

Effects of Dietary Supplementation of Arginine on Growth Performance of Broiler Chickens

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ABSTRACT

The purpose of this research added arginine to increase the growth of broiler chickens in Nangarhar University, Agriculture research farm in Afghanistan, study discovered Over 96 one-day broiler chickens in 42 days based on the record of their daily behaviors, Hence, record of the chickens have divided into Four groups, each group being divided into three replications. Each replication of each group consisted of eight chickens, the first group was control and the other three were treatment groups, such as, in T1 group (0.1%) on the arginine Dose given, the second T2 group 0.2% arginine was added to the Dose, and T3 group added arginine (0.3%) through the factor of FCR such as Weight gain, feed intake. Nevertheless, by statistical analysis, that Null hypothesis is fail to rejected, p-value is greater than 0.05 means there is no significant change amongst with the experimental groups in the first three weeks and also in the control group as well as at the fourth, fifth, and sixth weeks, P value is less than 0.05, hence Null hypothesis is rejected (Type 1 error), there is a significant difference between the treatment groups and the control group. Furthermore, all group feed conversion ratio (H0) is rejected. Study emphasized that's adding 0.3 per cent of arginine to daily diet chickens increase weight by less consumed feed as well reduce of mortality rate. According to this study, it is recommended that 0.3% arginine should be added to the chicken diet after the third week, to gain more weight by consuming a small amount of diet.

Keywords- Broiler chickens, Arginine powder, Nangarhar, Afghanistan.

I. INTRODUCTION

Arginine amino acid is an essential amino acid for normal body growth and maintenance of nitrogen balance in animals. Adult mammals can make arginine to meet their needs, but chickens cannot make arginine. Therefore, to meet the requirement of arginine for chickens, it should be added to the diet. With respect to animal nutrition, arginine is commonly considered a semi-essential or conditionally essential amino acid for adult mammals [Wu G, Morris SM, Jr,(1998). Barbul A,(1986), Rose WC,(1986)], while chickens exclusively rely on dietary arginine to meet their needs [Castro FLS, Kim WK(2020). Khajali F, Wideman RF(2010)]. Otherwise, the research revealed through the main objectives as gains more weight along with the less feed

expenditure as well as, in T3 groups added arginine and bring more weight along with the less feed consume as a result, not have been seen mortality of chickens. In the context , study examined respect to the various arginine percentage such as 0.1, 0.2, 0.3 ,have been added to the balance feed respect to compare of control .as consequence ,in the group of 0.3 per cent reduce the mortality rate of chickens and acquired heavily weight through the less feed consumed ,moreover ,in behind the research there are several factor affected on mortality rate and increased weight of chickens such as ,used of arginine acid ,growth by not affected disease ,appropriate feeds to chickens, suitable hygiene and suitable place per chicken.Chickens rely entirely on dietary arginine to meet their protein needs and perform other functions normally (Tamir and Ratner, 1963). According to the Lewis (1966)

