq.

Abstract

The experiment aimed to study the effect of dietary reduction at an early age, using hay powder during the second and third weeks of the bird's life on the productive performance of broilers. A total of 240 broiler (ROSS 308), one day age, were randomly distributed to four treatments; the first treatment (control treatment), as for the second, third and fourth treatment, its chickens were exposed to nutritional restriction by using fodder diluted with hay powder by 7%, 14% and 21%, respectively. The results of the experiment indicated that there was compensatory growth for birds in the first and second treatments, as body weight rates converged with the average body weight for control treatment at the age of 35 days, whereas, the average body weight in the third dilution treatment decreased compared to the comparison treatment at the same age, early feed restriction treatments showed a significant decrease on the mortality compared to the control treatment, with a significant decrease in the food conversion factor and the production index in the third treatment compared to the rest of the treatments.

Key words: early feed dilution, hay powder, productive, broilers.

Introduction

The great development that occurred in the speed of growth and the global transformative efficiency of converting fodder to meat in modern broiler breeds, the result of the efforts made by specialists in the processes of intense genetic selection, as well as feeding that meets the needs of birds of different nutrients, correct management of the herd during the rearing period (Hammoudi *et al*., 2001), however, this rapid growth in broiler meat negatively affected its immune response (Qureshi and Havenstein, 1994), because there is a negative genetic correlation coefficient between the growth rate and the immune response, search for solutions to break this negative correlation between immunity and growth, which led to a high rate of mortality in strains of broilers, because had illnesses like Ascites, sudden death syndrome and skeletal abnormalities (Julian, 2005). By reducing the speed of growth in the early ages of broilers and expedite the advanced ages, as there were no conditions for growth to compensate the bird for what was lost during the period of slow growth, the occurrence of the so-called Compensatory Growth, which happens after the food rationing period (Naji *et al*., 2003), There are many nutritional rationing programs used to achieve this, such as the Diet Dilution Program with non-digestible materials such as sawn wood and sand or with low-digesting materials such as wheat bran, date kernel powder and dried green bark crust powder (AL- Gharawi *et al*., 2018; AL- Zamili *et al*., 2018). The experiment aimed to study the effect of early nutritional rationing by providing dried rations of hay powder with ratios of 7, 14 and 21% in the diet of the starter and feeding them at the age of 7-21 days and determine the effect on compensatory growth and productive performance.

Materials and Methods

This study was conducted in the poultry field, Department of Animal production, College of Agriculture, Al-Muthanna University, from 5/12/2018 to 10/1/2019, a total of 240 unsex one day-old chicks (ROSS 308) broiler, each treatment included 60 chicks with three replicates (20 chicks / replicate), to know the effect of fodder reduction with hay powder on the productive characteristics of broilers.

The chicks were reared in three-storey batteries, each capacity of 1.5×1m. The study treatments were as follows:

1. First treatment (T1):- Control (without dilution of hay powder).

2. The second treatment (T2): The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days.

3. The third treatment (T3): The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age.

4. Fourth Treatment (T4): The control diet of hay powder was reduced by 21% from 7-21 days of age.

The feed materials used in the experiment, purchased from the local market, produced by Ghadeer Babel Company / Private sector, contains fodder formulation according to the required proportions for the needs of broilers, as for the treatments of the early nutritional rationing, attended, providing a quantity of fine hay powder free from impurities and foreign objects, sifted with a fine sieve with a diameter of 2 mm, then it is relaxed by exposing it to sunlight, then weigh 100 kg of the standard diet, took 7 kg of it and replaced it with 7 kg of powdered fine hay powder, mix thoroughly with a feed mixer until the mixture is completely homogeneous, reduced bush to reduce 7% hay powder, in the same way, the rest of the treatments were prepared in the form of reduced diets 14% and 21% hay powder, the chicks weighed one day old and weighed an average of 40 g, weight per week until the end of the experiment (35) days, likewise, the amount of feed consumed, the weight gain and the food conversion factor were calculated and the mortality over the length of the experiment, at the end of the experiment, the values of the PL (Production Index) were calculated, according to Al-Gharawi *et al.,* (2018b). Completely Randomized Design (CRD) was used to study the effect of different treatments on the studiedtraits, comparison of the mean differences between themeans of the Duncan, (1955) multiples test under a significant level of 0.05 and 0.01, SPSS, (2010) was used in statistical analysis.

