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Comparison of the effect of feed fermentation with the wet and dried Iraqi probiotic on the productive performance of Japanese quail birds

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***Abstract*---**The experiment was conducted in the poultry field of the al-Abbas's (p) Holy Shrine \ Al-Kafeel Company (10) km south of Karbala Governorate, using 90 birds of Japanese quail to know the effect of feed fermentation with wet and dry probiotics on the productive performance of Japanese quail birds. The birds were randomly distributed into 3 treatments (30). bird / treatment) in duplicate for each treatment, and the treatments were as follows: The first treatment(T1) included a standard diet without addition or fermentation (control treatment), the second treatment (T2) included a standard diet to which water and locally prepared probiotic at a concentration of 5 g/kg were added to feed to be fermented and served dried, the third treatment(T3) included a standard diet to which water and locally prepared probiotic at a concentration 5 g/kg were added to be fermented and served wet. The results showed that there were no significant differences between the fermentation treatments and the control treatment in the rates of feed consumption, while the effect was significant on the percentage of egg production, the weight of the eggs produced, and in the qualitative characteristics of the egg in the two treatments. The results also showed a significant effect of the addition treatments on the carcass weight.

***Keywords*---**feed fermentation, probiotic, performance, Japanese quail.

Introduction

Fermentation of feed means moistening it with water at a certain percentage first and adding beneficial microbial cultures that include Lactobacillus, Streptococcus, Aspergillus (Tannock et al., 2000), Bacillus (Jin et al., 1996) and

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Saccharomyces (Zhang et al., 2005) strains, which are among the main strains added to the feed, and then the feed is incubated in the incubator at a temperature of 37 degrees Celsius for a period of 24 hours for the purpose of fermentation (Uchewa, 2012), and the bio stimulants are considered live microbial cultures, whether they are bacteria, yeasts, molds or a mixture of them, as these organisms are isolated from the intestinal flora in the digestive tract of adult chickens (Reuter, 2001) and it is characterized by its ability to adhere to the epithelial cells lining the intestines, in addition to blocking the receptors in front of pathogenic bacteria, which prevents the infection of various diseases (Toghyani et al., 2001), as well as not leading to disease and has no toxic effect on birds, and it has a high ability to resist intestinal secretions and its ability to live in the intestines with an acidic environment and stimulate the body to resist against diseases, especially diseases that It affects the digestive system (Parra et al., 2004), and is characterized by the production of organic acids such as lactic acid and acetic acid, which have a toxic effect against pathogenic bacteria, as these two acids lower the pH, which provides an acidic environment inappropriate for the growth of pathogenic bacteria (Conway, 1996), which improves the health status of birds, which increases their ability to improve their productive performance, rather than directing it to resistance to disease (Al Dhanki, 2003).

The fermentation process for feed takes place in two ways: aerobic and anaerobic fermentation (Santoso et al., 1995). The beneficial bacteria that are fermented with feed are anaerobic bacteria, including *Lactobacillus acidophilus*, which can ferment various carbohydrates and convert them to lactic acid (Gibson, 2007). Many pathogenic microorganisms such as *E. coli* and Salmonella Spp., as well as the production of lactase enzyme, which helps to ferment some sugars and produce some antibiotics, which inhibits many pathogenic microorganisms (Ljungh, 2006) and *Bacillus subtilis*, which has the ability to produce enzymes such as amylase. Proteases that break down starchy and protein compounds, and they also break down sugars and produce acids, organic compounds and gases in foods, and Bifidobacterium, which are obligatory anaerobic bacteria and do not produce catalase and urease enzymes, and are weak in the production of lactic acid (Scardovi, 1986), it sticks to the walls of the intestines, but it has the ability to be consumed it high in oxygen and thus its presence provides anaerobic conditions suitable for the growth and reproduction of lactobacilli bacteria and has the ability to withstand the high acidity produced by lactobacilli bacteria as a result of fermentation processes (Ross, 1988).

Materials and Methods

The experiment was conducted in the poultry field of the al-Abbas's (p) Holy Shrine \ Al-Kafeel Company (10) km south of Karbala Governorate, using 90 Japanese quail birds, 1 day old, for a period of 18 weeks, divided into two productive periods (4 weeks/period), the birds were fed from the first day of the experiment with a diet Productivity of Japanese quail birds As shown in Table (1), the birds were randomly distributed to 3 treatments for each treatment of 30 birds, with each treatment being duplicated (15 birds/duplicate) and the treatments were as follows:

T1 - The control treatment dealt with a standard diet without any addition.