report, chickens cannot make arginine through the urea cycle, the reason is the lack of Carbamoyl phosphate Synthetase enzyme in the mitochondria, and as a result, chickens need more dietary arginine than other animals. In addition, when Arginine is added to the diet, it has a wide range of effects and benefits, For example, it increases the secretion of growth hormone and promotes muscle growth (prevents muscle breakdown) and also muscle metabolism which is essential for nitrogen transfer. In addition, it improves muscle performance and increases glucose uptake by muscle cells (Stevens and colleagues (2000). Research has been shown that arginine improves the functions of the digestive system of birds and mammals. Arginine increases the permeability of the intestine based on the production of nitric oxide and helps in the formation of lesions in the digestive system. Also, Arginine increases the function of the digestion of carbohydrates and proteins in the digestive canal of chickens, especially the small intestine, Jejunum. (Uni and Ferket, 2003). Corz and Kidd (2003) have determined that chicks require a large amount of dietary arginine in the first days of life, which may be related to the development of the immune system and microbial changes. (Fernandes) and colleagues in (1966) confirmed based on their research that adding more than one percent of arginine is necessary for muscle growth in broiler chickens during the starter phase. Although arginine plays a role in the secretion of growth hormone and chickens completely rely on arginine in their diet, ureotelic species such as birds cannot make arginine because they have an incomplete urea cycle. Jiao et al. (2010) have determined that feeding chickens without arginine to 80% of their body weight for 1-42 days reduced the weight and percentage of breast and leg muscles. Similarly, Khafali and her colleagues (2011) gave an opinion that the lack of arginine in the diet of broiler chickens reduces the percentage of carcass and breast tissue yield. Fernandes et al. (2009) observed that increased dietary arginine was important for muscle growth in broiler chickens from day 21 onwards. They also observed that the addition of 0.1, 0.2, and 0.3% L-arginine in the diet of broiler chickens during the age of 1-21 days has a role in increasing breast weight, thickness, and myofiber density. Ebrahim and his colleagues in (2014) obtained such results that with the increase of arginine in the diet, there is an increase in dry matter, crude protein, and fat in the chemical composition of the breast muscle of broiler chickens. Cuca and Jensen reported in 1990 that previous studies have clearly shown the importance of providing adequate dietary arginine to broiler chickens to aid in growth and weight gain. It was reported that the dietary inclusion of arginine significantly enhanced the immune responses in healthy and challenged broiler chicks (D'Amato and Humphrey, 2010). Arginine was recommended for metabolism improvement and alleviation of adverse effects during abnormal conditions in poultry (Atakisi et al., 2009). Dietary supplementation of arginine significantly increased serum NO in broiler chicks (Atakisi et al., 2009;

Bun et al., 2011). Al-Daraji et al. (2012) reported that the dietary inclusion of arginine significantly reduced the serum concentration of triglyceride. It was also reported that arginine supplementation ameliorated immune responses through reducing the concentration of inflammatory cytokines (A.M. Amerah *et al.*, 2015).

Afghanistan has been hit by constant wars and drought from every angle, and its reconstruction needs a lot of work and attention. One of the basic needs of a country is to have a strong economy. Agriculture and livestock have a fundamental role in the economic development of a country. Poultry training is an important part of livestock farming. Poultry training is of great value in strengthening the individual and national economy. Today, poultry farming and sales are widely used in different countries of the world. The consumption of meat in our country is increasing day by day. Chicken meat has now taken the place of animal meat. Chicken meat is a good source of protein, fat, vitamins, and minerals for human nutrition and is 80% digestible because compared to beef meat, chicken meat has fewer muscle fibers and connections. Due to the importance of chicken meat, most people in the world like chicken meat because it is soft, tasty, and easy to digest. Chicken meat has more protein than other animals, and its protein is the first place compared to the meat of other animals, and it contains all the essential amino acids, which play an important role in the structure of tissues. On the other hand, the percentage of fat in chicken meat is low for people who suffer from high cholesterol and cannot use meat from other animals; So for such people, chicken meat is beneficial. The government of Afghanistan and other foreign charitable organizations have tried to build commercial broiler farms in areas it have to be suitable for chicken training and have expanded chicken training and rearing. Poultry training and rearing provide a stable income for business to improve beloved farmers and a good source of food for standard their families. The world population have attracted of international community to increase the quality of live standard as with food sector. Hence, Obtaining food from chickens and their training has a special place in the economy of every country as well as the production of meat and eggs in our country is less compared developed countries and it's not boosting demand for our country, since it has been imported from abroad .To make the best use of broiler chickens; Therefore, study emphasized adding of arginine amino acid in the growth of broiler chickens and it has massive effects on increasing meat and eggs to the farmers who is busy with chicken training ,otherwise it has been studying the effects of arginine on the growth of broiler chickens to those farmers who are in the training of chickens, because all farmers and residents of the country adding arginine in the chickens feed so it is fulfill the basic requirement of our countryman, such as meat and eggs within the country ,it will be raising national income and fulfill requirements of our country nations. The main objectives of this study to investigate the effects of

arginine on the growth of broiler chickens and to find out what percentage should be added to diet so that the chickens can be gains good and appropriate weight and consume less food?

