Plant Archives Vol. 20, Supplement 2, 2020 pp. 306-310 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

THE EFFECT OF USING DIFFERENT DENSITIES OF REARING ON THE PRODUCTIVE PERFORMANCE OF ROSS 308 BROILER

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Abstract

This study was carried out for the period from 7/5/2018 to 12/5/2018 in the poultry field of the Animal Production Department at the College of Agriculture, Al-Qasim Green University. To know the effect of using different densities of rearing on the productive performance of Ross 308 meat broiler, and the results were a significant superiority ($P < 0.05$) in each of the two treatments (T_1 and T_2) density (12 and 14) in the characteristics of live body weight and weight gain at the fifth week From education, there were no significant differences ($P < 0.05$) by live weight and overweight during the first four weeks of rearing. As for feed consumption, in this characteristic, the two factors (T_1 and T_2), that is, the density (12 and 14) were significantly superior ($P < 0.05$), while a significant decrease at the same level ($P < 0.05$) was observed at the third and fourth week of rearing. It is noted that there were no significant differences ($P < 0.05$) between all the treatments (12, 14, 16, and 18) during all rearing weeks. As for the depreciation, it was noted that there were no declines in all the transactions during the first four weeks, but in the fifth week, the declines were only in the treatment Fourth (T4) (1.851%).
Keywords: densities, productive performance, Ross 308 broiler

Introduction

Stocking density is one of the most important non-genetic factors in poultry breeding. A high density of birds per square meter reduces the cost of production, but excessive density may affect the performance of the broilers. This is supported by statements by Mehmood *et al*. (2014). National Chicken Council (USA) recommended that stocking density must allow all birds to access feeders and drinkers, and will depend on the target market weight, type of housing, ventilation system, feeder/ drinker equipment, litter management and husbandry (NCC, 2017). Stress in broilers can be caused by different environmental factors (Dohms & Metz, 1991), and stocking density is considered as an important stress factor in modern broiler production. Broilers are housed at different stocking densities, depending on local regulations, production system, and target body weight, aiming at minimizing fixed costs and maximizing profitability Puron *et al.,* 1995; Muniz *et al.,* 2006; Buijs *et al.*, 2009; Skomorucha *et al.,* 2009). However, it is well documented that high stocking densities adversely affects broiler performance, health, livability, and immunity (Puron *et al.,* 1995; Pettit-Riley & Estevez, 2001; Heckert *et al.,* 2002; Thaxton *et al.,* 2006; Estevez, 2007; Pandurang *et al.,* 2011), mostly as a result of reduced access to feed and water (Jones *et al.,* 2005; Thaxton *et al.,* 2006). In addition, air flow at bird level is reduced, hindering the dissipation of body heat (Ravindran *et al.,* 2006; Pandurang *et al.,* 2011). Heat stress (HS) and high stocking density (HSD) are known to negatively impact the behavioral traits and growth performance of animals while simultaneously increasing health problems and mortality (Daramola *et al*., 2012; Slimen, 2016). As birds, including ducks, are covered with feathers and do not have sweat glands, when they are exposed to high temperatures of around 41 C under HS and HSD conditions, their body temperatures continue to rise to levels that can damage homeostasis (Etches *et al*., 2008; Mello *et al*., 2015), health, and behavioral traits and can lead to more serious damage (Xie *et al*., 2014). Therefore, increasing the stock- ing density as a way of boosting earnings has the potential to reduce productivity, especially when birds are exposed to HS during the summer (Chen *et al*., 2015). High stocking densities may contribute to reduced performance due to the high environmental temperature and the reduced airflow at bird level (Feddes *et al*., 2002). Mostari *et al*., (2002) mentioned that the profit per chicken decreases in higher stocking densities, while the total production of meat per unit of floor surface increases, which results in higher profit. Sanotra *et al*. (2002) found that the proportions of chicks drinking, eating, Oliveira *et al.* (2005) evaluated the litter characteristics and performance of broilers reared under different stocking densities and litter types and found that the feed consumption decreased, resulting in reduced dissipation of body heat to the air. High stocking density also causes poor air quality due to inadequate air exchange, increased ammonia and reduced access to feed and water, which results in reduced growth rate, feed efficiency, livability and carcass quality (Bessei, 2006; Feddes *et al*., 2002; Puron *et al*., 1995).

