# Study The Effect of Different Types of Probiotics on The Productive Performance and Egg Traits of Japanese Quail

Noor A. Sayah[1], Bahaa A. Alsereah[2], Nameer A. Khudhair[3]
[1, 2, 3]Department of Veterinary Public Health, Veterinary Medicine College, University of Basrah, Iraq.

**Abstract**
The aim of this project is to fortify the quail feeds with various types of probiotics and study the productive properties to recognize the best formula of probiotics for best production. The control group was feed on standard ration, Saccharomyces group was feed on standard ration fortified with Saccharomyces cerevisiae, Lactobacillus group was feed on standard ration fortified with Lactobacillus acidophilus, Bifidobactrium group was feed on standard ration fortified with Bifidobacterium bifidum and Mix probiotics group was feed on standard ration fortified with mixture of above probiotics. Body weight, weight gain, feed intake and feed conversation efficacy were daily recoded. The results showed at the mix probiotic group of birds appeared highest significant values ($p<0.05$) among the studied groups in weekly body weight and weight gain along the growth period. mix probiotic group showed high significant values ($p<0.05$) in their feed consumption (after the second week) compared with all groups of the study. These in turn reflex on values of feed conversion efficiency. The results revealed significant elevation ($p<0.05$) in feed conversion efficiency for control and saccharomyces groups along the study period compared with other type of probiotic that added to the diet of the groups. The mean number of eggs produced by birds fed on diet supplemented with mixture probiotic recorded high significant compared with another zstudied group. Although there were non-significant in mean of egg weight produced by different groups of the study, but the egg mass revealed significant increase in group of lacto, bifido and mix probiotics related to sacro and control groups. Through the research paper, we concluded that the addition mix probiotic supplementation has enhanced the productive performance (growth) in raising quail birds.
Keywords: Probiotic, Quails, Weight, Feed intake.

## 1. Introduction

The last decade coincided with many challenges for the poultry industry, starting with the fear of bird flu and ending with the feed and grain crisis. This is what makes us think of finding a suitable alternative that meets the market need and human consumption in terms of table eggs and meat. The attention of breeders and investors has drawn to the interest in breeding of quail birds. Japanese quail is considered one of the important alternative resources of animal protein, because it has many advantages such as fast growth, early sexual maturity, short incubation period, small size and high egg production, low feed requirements and less housing costs and space, compared with the different species of poultry ((Mountzouris *et al.*, 2017). In Addition, quail eggs are rich in protein and good sources of folate, vitamin B12, Various types of feed additives were used to improve growth and maintain the health of birds. Antioxidant is one of diet additives to protect feed from go bad and improve bird growth and enhance the immunity (Luna *et al.*, 2017). Also, Free-flowing agents to prevent interaction between the ingredient, pelleting, feeding enzymes, molds inhibitors, Coccidiostats and antibiotics are all act to protect the diet from oxidation or change to harmful form and enhance the bird growth and immunity (Jacob, 2020). Also, Probiotic has been a potential choice as feed additive due to its beneficial effects on nutrient digestibility (Mountzouris *et al.*, 2017). The current study aimed to demonstrate the effect of lysine requirements to achieve maximum performance (increased body weight and feed content ratio) in the feed of japanese quail.

## 2. Materials & Methods

### Management of birds

One hundred and fifty-one-day-old quail birds were used in the study, birds were divided into 5 groups randomly, each group containing 3 replicates (10) chicks / replicate. The duration of the experiment from start to finish was 1 to 42 days. Fed and water ad libitum. The dwelling was prepared with all the necessary equipment to provide the temperature and ventilation within the ideal limits, where the temperature on the first day was 33℃ and decreased weekly by 2 degrees until it reached 23℃ in the sixth week. The ration was prepared according to the basic diet during the experiment to provide all other nutrients.