1.1 Research problem:

Consumption of broiler chickens per kilogram of meat is more than production in the country. Lack of good quality meat and, the high price of broiler meat is one of the main problems. Because, Afghan farmers have faced with serious problems and issue and they cannot produce high-quality meat and nutrients (energy and protein), which it has been a pivotal play role in training of chickens.

1.2 Research Objectives

1:2: Hypothesis

Arginine has a positive effect on the growth of broiler chickens.

2:2: Objective

To increase the production of broiler chickens.

Reductions in feed cost per kilogram of meat.

Decreased mortality rate of chickens.

1.3 Research questions

1. Takes the right amount of weight?
2. Consumes food well?
3. Is FCR valuable or useful? Requires small amounts of balanced nutrients.

1.4 Importance of Research

The importance of this research to increase the meat production of broiler chickens in the country. On the other hand, it has been contributed the strengthening individual and national income of the farmers as with the chicken breeders (farmers)

II. LITERATURE REVIEW

It has been reported that increasing arginine in the diet increases and improves the weight gain, FCR, and feed intake of broiler chickens more than the National Research Council (NRC) recommendation (Hazim and Salih, 2012). According to Sathyappriya and colleagues (2018), the amount of crude protein and crude fat in the groups that were given different amounts of L-Arginine in the diet was higher in the breast muscles of broiler chickens compared to the control group. $P < 0.05$). Supplementation of dietary arginine increased the crude protein and fat content of breast muscle for three weeks (Stamler and Messner, 2001). Hazim and Salih conducted a study in 2012, which divided their study into two groups (control and experimental) and then divided the experimental group into three subgroups (Treatments). The study shows that the body weight of the control group was less than the experimental group ($P < 0.05$), and the body weight was increased based on the increase of arginine level, and this increase was higher than the third group. During the research, it was also proved that the experimental groups T1, T2, and T3 gained more weight than the control group in the first week. According to Jun Yu et al.'s (2017) research conducted on laying hens, they

studied all 300 one-day-old chicks and divided them into five groups. These groups were fed diets containing 1.19, 1.44, 1.69, 1.94, and 2.19% arginine, for 1-42 days, respectively. The results showed that dietary arginine has a significant effect on the body weight of chickens ($P < 0.05$), and the amount of insulin-like factor-I (IGF-I) in blood serum increased with the increases of arginine, ($P < 0.05$). The liver weight of chickens fed with arginine was also higher ($P < 0.05$). Diet containing 1.94% and 2.19% arginine had a positive effect ($P < 0.05$) on the length of the small intestine and the weight of the chicken. This study showed that a high concentration of arginine in the diet has a positive effect on body weight, feed efficiency, meat production, breast fat, and crude protein. (Ebrahimi M) and colleagues (2014) based on the research of Xu and colleagues (2018), who studied 300 one-day-old chicks and divided them into five groups in both experiments. These groups were fed diets containing 0.45, 0.9, 1.35, and 1.8% arginine. The effect of an arginine-containing diet on meat production and immune status was observed. Therefore, the results showed that with the increase of arginine-containing food, body weight increased significantly from 21 to 42 days ($P < 0.01$), daily weight gain increased ($P < 0.01$) and FCR in all periods was better ($P < 0.05$). In addition, increasing dietary arginine increased serum insulin-like factor-I growth ($P < 0.01$), growth hormone ($P < 0.01$), and thymus gland weight ($P < 0.05$) after 21 days of age. According to the well-known Nutrient Requirements of Poultry published by the NRC(1994), broiler chickens should be given diets containing 1.25%, 1.10%, and 1.00% of arginine up to the 3rd, from the 3rd to 6th weeks of age. Among the functional AAs (crystalline or synthetic), Arginine is one of the most versatile in animal physiology because it is a precursor of several molecules, such as creatine, ornithine, nitric oxide, citrulline, proline, and polyamines (Fernandes and Murakami, 2010; Birmani et al., 2019). The results of our research showed that the addition of arginine above the NRC recommendation (1.25-1%) in the diet has a positive effect on the weight, feed intake, and feed conversion rate of broiler chickens and on the immune system.