Materials and Methods

The place of rearing has been prepared in the poultry field of the Department of Animal Production at the College of Agriculture, Al-Qasim Green University, as a place was well cleaned, washed with water, sterilized with sterilizers and evaporated with formaldehyde gas. Then (180) chicks were received at the age of one day, breed Ross 308 at an average weight of (42 g), where they were prepared from the light hatchers in Babel governorate . The chicks were randomly distributed to four densities (treatments) where the first density was (12 birds/m^2) The second density (14 birds/m^2), the third density (16 birds/m^2) and the fourth density (18 birds/m^2), at a rate of three iterations per density (treatment). The chicks were raised on a bed of sawdust with a thickness of 5-4 cm, under a temperature of 35 °C, using gas incubators, and then gradually reduced the temperature by a rate of 2 °C per week to reach 24 °C at the age of 28 days, and each plastic dish was assigned to feed with a diameter 38 cm was replaced by a 10-day-old with hanging feeds with a diameter of 38 cm. It was constantly raised to the top to be at the level of the bird's back and a single inverted 5-liter manhole was replaced by automatic manholes at the age of 10 days. It was constantly raised to the top to be at the level of the bird's back.

After inserting the chicks into the spots, diabetic water and vitamin C were introduced to the chicks, and the Enerofloxcilin antibiotic was used for four days to prevent umbilical disease by 0.5 ml / L drinking water. At 10 days, I vaccinated with Newcastle vaccine, Lasota by drinking water, and then at 14 days, I vaccinated with a second Cambodia vaccine through drinking water. As for 20 and 30 days, the chicks were vaccinated with the second and third Newcastle vaccines through drinking water. For 4 hours, he was also given Vitamin C chicks after each flawless vaccination At 0.5 g / liter of drinking water for three days, as in Table No. 1, as the chicks were fed from one day to the end of the experiment at 35 days and the energy ratio in the diet of the initiator and the final was 3051 and 3155 kilos of Calories / kg feed and the percentage Protein 20.93 and 19.39% were calculated according to the recommendations of NRC (1994) and as in Table No. 1 using the free feeding system. A complete randomized design (CRD) was applied to analyze the effect of different factors on the studied characteristics, and the mean differences between the averages were compared with the Duncan test (1955) and using the SAS (2001) program in the statistical analysis according to the following mathematical model : Yijk = M + Ti + eijk .

Table 1 : The ratios of the feed components used in feeding the experiment chicks

Feed Materials	Initiator ration %	Secondary ration %
yellow corn	**51**	**55**
Wheat	**9**	**8**
Soybean meal	**29**	**25**
Protein center *	**7**	**7**
Limestone	**0.7**	**0.7**
Salt	**0.3**	**0.3**
Oil	**3**	**4**
Total	**100**	**100**
Calculated chemical composition**		
Crude protein	**20.93**	**19.39**
Energy actress K K \ kg feed	**3051**	**3155**

- The used protein concentrate produced from a Jordanian company contains 40% crude protein, 2100 kg /kg representative energy, 3.5% raw fat, 1% raw fiber, 6% calcium, 7.5% phosphorous, 3.25% lysine, 3.5% methionine + cysteine. It contains a mixture of rare vitamins and minerals that secures the birds' needs of these elements.
- By chemical composition, based on NRC (1994).

Studied traits

Weekly and Cumulative Weight and Increase: The chicks were weighed collectively at the beginning of the experiment at the age of one day and the average weight was (42) grams and the weight of the chicks was repeated weekly until the end of the experiment.