### Preparation of Probiotics for use

The different types of individual probiotics were purchase from Dura AL-Muthanna drug store,Almuthana province as a live capsulated

doi.org/10.31838/hiv23.01.133 Received: 18.09.22, Revised: 22.10.22, Accepted: 04.12.22

belong to different companies and doses ,as following:-

| Table 1: Compositions and chemical analysis of the diet used in the experiment:. | | |
|---|---|---|
| Ingredients | Growth diet (%)(1-42 )day | Productive diet (%) (45- end of the experiment) |
| Yellow corn | 49 | 46 |
| Wheat | 11.5 | 24 |
| Protein concentrated (50% protein) | 5.3 | 8.0 |
| Soybean meal (48% protein) | 31.2 | 17 |
| Limestone | 1.4 | 2.5 |
| Vegetable oil | 1.6 | - |
| Mixture of vitamins and minerals | - | 2.5 |
| Total | 100 | 100 |
| Metabolic energy (kcal/kg) | 3049 | 2930 |
| Protein (%) | 22.26 | 18.38 |
| Calcium (%) | 0.8 | 1.95 |
| methionine% | 0.50 | 0.50 |
| Phosphorus (%) | 0.58 | 0.8 |
| *NRC 1994 | | |

1- Pills containing Saccharomyces cerevisiae 250 mg1x107 CFU (Madamar food company/ Poland).
2- Probiotics 98% purity pills containing 5x108 CFU of Lactobacillus acidophilus (New gate company/ Britain).
3-Pills containing Bifidobacterium bifidum 30 mg 3x108 CFU (century company/ USA).
4- Mix probiotic capsule 5x108 CFU from all above probiotics (Now company/ USA).
The above probiotics were used by weighting the products according to the weight of birds and dose of product by using the following formula:
Mean weight of human X dose of product
Mean weight of birds' dose for birds
Then, probiotics mixed with100mg of carrier materials (wheat bran) and distributed with feed of bird.

### Study design

1. Treatments categorize depending on a type of probiotics supplemented with feed for about 42 days as following: -
2. Control group: birds were feed on standard ration.
3. Saccharomyces group (Sacro. Group): birds were feed on standard ration fortified with *Saccharomyces cerevisiae*.
4. Lactobacillus group (Lacto. Grpoup): Birds were feed on standard ration fortified with *Lactobacillus acidophilus*.
5. Bifidobactrium group (Bifido. Group): Birds were feed on standard ration fortified with *Bifidobacterium bifidum*.
6. Mix probiotics group (mix prob. group): Birds were feed on standard ration fortified with mixture of above probiotics.
7. Body weight and feed consumption were daily recoded.

## 3. Studied parameters

### Growth Traits

During the experiment intervals body Wight, Wight gain, feed consumption and feed conversion efficiency were weekly recorded.

### Average of living body weight (gm)

The birds were weighted weekly for each replicate of the different experimental treatments, starting from the age of 1 day with an initial weight until the age of 42 days by using electrical balance (chine)

### Weekly weight gain (gm)

The weight gain was calculated according to the following equation for each replicate (Al-Fayyad and Naji, 1989):
Weight gain = average live body weight at the end of the week - average live body weight at the beginning of the week).

### Feed conversion efficiency (gm)

Feed conversion efficiency= (feed intake (gm) / weight gain (gm)
(Al-zubidy 1986)

### Productive Traits

### Egg production

eggs production rate (HD%) = Number of eggs during the period( gm)/ average egg weight(gm)× The number of eggs produced during the period
(Al-zubidy 1986)

### Cumulative Number of Eggs Produced

According to the cumulative number of eggs at the end of a productive period estimated, according to the following equation:
Cumulative number of eggs= ((% HD) egg production rate))/100
(Naji and Hana, 1999).

### Eggs mass

The mass of eggs for the productive period was calculated according to the following equation:
Egg mass (gm/bird) = ((gm) eggs average weight x eggs number)/ (The length of the production period)
(Al-Fayyad and Naji,1989).

### Egg Production Rate

The percentage of production for the productive period and the length of the period is 4 weeks,

according to the following equation:
Egg Yield (HD%) = (Total number of eggs during the period)/ (Number of birds at the end of the period ×Length of time in days) × 100
(Naji and Hana, 1999).

## 4. Statistical Analysis

In order to determine the statistical significances among different variables SPSS program (Statistical package for social sciences) version 21 was used. Analysis of variance tests were applied to analyze the obtained results.

### Statistical analysis

In order to determine the statistical significances among different variables SPSS program (Statistical package for social sciences) version 21 was used. Analysis of variance tests were applied to analyze the obtained results.

## 5. Results

### Effect of probiotics additive on body weight and body weight gain

The probiotic supplement in the diet of Japanese quail's birds were effect on body weight during different growth stage as represented by table (2). The results revealed significant increase ($p<0.05$) in body weight for the birds supplemented with probiotic in the diet compared with birds of control group. As shown in result, the mix group of probiotic appeared highest significant values ($p<0.05$) among the studied groups along bird's growth period.