Results and Discussions

Table 1, shows the effect of fodder dilution with hay powder aged 7-21 days on the average weekly live body weight (g), as the result indicates that there were no significant differences in the first week between all treatments, at the second week, a significant increase ($P \leq 0.05$) appeared in the control treatment compared to the rest of the treatments in the experiment, weights for T1, T2, T3 and T4 treatments were (387.30, 365.30, 351.40 and 337.70 g), respectively. The reason for this significant decrease in the dilution treatments for the start of food rationing therein, they have poor feeds for low-energy birds and protein to dilute with hay powder (AL-Zamili *et al*., 2018). The significant decrease in the weights rates for the mitigation treatments continued during the third week, for continued nutritional rationing, as for the fourth week, no significant differences appeared between T1, T2 and T3 treatments in weights except for T4, showed a significant decrease in the weight ratio compared to the rest of the treatments. The reason for the decrease in weight ratio was explained by the dilution treatments, to the low energy and protein content in the diet that the birds fed this treatment, as a result of increased dilution rate by hay powder, this affected her failure to reach full compensatory growth, so it gave significantly less weight compared to the rest of the treatments, as for the fifth week, the significant differences between the weight rates between all treatments disappeared, to remove the effect of dietary rationing in the special week, give close weights between all treatments.

Table 2, shows the effect of feed dilution with hay powder at an early age on the rate of weekly weight gain (g), there were no significant differences at the first week among all treatments, whereas, a significant decrease ($P \leq 0.05$) was observed in the rate of weight gain in food dilution treatments during the second and third week

Table 1: Effect of feed dilution with hay powder (7-21 days) on weekly body weight (g) of broiler (Mean ± Standard Error).

Treatment	Age (week)				
	First	Second	Third	Forth	Fifth
T1	1.28±132.85	4.36±387.30a	6.10±747.65a	8.10±1124.70a	11.30±1779.60
T2	1.35±133.35	10.50±365.30b	7.30±693.05b	7.25±1121.60a	13.15±1778.85
T3	1.50±132.60	15.30±351.40c	10.80±653.85c	12.5±1116.90a	16.70±1783.86
T4	1.57±131.30	16.90±337.70d	17.85±616.55d	21.60±1096.80b	23.10±1780.35
Sig.	N.S	*	*	*	N.S

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

Table 2: Effect of feed dilution with hay powder (7-21 days) on weekly weight gain (g) of broiler (Mean ± Standard Error).

Treatment	Age (week)					
	First	Second	Third	Forth	Fifth	Cumulative
T1	1.25±93.85	6.50±254.45a	7.25±.360.35a	2.85±377.05d	10.15±654.40	8.10±174.06
T2	1.50±94.35	3.75±231.65b	8.35±327.75b	5.50±428.55c	11.40±657.25	7.50±1739.85
T3	1.80±93.60	11.40±218.80c	6.50±302.45c	9.20±463.05a	13.10±66.96	6.95±1740.86
T4	1.95±92.30	16.80±206.40d	10.25±278.65d	11.20±480.45a	16.30±683.55	13.50±174.35
Sig.	N.S	*	*	*	N.S	N.S

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

compared to the control treatment for the start of the food rationing program, as the diets fed by birds were low in their level of nutrients necessary for sustaining and growth such as energy and protein, because these treatments were diluted with hay powder, leads to reduce nutrients in the leech and not meet the requirements of broiler meat, but only to maintain (Sharma *et al*., 2012; Al-Gharawi *et al*., 2018a; Al-Jayashi, 2019). At the fourth week, a significant increase was observed in the hay powder reduction treatments compared to the control treatment, compensatory growth in the birds of these treatments, because the food rationing period has ended and the birds return to free feeding, as for the fifth week and the cumulative weight increase from 1-35 days, no significant differences appeared between all the dilution treatments and the control treatment, because full compensatory growth occurred during the weeks following the food rationing period and the birds returning to feeding and compensate the birds for the lost growth in the food rationing period.