Weight gain = *live body weight at the end of the week - live body weight at the beginning of the week*

The accumulated feed quantity consumed weekly: The amount of feed consumed for each repeater was calculated weekly during the trial period, through the following formula:

The amount of feed consumed = the amount of feed provided at the beginning of the week - the amount of feed remaining at the end of the week

Cumulative and weekly food conversion efficiency: It is the amount of feed consumed in grams per gram by weight gain and was calculated using the following formula:

$$\text{Efficiency of food conversion} = \frac{\text{The amount of feed consumed by the herd during a certain period}}{\text{Weight gain for the same period}}$$

Depreciation ratio: The mortality are recorded in each repetition weekly and calculated as a percentage of the total number of spawning in each repetition and treatment at the end of the experiment, according to the following formula:

$$\text{Mortality ratio} = \frac{\text{Number of dead chicks}}{\text{Total number of chicks}} \times 100$$

Results and Discussion

From Table No. (2) the effect of densities on the live weight trait, a High significance ($p \leq 0.05$) is observed for all densities used in the experiment during the weeks (1, 2, 3 and 4). As for the fifth week, it was noted that the first and second treatment (T_1 and T_2), which are two No significant difference between them was observed between the two treatments of the experiment (T_3 and T_4), and this superiority was highly significant ($p \leq 0.05$), and no significant difference was observed between the two treatments (T_3 and T_4) where the weights were as follows for the treatments (T_1 and T_2, T_3 and T_4) respectively 1954.67, 1961.67, 1863.40 and 1797.37. This is indicated by (Imeade, 2000; Garcia *et al.*, 2002) whose study found that increased bird density leads to a significant decrease ($P < 0.05$) in weights rates over the age of 35 days when the density was high (16 and 18 Birds/m^2) and this is what also happened to the weight increase in Table No. (3)The effect of densities on the characteristic of the weight increase and the cumulative weight increase, where a high significant significantly ($p \leq 0.05$) is observed for all densities used in the experiment during weeks (1, 2, 3 and 4). As for the fifth week, it was observed that the first treatment (T_2) was significantly superior and this superiority was highly significant ($p \leq 0.05$) compared to the treatment (T_3), as was not observed. There was no significant difference between treatments (T_1, T_2, and T_4), no significant difference was observed between the treatments (T_1, T_3, and T_4) as the weight increase was as follows for the treatments (T_1, T_2, T_3 and T_4), respectively 436.67 and 500.03 and 325.73 and 357.77.

Table 2 : Effect of densities on live weight

Period / Treatment	Week 1	Week 2	Week 3	Week 4	Week 5
T_1	152.070±0.202	420.55±0.432	911.11±19.121	1518.00±11.470	1954.67±25.613 a
T_2	152.700±0.369	408.81±0.337	877.38±16.342	1461.63±13.121	1961.67±34.887 a
T_3	154.733±0.426	433.43±0.555	930.21±16.982	1537.67±14.007	1863.40±20.019 ab
T_4	159.997±0.322	430.64±0.394	930.55±18.216	1439.60±10.637	1797.37±22.832 b
Level of significance	NS	NS	NS	NS	*
Symmetric characters within a single row indicate no significant differences between coefficients at the probability level (P <0.05)), NS: Non-Significant.					

As for the characteristic of the cumulative weight increase in table No(3) , it was noted that the two treatments (T_2 and T_3) had a significant significantly superiority at the level (p≤0.05) compared to the treatment (T_4), while no significant difference was observed between the treatments (T_1, T_2 and T_3), and no difference was observed. Significant between treatments (T_3 and T_4) where the cumulative weight increase was as follows for the treatments (T_1, T_2, T_3 and T_4), respectively 1912.63, 1919.65, 1821.40 and 1755.37. The reason for the high weights of birds raised on density (12 and 14) birds/m^2 and its decrease at (18) birds/m^2 is that high density means crowding as a result of forcing the bird to live in an area insufficient for it and vice versa, because low density means that the bird enjoys With enough space for food and drinking and for the rest of the behaviors that the bird wishes to perform, that is, they provide sufficient space around the feed for the bird. In addition, birds can reach the feed and eat food easily and without competition, and this is confirmed by (Alltane *et al.*, 2018; Qaid, 2016) in their study, where they found that there are sufficient spaces around The feed affected birds weights and they were also found Strong relationship between aggressive behavior, as aggression increased in high densities and vice versa at low intensity. These results were consistent with current results.