T2 - Treatment of adding the locally prepared probiotic at a concentration of 5 g/kg fermented and dried fodder.
3 - Treatment of adding the locally prepared probiotic at a concentration of 5 g/kg fermented and wet feed.

The characteristics of egg production (HH%), average egg weight (gm), feed consumption (gm/bird/day) and feed conversion efficiency (gm of feed/gm of eggs), and egg quality characteristics, which included high yolk and high white, were studied. A total of 6 birds from each treatment to measure the carcass weight (gm). Statistical analysis was carried out using a completely random design using the statistical program SAS (2001) and significant differences between means were tested using Duncan's multinomial test.

Table (1) The proportions of feed materials in the composition of the Japanese quail's diet during the period of egg production

Ration ingredients	%
Corn	56.1
Soybean meal	31.1
Protein concentration	5.0
Oil	2.0
Calcium	4.9
Di calcium phosphate	0.6
Salt	0.3
Chemical composition*	
Metabolic energy Kcal./Kg	2903
Protein %	20.0
Lysine %	1.11
Methionin + Cystein	0.77
Calcium	2.54
Available phosphorous	0.35

*The chemical composition calculated for this diet.

Results and Discussion

Table (2) shows that there is a significant superiority ($P<0.05$) for the two feed fermentation treatments (T2, T3) over the control treatment, and treatment T3 recorded the highest production rate of 82.55%, while treatment T2 had a production rate of 79.58% and the control group with a rate of 75.66% egg production. We note from the same table that there is a significant ($P < 0.05$) in the percentage of egg production on the basis of (HD) in the third, fourth and fifth periods over the first period, as the production rate reached 83.96, 83.10, and 81.62%, respectively. Production was low in the first period because it is the beginning of production, then it starts to gradually rise to reach the peak of productivity. This result differed with the findings of Yousifi and Karkoodi (2007) and also differed with the findings of Al-Danaki (2003) and Zangana (2007), while it agreed with Ayasen et al. (2006). The improvement in the egg production rate of the T3 treatment and its superiority over the T1 treatment may be attributed to the fermentation of the feed by adding water and probiotics that increase the percentage of beneficial microorganisms, as indicated by Smirnov et al. (2005) Corporation (Wysong, 2006) and their spread on the surface of the mucus layer. Spread on the myosin fiber network, this network provides the appropriate medium for its growth and reproduction and increases its secretion of amino acids such as lysine, which contributes significantly to increasing egg production rates. The improvement in the rate of egg production may be attributed to the fact that the probiotic works to maintain the microbial balance through the dominance of beneficial microorganisms in the intestinal flora and the speed of their adhesion to the surface of the intestinal epithelium (Mathew, 2001).

Feed consumption rate explained in Table (3), there were no significant differences in the rate of feed consumption between treatments and throughout the duration of the experiment. This result agreed with (Abdel-Azeem et al., 2005; Ayasen et al., 2006; Namra, 2006; Yousefi and Karkoodi, 2007).

While we notice from Table (4) that the parameters of forage fermentation and the probiotic regarding feed conversion efficiency did not outperform the two experimental treatments on the control group, where the T3 treatment, which excelled with a high significant difference ($P<0.01$) on the control group, and the T3 treatment recorded the best conversion efficiency of feed grams into grams of eggs (2.53). Whereas, the control treatment recorded a feed conversion efficiency of (2.80), and the T1 treatment recorded the lowest conversion efficiency of feed grams into eggs. The results of the experiment did not agree with that of Zewell *et al.*, 2006. While I agree with the findings of Ayasen et al., 2006; Yousefi and Karkodi, 2007. Our results agreed with Zangana (2007), that lactobacilli produce lactic acid, which kills harmful bacteria by lowering the pH of the intestines (pH), which is considered an inappropriate medium for the growth of pathogenic bacteria such as salmonella and *E. coli* (Rolf, 2000), which compete with the host depends on the consumption of nutrients, and the intestinal cells benefit from lactic acid as a food material that leads to an increase in the number of intestinal villi and an increase in the length of the villi, which increases the ability of the intestine to absorb nutrients (Haddain et al., 1997). Together, this leads to the superiority of probiotics containing multiple types of microorganisms over those consisting of one type of microorganisms (Al-Nouri, 2006; Al-Khalidi, 2005).