Table 2: Effect of probiotics additive on body weight of Japanese quail birds during growth stage (mean ± standard error

| Weeks groups | First week | Second week | Third week | Fourth week | Fifth week | Sixth week |
|---|---|---|---|---|---|---|
| Control | 22± 0.25 | 51.13± 1.84b | 112.66± 2.18 | 137± 3.34b | 158.66± 6.32b | 178± 6.21b |
| Sacro. Group | 24.33± 0.14 | 55.82± 2.79 ab | 114.33± 2.39 | 143± 4.83 b | 162.45± 7.17b | 181± 8.54b |
| Lacto. Group | 25.23± 0.35 | 58.43± 2.45a | 115.24± 2.09 | 148.66± 5.71 ab | 167.74± 5.44ab | 195± 9.87ab |
| Bifido. Group | 24.66± 0.28 | 62.22± 1.98 a | 116.72± 2.40 | 145.66± 4.63 ab | 170.83± 6.28a | 196± 8.76ab |
| mix. group | 23±0.36 | 65.81± 1.75 a | 116.65± 2.27 | 151.33± 5.76 a | 173.65± 7.81a | 213± 9.33 a |
| Small letters referred to significant difference among groups at ($p<0.05$) | | | | | | |

Therefore, body weight gain showed significant elevation ($p<0.05$) in probiotic groups compared with control birds group that fed on diet without probiotic. While mix probiotic group of birds appeared highest significant values ($p<0.05$) among the studied groups in weekly body weight gain along the growth period (table 3).

Table 3: Effect of probiotics addition on body weight gain of Japanese quail birds during growth stage (mean ± standard error)

| Weeks groups | 1-2 week | 3-4 week | 5-6 week |
|---|---|---|---|
| Control group | 29.13 ± 0.57c | 24.34 ± 1.93c | 19.34 ± 1.62c |
| Sacro.group | 31.49 ± 0.26 c | 29 ± 1.50b | 18.55 ± 1.84c |
| Lacto.group | 33.2 ± 0.49bc | 33.42 ± 1.44a | 28 ± 2.76b |
| Bifido.group | 37.56 ± 0.33b | 28.94 ± 1.95bc | 26 ± 2.34b |
| mix.group | 42.81 ± 0.74 a | 34.68 ± 1.98a | 39.35 ± 3.12a |

### Effect of probiotics on Feed consumption and feed conversion efficiency

Feed consumption of birds that supplemented with different types of probiotic (table 4) appeared significant increase ($p<0.05$) in their consumption after the second week of breeding when compared with control bird group that fed without probiotic addition. Whereas, mix probiotic group showed high significant values ($p<0.05$) in their feed consumption (after the second week) compared with all groups of the study. These in turn reflex on values of feed conversion efficiency

Table 4: Effect of probiotics addition on feed conversion ratio of Japanese

| | Feed intake (g/bird/period) | | | Feed conversion ratio (g feed/g gain) | | |
|---|---|---|---|---|---|---|
| Weeks groups | 1-2 week | 3-4 week | 5-6 week | 1-2 week | 3-4 week | 5-6 week |
| Control Group | 103.54 ±3.62 | 178.56 ±4.16 c | 276.13 ±8.21c | 3.55 ±0.07a | 7.33 ±0.08a | 14.27 ±0.07a |
| Sacro. Group | 102.52 ±2.75 | 176.43 ±5.81 c | 282.92 ±7.45c | 3.25 ±0.06ab | 6.08 ±0.04b | 15.25 ±0.06a |
| Lacto. Group | 106.14 ±1.97 | 184.26 ±4.72 b | 294.27 ±8.57 b | 3.19 ±0.02bc | 5.51 ±0.05b | 10.5 ±0.09b |
| Bifido. Group | 108.32 ±3.72 | 188.52 ±3.91 ab | 292.93 ±9.11bc | 2.88 ±0.03c | 6.51 ±0.03ab | 11.26 ±0.07b |
| mix. group | 110.63 ±2.86 | 193.71 ±5.67 a | 311.64 ±12.46 a | 2.58 ±0.03c | 5.58 ±0.06b | 7.91 ±0.05c |

quail birds during growth stage (mean ± standard error )

The results of table (4) revealed significant elevation ($p<0.05$) in feed conversion efficiency for control and saccharomyces groups along the study period compared with other type of probiotic that added to the diet of the groups. Otherwise, mix probiotic group significantly decrease ($p<0.05$) in their feed conversion efficiency values among all studied groups.