III. MATERIALS AND METHODS

3.1 Research site

This study conducted ,the research farm of Nangarhar University, Faculty of Agriculture to investigate the effects of arginine amino acid on the growth of broiler chickens in 2019-Oct-31 up to 2019-Dec-12.

3.2 Research design

This research conducted through the CRD (Complete Randomized Design) method as it defined the experimental filed through the choice random chickens of each group and inclined the all 96 broiler chickens were divided randomly into four groups, one control group and

three experimental treatment groups, The first group was T1, the second group was T2 and the third group was T3, 24 chickens were placed in each group randomly, and each group consisted of three replicates with 8 chickens in each replicate. The control group was fed the standard diet and the experimental groups (T1, T2, and T3) were supplemented with 0.1, 0.2, and 0.3% arginine in the standard diet, respectively. At the beginning of each day, 9 chickens of each group were randomly weighed, and the amount of food left over from the food added for each day was negative, from which the amount of food eaten was determined, and for the next day a known amount of food. The average daily weight and feed intake of the 1-42-day-old chicks were recorded.

3.2 Plan of work

In this study, 96 broilers chickens (one day /chickens) has been taken form market .Before bringing the chickens to the farm, the farm was disinfected according to sanitary conditions and for the wood dust and a newspaper (paper) were arranged for it. Light, ventilation, and heating facilities were provided. Then we divided the chickens in the farm equally into four groups, each group in 3 replicates with 8 chickens in each replication. We randomly divided the chickens into groups and replicates .Arginine powder was purchased from the market and was added to the feed of chickens in known amounts (0.1, 0.2, and 0.3%).

Food: When the chickens were brought to the farm, they were given glucose in water for the first three hours and after three hours we gave them normal water and (Staters) small number (R4) feed. Normal diet to the control group and the three experimental groups were supplemented with 0.1, 0.2, and 0.3% arginine respectively, this food was given to chickens consecutively three weeks. After 3 weeks to Six weeks, growing feed of the largest number (R9) was fed, to which arginine was added at the above percentage. The remaining food from the thrown food would be negative, which would determine the amount of food consumed. A sensitive scale (weighting scale) was used for weighting food and poultry as well as we have used vaccines against several viral diseases, in the sixth day, chickens were vaccinated with ND + IB in the form of eye drops, ND with B1 strain, and IB with H-120 strain was possessed as well in the twelfth day, chickens were given a diagonal implant in the eye of Gambor (IBD), moreover , in the 18th day, chickens were also vaccinated against the ND Lasota strain, which was giving in the form of eye drops.

3.3 Data analysis

In this study, primary data collected by experimental trajectory method and we used SPSS for statistical analysis of broiler chickens along with the daily feed intake, weekly weight and FCR . The results obtained by analyzed of ONE-WAY ANOVA that's general confidence interval is considered to be 6 and the variable ($p < 0.05$) varies considerably. We have been using graph pad, excel representative such as line and scatter plot.

IV. RESULT

At the end of this study, the group that was given 0.3% arginine in the diet had a better weekly weight gain than the other experimental and control groups who consumed less food and had a better (lower) FCR. In the first week, the groups that were supplemented with 0.2% and 0.3% arginine gained more weight than the other groups. In the second week, the T1 group was supplemented with 0.1% arginine and gained more weight. On the other hand, they consumed more food the other experimental along with control groups. However, in the T3 group, we have been added 0.3 percent of arginine to feed had low FCR .BY the Compared of other groups and T3, though T1 groups gained more weight in the third week, and also group consumed more food than other groups. In the fourth week, T3 group gained more weight than the other groups, but T1 and control groups consumed more food, as well T3 group had lower FCR than all groups. In the fifth and sixth weeks, T3 group gained more weight, consumed less food, and had a lower FCR than the other groups. In the fifth and sixth weeks, control group consumed more food than the experimental group and had a higher FCR.