Table 3 : Effect of densities on the characteristic of the increase weekly weight and the cumulative weight in g/week.

Period / Treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 1-5
T_1	110.070±0.493	268.45±0.601	490.56±18.701	606.89±14.995	436.67±22.123 ab	1912.63±17.500 a
T_2	110.700±0.522	256.11±0.551	468.57±15.317	584.24±11.007	500.03±16.995 a	1919.65±17.210 a
T_3	112.733±0.419	278.70±0.598	496.77±11.808	607.46±11.535	325.73±18.021 b	1821.40±19.113 ab
T_4	117.997±0.333	270.65±0.471	499.91±13.119	509.05±12.090	357.77±12.121 ab	1755.37±11.103 b
Level of significance	N.S	N.S	N.S	N.S	*	*
• Symmetric characters within a single row indicate no significant differences between coefficients at the probability level (P <0.05), NS: Non-Significant.						

Table 4 : Effect of densities on weekly feed consumption and cumulative consumption g / week

Period / Treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 1-5
T_1	81.75 ± 3.104	294.30±5.110	±15.411 a 900.80	±43.335 a 995.53	±34.212 a 1083.13	±22.512 a 3355.52
T_2	61.50±3.003	±6.090 315.76	±16.539 ab 827.09	±31.900 b 822.93	±42.900 ab 970.33	±23.900 b 2997.62
T_3	62.87±2.690	±6.216 305.83	813.96±14.001 ab	±43.331 b 816.33	±30.534 bc 860.60	±29.001 c 2859.59
T_4	66.07±3.442	±4.775 340.46	751.20±13.196 b	±32.973 b 788.87	±32.026 c 779.97	±22.106 d 2726.56
Level of significance	N.S	N.S	*	*	**	***
• Symmetric characters within a single row indicate no significant differences between coefficients at the probability level (P <0.05), NS: Non-Significant.						

From Table (4), the effect of densities on the consumption of weekly and cumulative feeds, it is noted that there were no significant differences when significant (p≤0.05) between all treatments in the first and second week. In the third week, treatment (T_1) was outperformed by increased feed consumption compared to treatment (T_4), which was the lowest feed consumption compared to the other treatments, while no difference was observed between treatments (T_1 , T_2, and T_3) as well, no difference was observed between the treatments (T_2 , T_3, and T_4), while in the fourth week, it was noted that the treatment ((T_1) increased with the amount of feed consumed over the rest of the transactions (T_2, T_3 and T4) which achieved the lowest consumption of feed and this superiority was highly significant at the level (p≤0.05), as was also observed at the week Fifth, the treatments (T_1 and T_2) were significantly higher at (p≤0.05), which was characterized by an increase in the amount of feed consumed compared to the treatment (T_4) and was the lowest in feed consumption , and there was no significant difference between the two treatments (T_3 and T_4). Equally, the two treatments (T_2 and T_3) were equally. As for the cumulative feed consumption, the treatment (T_4) was outperformed in terms of the lowest amount of feed consumed On all trial treatments (T_1 , T_2 and T_3), the treatment superiority (T_3 over T_1) and (T_2) and the superiority (T_2) over the treatment (T_1) where the differences between the treatments were highly significant at (p≤0.05). As it appears from Table No. (5) the effect of densities on the quality of the weekly food conversion efficiency and the cumulative conversion efficiency, there are no significant differences between all With experiment treatments during weeks (1, 2, 4, and 5), however, only at the third week did a significant superiority of treatment (T4) be observed at the level ($p \leq 0.05$) compared to treatments (T_1 and T_2) while this difference was not noticed between both treatments (T_1 , T_2 , T_3) and between the treatments (T_3, T_4).