Table 5: Effect of probiotic and their mixture on eggs production and characteristics of Japanese quail birds (mean ± standard deviation)

| Trait | Groups | (mean ± standard deviation) |
|---|---|---|
| Weight of the first egg (gm) | Control group | 6.54± 0.16 b |
| | Sacro. group | 6.56 ±0.15 b |
| | Lacto. group | 6.72± 0.19 b |
| | Bifido. group | 7.26±0.41 a |
| | Mix prob.group | 7.37 ±0.19 a |
| | Mean effect | LSD 0.27 |
| Rate of Egg Production (%) (33 days after the refiner reaches 50% of the egg production) | Control group | 63.34±4.25 b |
| | Sacro. group | 72.93±4.46 a |
| | Lacto. group | 67.27 ±5.83 a |
| | Bifido. group | 68.96±5.80 a |
| | Mix prob.group | 66.22±6.10 a |
| | Mean effect | LSD 3.23 |
| Average Number of Eggs Produced (Egg/Bird) (33 days after the refiner reaches 50% of the egg production) | Control group | 19.77±0.70 c |
| | Sacro. group | 21.43±0.78 b |
| | Lacto. group | 20.93±1.41 b |
| | Bifido.group | 21.86±2.02 b |
| | Mix prob.group | 22.34 ±2.00 a |
| | Mean effect | LSD 1.72 |
| Egg Weight Rate (gm) (33 days after the refiner reaches 50% of the egg production) | Control group | 9.83±0.10 |
| | Sacro. group | 9.93± 0.11 |
| | Lacto. group | 9.94± 0.12 |
| | Bifido.group | 9.96±0.12 |
| | Mix prob.group | 10.00±0.16 |
| | Mean effect | N.S |
| Egg Mass (gm/Bird) (33 days after the refiner reaches 50% of the egg production) | Control group | 196.32±5.51 c |
| | Sacro. group | 211.12±9.83 b |
| | Lacto. group | 226.49± 10.84 a |
| | Bifido.group | 284.67±7.36 a |
| | Mix prob.group | 286.62 ±6.53 a |
| | Mean effect | LSD 17.64 |
| Small letter referred to significant difference among the group at ($p\leq0.05$) | | |

The globulin level in bifido and sacro groups appeared significantly higher in 45day of experiment than 30 days of this study. while the other treatment group showed without difference. Hb revealed significant elevation in Hb concentration for the groups treated with probiotic compared with control group that fed on standard ration without adding probiotics for the two intervals period (30 and 45). While comparison Hb concentration between the intervals (30 and 45 day) in the same group were appeared non-significant difference for all studied group. The first 30 day of experiment showed non-significant difference in PCV values among the groups.

But, the 45 intervals recorded significant increase in PCV percent for mix, bifid and sacro groups compared with control and lacto groups. Also, PVC percent showed non-significant difference between the two intervals of experiment, except in bifido group that appear significant elevation in 45 day compared with 30 day of experiment.

eggs production The mean number of eggs produced by birds fed on diet supplemented with mixture probiotic recorded high significant compared with other studied group. Although there were non-significant in mean of egg weight produced by different groups of the study, but the egg mass revealed significant increase in group of lacto, bifido and mix probiotics related to sacro and control groups.

## 6. Discussion

### Effect of probiotics additive on body weight and body weight gain

It is noticed from the results showed in (table 2), There were significant increase ($p<0.05$) in body weight for the birds supplemented with probiotic in the diet compared with birds of control group. Also, the mix probiotic group appeared highest significant values ($p<0.05$) among the studied groups along bird's growth period. This may be due to stimulating effect of mix probiotics that have lactobacillus, saccromyces and bifidobacterium microorganism