The results and figures obtained from the research will be explained as follows based on the comparison of related factors:

4.1 Weekly weight gain

Weekly weight, which is an important factor in this study was recorded separately for each week; So, based on the statistical analysis, first the weekly comparison of the four groups will be shown in the form of a table and then in the form of a graph:

The first table shows the live weight of broiler chickens in six weeks. According to the statistical analysis, during 1-2 weeks, there is no significant changes in the live weight of chickens in different percentage groups of arginine compared to the control, as a result Null hypothesis is accepted, it's statistically mean like ($p > 0.05$), In the third week, different percentages of arginine have significant changes compared to the control, as a result Null hypothesis is rejected , it's statistically mean like ($p < 0.05$), while significant changes were also observed in the percentages of arginine. It means that the live weight of T1 and T2 groups in the third week was higher than T3 and control, but compared to the control group, different percentages of arginine had a significant change ($P < 0.05$) during the fourth week. It means that during the fourth week, the weight of different percentage groups of arginine increased, but there was no significant difference ($P > 0.05$) between different percentage groups of arginine in the fourth week. During 5-6 weeks, there was a significant change ($P < 0.05$) for the different percentage groups of arginine compared to the control, while there was also a significant change between the different percentages of arginine. The live weight ratio of the T3

group was higher (2314.0±8.48) or increasing (2705.0±7.07) than T2 and T1.

Groups	Weight gain in six weeks (average±Standard deviation)*					
	1st week	2nd week	3rd week	4th week	5th week	6th week
Control	77.2 5±4. 59 ^a	423.4 5±2.3 7 ^a	846.1 0±18. 24 ^a	1335. 15±4 5.46 ^b	2115. 55±5 5.27 ^a	2498. 33±2. 35 ^a
T1	75.6 0±8. 4 ^a	427.5 0±4.2 4 ^a	909.2 5±17. 60 ^b	1444. 1±31. 96 ^a	2180. 25±8. 838 ^b	2562. 0±25. 24 ^b
T2	76.8 ±2.9 6 ^a	411.9 0±7.6 3 ^a	906.3 5±41. 22 ^b	1452. 15±9 121 ^a	2221. 66±4 0.06 ^c	2640. 0±14. 14 ^c
T3	76.0 0±1. 131 ^a	419.6 0±15. 41 ^a	854.4 0±30. 54 ^a	1468. 85±2 5.24 ^a	2314. 0±8.4 8 ^d	2705. 0±7.0 7 ^d

a, b, c, d The averages indicated by different English letters in the same column are meaningfully different from each other. Significant differences between means are indicated at the P<0.05 level.

The figure below shows the general live weight of broiler chickens during 1-6 weeks, according to which the four groups do not have significant (p>0.05) changes in the first two weeks. However, there were significant changes (p<0.05) for different percentages of arginine compared to the control during 3-6 weeks, while there was also a significant change in the percentages of arginine.

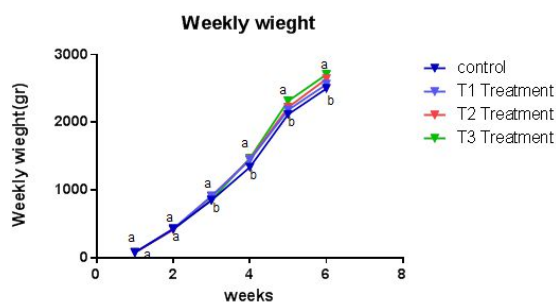


Figure 1:1: The figure above shows the difference between the weight gains of different groups over six weeks. a-b Different letters in the same week indicate significant differences between averages. Differences were considered significant when P<0.05. The averages for each week are representative of the average weight gain of eight broiler chickens. Error bars indicate the standard deviation of the averages. Based on the results, different groups of arginine percentages have no noticeable change compared to the control in the first two weeks, but from the third to the sixth week, there is a

noticeable P<0.05 change compared to the control and each other.