Table 3, shows the effect of feed dilution with hay powder with the average daily feed consumption (g) for broiler, as the table indicates that there were no significant differences in the first week among all treatments in the experiment, at the second and third week, a significant decrease ($P \leq 0.05$) was observed in all dilution treatments compared to the control treatment and the appearance of significant differences between the dilution treatments, the decrease was increased as the dilution rate in the diet increased, this difference was attributed to the rate of feed consumption in the powdered transactions of hay powder, to the high percentage of fiber and cellulosic materials, due to the increase in the percentage of hay powder, which leads to a volumetric increase in the amount of feed intake, gives the bird a sense of contentment and satiety with a small weight of feed, which does not meet the requirements of the nutrients necessary and essential for sustainability and growth, because hay powder was low in nutrients, including energy and protein and thus influence the amount of growth the bird gives, as well as the birds not accepting feed to increase the proportion of hay powder (Hassanabadi and Moghaddam, 2006; Khudair and Ibrahim, 2010); AL-Zamili *et al*., 2018). As for the fourth week, there was a significant increase ($P \leq 0.05$) in the feed consumption rate in the food mitigation treatments compared to the control treatment, with the significant differences between the same dilution treatments, this significant increase in the feed consumption rate is explained by the dilution treatments, for the end of the term of food rationing and to start free feeding, therefore, the birds resorted to eating larger quantities of fodder in an attempt to compensate for the lost growth during the rationing period, reach full compensatory growth in the period following the severe

Table 3: Effecrt of feed dilution with hay powder (7-21 days) on weekly feed consumption (g) of broiler (Mean ± Standard Error).

Treatment	Age (week)					
	First	Second	Third	Forth	Fifth	Cumulative
T1	3.50±147.58	8.10±437.65a	7.20±630.61a	10.20±667.37d	8.15±1150.83	16.40±3034.04
T2	2.50±150.15	9.30±417.5b	12.90±596.50b	13.5±728.53c	11.70±1170.47	18.20±3033.16
T3	3.10±150.50	11.80±406.96c	7.18±568.60c	15.25±766.44b	12.80±1147.17	20.25±3045.75
T4	4.55±148.64	13.20±390.80d	10.40±548.20d	20.50±796.57a	15.40±1164.57	22.20±3048.78
Sig.	N.S	*	*	*	N.S	N.S

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

Table 4: Effecrt of feed dilution with hay powder (7-21 days) on feed conversion (g diet/ g weigh gain) of broiler (Mean ± Standard Error).

Treatment	Age (week)					
	First	Second	Third	Forth	Fifth	Cumulative
T1	0.01±1.51	0.02±1.72b	0.03±1.75b	0.04±1.77	0.03±1.78	0.01±1.74
T2	0.02±1.52	0.04±1.80ab	0.04±1.82ab	0.04±1.70	0.02±1.72	0.01±1.74
T3	0.01±1.51	0.03±1.86a	0.02±1.88a	0.03±1.72	0.02±1.72	0.02±1.75
T4	0.02±1.52	0.03±1.89a	0.04±1.96a	0.04±1.73	0.04±1.75	0.03±1.75
Sig.	N.S	*	*	N.S	N.S	N.S

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

food rationing period, however, these significant differences in the feed consumption rate in the fifth week and in the cumulative feed consumption rate have vanished, feed intake became close to all treatments in the study.