which act for better digestion and absorption of nutrients that helps to improve the body weight. (Banna et al.,2010). While Line and his team attributed the increase in body weight of birds to the role of probiotics and yeast, which increase the availability of nutrients and reduce the harmful effect of pathogenic microorganisms such as (Salmonella) and other intestinal pathogenic bacteria on the sites of its presence inside the intestine and cecum (Line al et,.1995). These in turn agreement with Odeh (2017) that investigate the role of probiotics in enhance body weight and production when using kefir milk as a probiotic at three different levels (12,8,4) ml / liter of drinking water for broilers. Kabir et al,.(2004) mentioned that addition of probiotic to bird feed at the age of one day led to a significant improvement in weight gain, ready-made carcass weight, and cut-off weights and the immune response. In contrast, body weight gain showed significant elevation ($p<0.05$) in groups fortified with probiotic compared with control birds' group that feed on diet without probiotic. While mix probiotic group of birds appeared highest significant values ($p<0.05$) among the studied groups in weekly body weight gain along the growth period (table 3). This result agrees with Al Nuaimi, (2015) when used unsexed 500 Cobb broiler chicks at one day old, using the local probiotic and imported yeast powder (Saccharomyces cerevisiae), where noticed a significant difference in the mean of body weight gain between treatments compared to the control factor. Whereas, Kammaran et al, (2002) revealed that addition of probiotic did not led to an improvement in feed intake, weight gain, feed conversion efficiency. Both Manati and Ahmed (2014) observed a significant improvement in the average body weight and increase weight, feed conversion factor and production index values with an increase in the rate of feed consumed in favor of treatments in which probiotics were used at a concentration of 3.0 ml, to inject hatching eggs compared with the control treatment.

### Effect of probiotics on feed consumption and feed conversion efficiency

According to the results shown in the (table 4) that revealed significant increase ($p<0.05$) in feed consumption of birds supplemented with probiotics after the second week of breeding when compared with control bird group that fed without probiotic addition. Whereas mix probiotic group showed high significant values ($p<0.05$) in their feed consumption (after the second week) compared with all groups of the study. These in turn reflex on values of feed conversion efficiency body weight gain showed significant elevation ($p<0.05$) in probiotic groups compared with control birds' group that feed on diet without probiotic. While mix probiotic group of birds appeared highest significant values ($p<0.05$) among the studied groups in weekly body weight gain along the growth period. Yeasts are an important probiotic source that had suppressant action against pathogenic bacteria as well as improvements in gastrointestinal physiology, which contributed to improved production results (Morales 2004).in addition, Lactobacillus improves the coefficient of digestion and the coefficient of food conversion, by increasing the readiness of some nutrient compounds such as proteins, fats, carbohydrates, minerals and vitamins (Hammod et al., 2019). These results came in agreement with other study that attribute the increase in feed consumption to the role of yeast that had resistance to stress caused by the action of harmful microorganisms through compete with beneficial microorganisms and the host for Nutrients (Al-Shedidi,.2001). Also agree with Al- Nuaimi (2015) where noticed a significant difference in Feed intake and significant decreased in the feed conversion ratio although there were improve in the rate of feed consumption between food transactions. Whenever, Zarei et al. ( 2011) adding the probiotics to laying hens' diets and recorded a significant improvement in the feed conversion factor and feed consumption compared to the control factor.

### Effect of probiotic and their mixture on eggs production and characteristics of Japanese quail birds

Weight of the first egg appeared high significantly in mix probiotic group relation to the weight of egg produced by the other studied group. In contrast, all probiotic treated group appeared higher than control group in rate of eggs production. The mean number of eggs produced by birds fed on diet supplemented with mixture probiotic recorded high significant compared with another studied group. Although there were non-significant in mean of egg weight produced by different groups of the study, but the egg mass revealed significant increase in group of lacto, bifido and mix probiotics related to sacro and control groups. The reason for the addition of sacro yeast who made the beneficial effects on egg production percentage, egg weight, egg mass, and serum, and yolk cholesterol concentration have been previously reported (Nahashon et al. 1994; Abdulrahim et al. 1996; Jin et al. 1997). High rate of egg production is due to the high concentration of protein in the blood, which works to maintain the volume of bodily fluids and the acid-base balance, it is also a carrier of fats, carbohydrates, vitamins, minerals and hormones to increase egg production because there is a positive relationship between the concentration of protein in the blood serum and the rate of egg production. The beneficial effects of probiotics in laying hens on egg production percentage, egg weight, egg mass, and serum, and yolk cholesterol concentration have been previously reported (Nahashon et al. 1994; Abdulrahim et al. 1996; Jin et al. 1997). Hassanein and Soliman ( 2010)indicated that adding a probiotic to productive performance at a rate of (0.4 and 0.8) to the feed, it contributes to improving the productive performance of laying hens (characteristics productivity and quality) for eggs represented in egg production and shell rate in his experiment in which

he added (0.0 ,0.4,0.8,1.2 and 1,6) In the diet of laying hens breed Hy line (W- 36).