4.2 Feed intake:

Food consumption, which is the second main factor for studying the effect of the four groups, the results of this study clarified which training group consumed more food, and this comparison is also based on the statistical analysis of the table and the figure is illustrated:

The second table shows the daily food intake of broiler chickens during six weeks. In the first week, the T3 group consumed less food than the other groups, but there was no significant difference from the statistical analysis. In the second week, the T1 group consumed more food than the other groups, and there was a significant difference in the statistical analysis (P<0.05). In the third week, the T1 and control groups consumed more food, and according to statistical analysis, there was a significant difference in the T1 group (P<0.05), but in the fourth week, the control group consumed more food than the other groups. According to statistical analysis, there were no significant changes. In the fifth week, the control group consumed more food than the treatment group, and there was a significant difference (P<0.05) according to statistical analysis, accordingly, in the sixth week, the control group consumed more feed than the treatment group, and according to the statistical analysis, there was a significant difference (P<0.05).

Rearing	Table 1:2 Shows feed intake in different weeks(Average±standard deviation)					
	1 st week	2 nd week	3 rd week	4 th week	5 th week	6 th week
Control	124. 94±1 2.2 ^b	637. 50±1 0.6 ^a	1292. 8±41. 43 ^a	2383. 63±8 1.5 ^a	3630. 0±12 2.1 ^b	4696. 0±13 0.47 ^b
T1	112. 33±3 .92 ^a	655. 0±7. 07 ^a	1322. 05±1 0.25 ^b	2388. 50±2 0.44 ^a	3558. 13±5 2.09 ^a	4889. 5±56. 39 ^a
T2	111. 45±2 .88 ^a	610. 0±14 .14 ^a	1270. 07±5. 4 ^a	2337. 36±1 0.65 ^a	3509. 24±1 4.60 ^a	4818. 45±1 3.85 ^a
T3	110. 25±0 .47 ^c	592. 0±2. 82 ^b	1231. 91±6. 59 ^a	2291. 91±1. 53 ^b	3366. 91±3 3.82 ^c	4685. 79±3 6.94 ^b

a, b, c, d The averages indicated by different English letters in the same column are meaningfully different from each other. Significant differences between means are indicated at the P<0.05 level.

In the figure below, the control and four groups of different percentages of arginine are shown on the diet of broiler chickens during six weeks, according to which, in the first two weeks, the groups of different percentages of arginine compared to the control, there was no significant difference, but from the third week to the sixth week, the different percentage groups of arginine showed a significant change compared to the control. However, there was no noticeable change between the different

groups of arginine (0.1%, 0.2%, and 0.3%), but it should be noted that the treatment with 0.3% of arginine was more uniform and healthy, that is, the uniformity was greater. No significant changes were observed between the arginine groups, but with low food consumption, there was a significant change compared to the control, T1, and T2 groups.

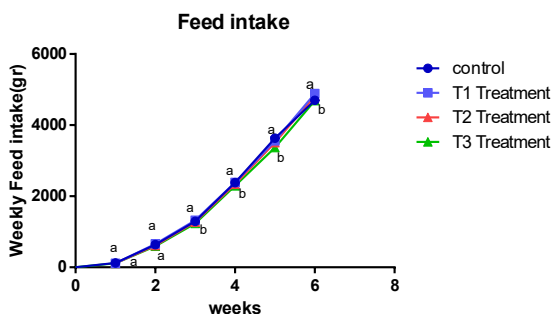


Figure 2:1: The above figure shows the difference between the different groups over six weeks. a-b Different letters in the same week indicate significant differences between averages. A significant difference was considered when $P < 0.05$. Averages per week represent the average feed intake of eight chickens. Error bars indicate the standard deviation of the averages. Based on the results, the groups with different percentages of arginine had no noticeable change in the first two weeks compared to the control, but there was a noticeable change in the last four weeks compared to the control. However, the ratio of different percentages of arginine to each other varies considerably.