Table (5) indicates that there were highly significant differences ($P < 0.01$) in the egg production mass by each quail female, as the T3 treatment significantly outperformed the two experimental treatments, and T3 recorded the highest egg mass (136.09 g / quail / 14 days), followed by the treatment T2 at an average of (123.45) g / quail / 14 days). The improvement in the efficiency of food conversion and the increase in the rate of egg production lead to an increase in the mass of eggs produced in relation to the number of grams of feed. The reason for this may be due to the fact that the microorganisms involved in the formation of probiotics and fermented feed have the ability to secrete many digestive enzymes that increase the readiness of nutrients inside The alimentary canal and then increasing the benefit of the feed intake and converting it into eggs (Abd-Azeem et al., 2005). The locally prepared probiotic provides energy for the beneficial anaerobic microorganisms after decomposing it to the complex group of sugars that make up the yeast wall (Mannan Oligo Saccharid); Because it possesses digestive enzymes and produces lactic acid (Apajalahti et al., 2004), which in turn disrupts the activity of enzymatic pathogenic bacteria by entering through its wall and stopping its work, thus leading to non-reproduction and elimination, thus improving the health of birds and increasing their benefit from feed (Naji et al., 2007).

Table (6) also showed that there was a significant effect on the level ($P < 0.05$) between the two forage fermentation treatments and the control treatment in the general average number of eggs produced, as it is noted that the T2 and T3 treatments were superior to the T1 control treatment with a significant difference and differed with Abdel-Azeem et al. (2005), and agreed with Yousifi and Karkoodi (2007).

Table (7) indicates that there is a highly significant ($P<0.01$) in the average egg weight of the T3 treatment over the rest of the two treatments. The results differed with (Ayasen et al., 2006).

Table (2) Effect of fermentation of feed by adding water and probiotics prepared locally on the percentage of egg production, calculated on the basis of HD, of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	68.58^{A} ± 5.821	73.80^{A} ± 3.919	75.47^{A} ± 4.536	72.61^{b} ±1.713
10-12 weeks	78.63^{A} ± 2.48	82.74^{A} ± 3.455	79.87^{A} ±1.777	80.41^{ab} ± 0.893
12-14 weeks	81.29^{B} ±1.030	88.68^{A} ± 2.386	81.11^{B} ±1.031	83.69^{a} ± 0.896
14-16 weeks	80.50^{A} ± 0.217	86.04^{A} ± 1.329	82.84^{A} ± 2.870	83.12^{a} ± 0.882
16-18 weeks	79.56^{A} ± 0.414	85.22^{A} ± 4.294	76.81^{A} ± 3.061	80.53^{a} ±1.237
Average** 8-18 weeks	77.71^{b} ±0.974	83.29^{a} ± 0.916	79.22^{b} ±1.50	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level ($p<0.05$).
**The different lowercase letters within the same row indicate the presence of significant differences ($P < 0.05$). Between the rates of the transactions, and the different letters within the same column indicate the presence of significant differences ($P < 0.05$) between the different periods.

Table (3) Effect of fermentation of feed by adding water and probiotics prepared locally on the feed consumption rate (gm/ quail /day) of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	21.60 ^{A} ± 1.446	22.30^{A} ± 0.709	22.53^{A} ± 0.233	22.14^{a} 0.342
10-12 weeks	21.36^{AB} ± 0.433	21.13^{AB} ± 0.218	20.40^{B} ± 0.305	20.96^{a} ± 0.155
12-14 weeks	24.40^{A} ± 0.642	25.03^{A} ± 1.117	24.86^{A} ± 0.696	24.76^{a} ± 0.305
14-16 weeks	25.53 ^{A} ± 1.086	24.80^{A} ± 0.100	24.23^{A} ± 0.003	24.82^{a} ± 0.294
16-18 weeks	25.70^{A} ± 0.1.080	25.73^{A} ± 0.437	24.90^{A} ± 0.896	25.44^{a} ± 0.351
Average** 8-18 weeks	23.71^{b} ±0.974	23.79^{a} ± 0.916	22.78^{b} ±1.50	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level ($p<0.05$).
**The different lowercase letters within the same row indicate the presence of significant differences ($P < 0.05$). Between the rates of the transactions, and the different letters within the same column indicate the presence of significant differences ($P < 0.05$) between the different periods.

Table (4) Effect of fermentation of feed by adding water and probiotics prepared locally on the feed conversion ratio (Kg feed / Kg egg) of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	2.86 ^{A} ± 0.106	2.74^{A} ± 0.214	2.71 ^{A} ± 0.189	2.76^{a} ± 0.073
10-12 weeks	2.43^{A} ± 0.056	2.24^{B} ± 0.087	2.33^{AB} ± 0.029	2.33^{a} ± 0.024
12-14 weeks				

	2.65A ± 0.063	2.43A ± 0.040	2.74A ± 0.103	2.60a ± 0.045
14-16 weeks	2.72A ± 0.23	2.32B ± 0.090	2.47AB ± 0.060	2.50a ± 0.046
16-18 weeks	2.76A ± 0.180	2.61A ± 0.118	2.88A ± 0.181	2.75a ± 0.056
Average** 8-18 weeks	2.68b ±0.974	2.46a ± 0.916	2.62b ±1.50	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level ($p<0.05$).
**The different lowercase letters within the same row indicate the presence of significant differences ($P < 0.05$). Between the rates of the transactions, and the different letters within the same column indicate the presence of significant differences ($P < 0.05$) between the different periods.