Table 4, indicates the effect of fodder dilution with hay powder on the weekly feed conversion, no significant differences emerged between all treatments in the experiment during the first week, as for the second and third week, there was a significant deterioration in the nutritional conversion factor for the dilution treatments in the hay powder compared to the control treatment with the appearance of significant differences between the dilution treatments. Explain the deterioration in the nutritional conversion factor for dietary dilution treatments, due to the high percentage of fibers and cellulosic materials, the higher the ratio of dilution of hay powder in the diet, which affects the efficiency of digestion and absorption of feedstuff due to the low nutritional value of hay powder, as it is low from many nutrients necessary and essential for sustaining and growth, including energy and protein, this affects the food conversion factor, considering that the growth that occurs in the bird's body is one of the main pillars upon which it depends in calculating the food conversion factor (Al-Gharawi *et al*., 2018a; Zamili *et al*., 2018). At the fourth and fifth week, there were no significant differences between all treatments in the experiment, to eliminate the effect of food rationing and the return of birds to free feeding, as for the cumulative conversion factor (1-35) days, there were no significant differences between all the treatments, no difference in conversion factor is explained after the nutritional rationing period, to eliminate the effect of food rationing, birds showed a similar food conversion factor in all treatments.

Table 5, shows that there was a significant decrease ($P \leq 0.05$) on the mortality in early food dilution treatments during the food rationing period at the age of 1-21 days compared to the control treatment, the reason may be due to the high rate of mortality in the groups of birds belonging to the control treatment, to the rapid growth and increase the appetite of birds to eat fodder because the birds are in a state of free feeding, this increased the need for oxygen, increased heart rate and increased

Table 5: Effect of feed dilution with hay powder (7-21 days) on total mortality (%) of broiler (Mean ± Standard Error).

Treatment	Age (day)		
	1-21	22-35	1-35
T1	1.66±8.33a	1.66±5.00	3.33±13.32a
T2	1.66±3.33b	1.66±3.33	3.32±6.66b
T3	1.66±3.33b	1.66±3.33	3.32±6.66b
T4	1.66±3.33b	1.66±3.33	3.32±6.66b
Sig.	*	N.S	*

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

Table 6: Effect of feed dilution with hay powder (7-21 days) on production index of broiler (Mean ± Standard Error).

Treatment	Production index
T1	12.56±263.02 b
T2	16.23±278.98 a
T3	13.67±276.70 a
T4	15.14±271.31 a
Sig.	*

T1: Control (without dilution of hay powder); **T2**: The control diet of hay powder was reduced by 7% and was given to chicks aged 7-21 days; **T3**: The control diet in the hay powder was reduced by 14% and was given to chicks from 7-21 days of age; **T4**: The control diet of hay powder was reduced by 21% from 7-21 days of age. * The different letters within the same column indicate significant differences between the mean at the probability level of 0.05. N.S: Non-significant.

pressure on the work of the heart, leads to the heart's inability to supply the oxygen needs of the bird, then the birds are prepared for sicknesses and high mortality in control birds. Many researchers pointed out that the modern strains of broiler chicks were characterized by high growth speed and good efficiency in converting food into growth, but this growth has had negative consequences for the immune response, as it decreases with increasing growth and thus increasing the chance of disease injuries and then increasing the diseases and increased the mortality (Khudair and Ibrahim, 2010). As for the mortality from the age of 22 to 35 days, there were no significant differences between all treatments, whereas, a significant increase ($P \leq 0.05$) on the mortality in control treatment compared to all dilution treatments, because the cumulative effect of mortality has appeared in the initiator stage along the trial period, therefore, the significant increase on the mortality in the control treatment was observed compared to the different mitigation factors at the end of the experiment.

Table 6, indicates the effect of feed dilution with hay powder at an early age on the production index values for broilers, a significant increase ($P \leq 0.05$) was observed in the productive index values in all feed dilution treatments compared to the control treatment, the reason for the production index values for the dilution treatments may be due to the control treatment, to the high rate of mortality in the treatment of control, which reduced the value of the production manual in the control treatment, because calculating the mortality in one of the criteria on which it depends when measuring the production index, therefore, the significant increase in the mortality in the control treatment was observed compared to the different dilution treatments at the end of the experiment.

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