4.3 Feed conversion ratio (FCR)

Another important factor is the ratio of food conversion to meat, based on statistical analysis, firstly in the form of a table and then in the form of a figure, it will be clear in each group and compared with each other:

Re ari ng	Table 1:3 Shows FCR in different weeks(average±Standard diavition)*					
	1 st week	2 nd week	3 rd week	4 th week	5 th week	6 th week
Co ntr ol	1.61 5±0.062 ^a	1.50 5±0.018 ^a	1.528 ±0.081 ^b	1.787 ±0.021 ^b	1.717 ±0.102 ^a	1.988 ±0.050 ^a
T1	1.48 6±0.026 ^b	1.53 2±0.001 ^a	1.454 ±0.0168 ^a	1.657 ±0.022 ^a	1.631 ±0.017 ^b	1.908 ±0.003 ^a
T2	1.64 5±0.018 ^a	1.48 0±0.006 ^b	1.402 ±0.057 ^a	1.609 ±0.002 ^a	1.579 ±0.0219 ^c	1.825 ±0.004 ^b
T3	1.45 0±0.028 ^b	1.41 1±0.045 ^b	1.442 ±0.043 ^a	1.559 ±0.0278 ^c	1.455 ±0.0199 ^d	1.732 ±0.0181 ^c

Table 3 shows the FCR of broiler chickens with different percentages of arginine and control during 1-6 weeks. Before statistical analysis, the FCR of the T3 and T2 groups was better than the T1 and control groups in

the first week. And there was a significant difference from the statistical analysis ($P < 0.03$). In the second week, the FCR ratio of the T2 group was lower than the other groups, and according to statistical analysis, there was a significant difference ($P < 0.05$), but in the third week, the FCR ratio of the T2 group was better than that of the T3 and other groups and according to statistical analysis, there was significant variation. In the 5th and 6th weeks, the FCR ratio of the T3 group was better than all groups, and there was a noticeable change according to statistical analysis ($P < 0.03$).

a, b, c, d The averages indicated by different English letters in the same column are meaningfully different from each other. Significant differences between means are indicated at the $P < 0.05$ level.

The figure below shows the FCR of broiler chickens of different percentages of arginine and control treatments during 1-6 weeks, according to which the different percentages of arginine treatments showed significant ($p < 0.05$) changes compared to the control, and also had significant ($p < 0.05$) changes between different percentages of arginine. But only in the third week in 0.2 percent of the sudden occurrence of diseases, the FCR is small and they consumed less food. It should also be noted that the 0.3% group had a good FCR in the fifth and sixth weeks and the opinion had a noticeable change to the other groups, and the control opinion had a bad and high FCR to all treatments.

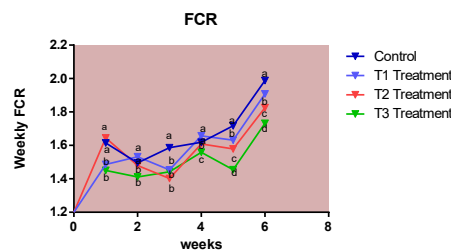


Figure 3:1: The figure above shows the difference between the ratio of different percentages of arginine and the control diet over six weeks. a,b,c,d different English letters in the same week indicate a significant difference between the averages. A significant difference was considered when $P < 0.05$. Weekly averages represent the average of the diet conversion ratios of eight chickens. Error bars indicate the standard deviation of the means. The FCR of broilers treated with different percentages of arginine and control during 1-6 weeks showed significant ($p < 0.05$) changes in treatments with different percentages of arginine compared to the control, as well as arginine. There were significant ($p < 0.05$) changes between the different percentages, but only 0.2 percent of the disease occurred in the third week, the FCR was small and they consumed less food. It should also be noted that the 0.3% group had good and observable ($P < 0.05$) FCR at the fifth and sixth weeks and the control group had poor and high FCR for all treatments.