Table (5) Effect of fermentation of feed by adding water and probiotics prepared locally on the eggs production mass (g / bird/ 14 days) of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	106.31A ±11.715	115.50A ± 4.974	117.65A ± 8.343	113.15C ± 2.984
10-12 weeks	123.62A ± 4.637	132.76A ± 6.549	123.62A ±1.750	126.66b ± 1.512
12-14 weeks	133.60AB ± 3.480	143.96A ± 4.284	127.44 ± 2.923	135.00a ±1.781
14-16 weeks	131.46B ± 4.324	149.80A ± 5.614	137.80 AB ± 2.910	139.68a ± 2.288
16-18 weeks	128.80A ± 7.594	139.11A ± 7.017	121.98A ± 3.546	130.06a ± 2.487
Average** 8-18 weeks	124.75b ± 1.938	136.22a ± 1.662	125.69b ± 0.785	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level ($p<0.05$).
**The different lowercase letters within the same row indicate the presence of significant differences ($P < 0.05$). Between the rates of the transactions, and the

different letters within the same column indicate the presence of significant differences (P < 0.05) between the different periods.

Table (6) Effect of fermentation of feed by adding water and probiotics prepared locally on the cumulative egg coefficient (egg / chicken / 14 days) of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	9.36^{A} ± 0.61	10.23^{A} ± 0.54	10.50^{A} ± 0.63	10.03^{a} ± 0.23
10-12 weeks	10.96^{A} ± 0.33	11.53^{A} ± 0.48	11.10^{A} ± 0.26	11.19^{a} ± 0.12
12-14 weeks	11.33^{A} ± 0.13	12.33^{A} ± 0.34	11.26^{A} ± 0.14	11.64^{a} ± 0.12
14-16 weeks	11.23^{A} ± 0.03	11.96^{A} ± 0.17	11.50^{A} ± 0.40	11.56^{a} ± 0.11
16-18 weeks	11.10^{A} ± 0.05	11.90^{A} ± 0.60	10.70^{A} ± 0.43	11.23^{a} ± 0.17
Average** 8-18 weeks	10.79^{d} ± 0.204	11.59^{a} ± 0.169	11.01^{cd} ± 165	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level (p<0.05).
**The different lowercase letters within the same row indicate the presence of significant differences (P < 0.05). Between the rates of the transactions, and the different letters within the same column indicate the presence of significant differences (P < 0.05) between the different periods.

Table (7) Effect of fermentation of feed by adding water and probiotics prepared locally on the Average egg weight (gm) of Japanese quail raised for a period of 8 to 18 weeks

Treatments[1] Periods[2]	T1	T2	T3	Average*
8-10 weeks	11.03^{A} ± 0.29	11.20^{A} ± 0.15	11.13^{A} ± 0.17	11.12^{a} ± 0.75
10-12 weeks	11.23^{AB}	11.46^{A}	11.06^{AB}	11.25^{a}

	± 0.06	± 0.18	± 0.08	± 0.06
12-14 weeks	11.33 [A] ± 0.08	11.60 [A] ± 0.20	11.23 [A] ± 0.14	11.38[a] ± 0.06
14-16 weeks	11.70 [AB] ± 0.40	12.43 [A] ± 0.32	11.90 [AB] ± 0.23	12.01[a] ± 0.15
16-18 weeks	11.56 [A] ± 0.62	11.83 [A] ± 0.23	11.36 [A] ± 0.21	11.58[a] ± 0.15
Average** 8-18 weeks	11.37[ab] ± 0.20	11.70[a] ± 0.09	11.33[b] ± 0.00	

[1]Add the locally prepared probiotic at a rate of 5 gm/kg of feed, according to the manufacturer's recommendations.
[2]The values represent 2.5 months (each period is 14 days).
*The different capital letters within the same row indicate the presence of significant differences between the treatments at the level ($p<0.05$).
**The different lowercase letters within the same row indicate the presence of significant differences ($P < 0.05$). Between the rates of the transactions, and the different letters within the same column indicate the presence of significant differences ($P < 0.05$) between the different periods.

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