Table 5 : Effect of densities on the characteristic of food transfer efficiency and cumulative conversion efficiency

Period / Treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 1-5
T_1	0.7431±0.011	1.0932±0.030	1.84000± 0.027 a	1.6410± 0.041	2.4917± 0.172	7.8090±0.198 a
T_2	0.5547± 0.021	1.2373± 0.045	1.76867± 0.024 a	1.4293± 0.055	2.0200± 0.190	7.0100±0.173 b
T_3	0.5909± 0.018	1.0997± 0.052	± 0.013 ab1.63667	1.3450±0.048	2.6420± 0.163	7.3142±0.121 ab
T_4	0.5705± 0.011	1.2581± 0.029	1.49900± 0.019 b	1. 5990± 0.039	2.2500±0.159	7.1766±0.157 ab
Level of significance	N.S	N.S	*	N.S	N.S	*

• Symmetric characters within a single row indicate no significant differences between coefficients at the probability level (P <0.05), NS: Non-Significant.

As for the cumulative feed consumption, the treatment (T_2) was significantly superior ($p \leq 0.05$) in terms of the lowest amount of feed consumed per unit weight gain compared to the treatments (T_1, T_3 and T_4), and there was no significant difference between the treatments (T_1 and T_3 And (T_4), there was also no significant difference between the treatments (T_2, T_3 and (T_4). The reason for the decrease in the amount of feed consumed for the birds raised on density (15) birds/m^2 is that the increase in the number of birds per unit area leads to congestion around The feed thus leads to a state of competition, payment and a reduction in the feeding area, which leads to a decrease in the amount of feed consumed, where the results agreed The current study with the results of (Park *et al.*, 2018; Zainb *et al.*, 2018; Thomas *et al.*, 2004), who indicated in his study that birds raised at the low density level consumed a greater amount of feed compared to high levels of density when the levels were (5, 10, It did not agree with the results of (Simitzis *et al.*, 2012), which indicated that there were no significant differences (P <0.05) in the amount of feed consumed when raising birds at levels (12, 15 and 18) birds/m^2, As the reason for the difference between the results of the current study and the results of previous studies may be due to the difference in the crossbreeding of broilers.

Table 5 : Effect of densities on the mortality percentage during the rearing period

Period / Treatment	Week 1	Week 2	Week 3	Week 4	Week 5
T_1	---	---	---	---	---
T_2	---	---	---	---	---
T_3	---	---	---	---	---
T_4	---	---	---	---	1.851± 0.137
Level of significance	NS	NS	NS	NS	**

• Symmetric characters within a single row indicate no significant differences between coefficients at the probability level (P <0.05), NS: Non-Significant.

Through a table No. (5), which indicates the effect of density levels on the percentage of mortality, it is clear that there are no mortality due to the density at the densities (12, 14 and 16 birds/m^2), while the percentage of mortality was high at the density (18 birds/m^2), where it reached (1.851%). The reason for the occurrence of this percentage of mortality at the density (18 birds/m^2) meaning that when birds are rearing in high density, some strong birds dominates weak birds in this high density compared to low density, and also because there is sufficient space to move around the feed, meaning that competition does not appear between birds that are rearing at low density. Meaning that birds of high dominate can access feed and eat freely and without competition, while birds of low dominate cannot easily reach feed without competition and over time they become weak because they do not eat food, so they are pushed back or crushed and may reach perishing, Also, rearing birds in crowded groups that leads to the accumulation of birds in one place, which causes bottlenecks and thus an increase in the proportion of mortality, This study was consistent with the results (Hassan, 1993; Kaan *et al.*, 1996; Imeada, 2000) whose study indicated an increase in mortality by raising the density level (12, 15 and 18 birds/m^2), while the results of the current study did not agree with what he indicated (Zainb *et al.*, 2018; Feedes *et al.*, 2002), whose results indicated that the percentage of motality is not affected by the density level.

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