V. DISCUSSION

Due to the growing condition of broiler chickens, more research has been done in this area. The addition of dietary arginine to the NRC recommendation has a positive effect on the growth of beef chickens. Also, beef chickens are becoming more and more sensitive and weak against diseases. It is necessary to work on improving their immune system. The increase in the amount of arginine in food plays an important role in keeping chickens' immune systems alive. It also protects chickens from the effects of stress.

As a result of this study, it was found that with the increase in the amount of arginine in the diet, there was an increase in the weight gain of the chickens ($p < 0.05$). The results of this study are consistent with the findings of Hazim and Salih 2120, who showed that the addition of arginine in broiler chickens' diet caused an increase in body weight.

In the second week, the group with 0.1% arginine added to the diet gained more weight than the other groups, and this weight gain continued until the third week. The results of this study were similar to the results of a study conducted by Jun Yu and his colleagues in 2017, who found that in the first week, the group of chicks gained more weight than those in whom 1.44% arginine was added to the diet.

During the 21-42 days, the research group fed with 0.3% dietary arginine had better body weight than the control and other experimental groups and also had lower food intake and better FCR than the other groups ($p < 0.05$), which was similar to the findings of Ebrahimi et al. and Xu et al., 2014, who showed that increasing dietary arginine above the NRC recommendation significantly increased the growth of broiler chickens. , has a positive effect on weight gain and food consumption.

The food consumption of the control group was higher than the other groups from the first day to the last day, and this increase continued until the last day of the study. The results of our research were different from the research of Hazim and Salih in 2012 because the results of their research showed that food intake increases with the increase in dietary arginine, which may be due to the increase in protein concentration. As a result, the tendency to take food decreases with the increase of arginine level, but it was found that in the last 14 days, the group that had 0.1% arginine added to the food had more food-taking power.

The results of this study showed that the increase of arginine in the diet has a special role in lowering the FCR and the best FCR was in the group that was supplemented with 0.3% extra arginine. The results of our research were similar to the results of the research of Hazim and Salih 2120, they clarified that the increase of arginine in the diet of broiler chickens has a special role in lowering FCR. Based on the research, the weight gain of chickens in the experimental groups was higher than the control group, which was statistically significant

($p < 0.05$). Based on the increase of arginine, the body weight increased. This increase continued until the third experimental group. During the research, it was confirmed that the treatment groups T1, T2, and T3 gained more weight than the control group from the first week and consumed less food.

The study was similar to the findings of the above scholars in that the body weight of the experimental group was more weight than the control group, after the first week, it was observed that the chicks gained more weight and also increased the weight of the chicks in the diet. In particular, with the addition of 0.3%, sows gained more weight and had lower feed intake and lower FCR compared to the control group.

VI. CONCLUSION

Arginine amino acid is essential for normal body growth and maintenance of nitrogen balance in animals. In addition, when arginine is added to the diet of chickens, it has other benefits and wide-ranging effects, for example, it increases the secretion of growth hormone and promotes muscle growth (prevents muscle breakdown), as well as It is an essential amino acid for nitrogen transport in muscle metabolism, in addition to improving muscle performance, it also increases glucose uptake in muscle cells. Study conclude that's , 96 one-day-old chickens has been examined through the study, which were randomly divided into four equal groups, and each group was divided into three sub-replications respect to the 24 chickens in each group in repetition, 8 numbers of chickens were placed. Moreover, one group was control and the other three were treatment (experimental) groups, T1 group was given 0.1%, T2 0.2%, and T3 group 0.3% extra arginine in food. Overall, this study shows that if 0.3% of arginine is added to chicken feed; so the chickens will gain more weight with less food consumption and the death rate of the chickens will be significantly reduced. Lastly, we recommend that the adding of arginine more than the NRC recommendation in the diet of broiler chickens has a positive effect on the growth of the broiler chickens; therefore, it have to be added in a suitable amount arginine (0.3%) in food.

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