As well agreement with Manati and Ahmed (2014) observed a significant improvement in the average body weight and increase weight, feed conversion factor and production index values with an increase in the rate of feed consumed in favor of treatments in which probiotics were used at a concentration of 3.0 ml, to inject hatching eggs Compared with the control treatment. Zarei et al. ( 2011)Adding the probiotics to laying hens' diets contributed to increasing the egg production rate and egg weight, as well as a significant improvement in the feed conversion factor compared to the control factor.

## 7. Conclusion

Our finding of study appear that productive performance was improved when used concentration of mixed probiotic according to recommendations.

## References

1. Luna 1, Or C Lema-Alba 2, J S Dambolena 3, J A Zygadlo 3, M C Labaque 4, R H Marin 4(2017). Thymol as natural antioxidant additive for poultry feed: oxidative stability improvement. Poult Sci.2017 Sep 1;96(9):3214-3220. doi: 10.3382/ps/pex158

2. Jacob, Jacquie. FEED ADDITIVES FOR POULTRY. SMALL AND BACKYARD POULTRY,Poultry Extension website. https://poultry.extension.org/articles/feeds-and-feeding-of-poultry/feed-additives-for-poultry/.2020

3. Matusevicius, P. (2017). The effect of a probiotic preparation containing 166Enterococcus faecium DSM 7134 for chickens on growth performance, immune status, and the histology and microbiological profile of the jejunum. Animal Production Science, 59(1): 101-108.

4. Al-Fayyad, H. Abdel-Aziz and Nagy, S.Abdel-Hussein (1989). Poultry products technology. First Edition, Directorate of Higher Education Printing Press, Baghdad

5. Al-Zubaidi, Suhaib Saeed Alwan (1986). Poultry management. Basra University Press.

6. Odeh, Aqil Towena (2017). Effect of adding different levels of kefir milk to drinking water on the productive, physiological and immune traits of broilers. Master's thesis. faculty of Agriculture,Albasrah university . 146 pages

7.Al-Nuaimi, A. Nazim Zaki (2015). Evaluation of adding different levels of kefir granules in productive performance the physiological characteristics of broilers. Master Thesis. College of Agriculture, University of Baghdad

8. Manati, J. Qassem and Ahmed, I. Shehab (2014). The effect of injecting hatching eggs with probiotics in (592-584: (6)) Some productive characteristics of broilers. Iraqi Journal of Agricultural Sciences, 45

9. Hammod, A. J.; Alshukri, A. Y. and Areaaer, A. H. (2019). Effect of
probiotic and humic acid addition on physiology and immunity traits of
broiler chicks. Biochemical and Cellular Archives, 19(2): 2803-2805.

10. NRC (1994). Nutrient Requirements of Poultry (9th ed.). National Academy Press, Washington D.C., USA.

11.Line, L. E.; N. J. Stern; N. A. Cox and J. S. Bailey. 1995. Saccharomyces treatment to diminish campylobacter and salmonella in chickens. Poult. sci., 74(suppl. 1): S 81 (Abstr.)

12.Kamaran, M.; T. N. Pasha; A. Mahmud and Z. Ali. 2002. Effect of Commercial Enzyme (Natugrain) supplementation on the Nutritive Value and Inclusion Rate of Guar Meal in Broiler Rations. International Journal of Poultry Science, 1: (6) 167-173

13.Kabir, S. M. L.; M. M. Rahman, M. B. Rahman, M. M. Rahman and S. U. Ahmed. 2004. The Dynamics of Probiotics on Growth Performance and Immune Response in broilers. International Journal of Poultry Science, 3(5): 36 – 364

14. Zarei, M.; Ehsani, M. and Torki, M. (2011). Dietary Inclusion of probiotics, prebiotics and synbiotic and evaluating performance of lying hens. American Journal of Agriculture and Biological Sciences, 6 (2): 249 – 255

15. Murry, A.C.; A. Hinton and H. Morrison.2004a. Inhibition of Growth of Escherichia coli, Salmonella tuphmurium, and Clostridia perfringens on Chicken Feed Media by Lactobacillus salivarius and Lactobacillus plantarum. International Journal of Poultry Science, 3(9): 306 – 607

16. Al-Shadidi, Scheherazade Muhammad. ( 2001). Effect of using percentages of bread yeast cerevisiae Sacchraomyces and its fermented feed on the productive performance and immune response of broilers. Master Thesis - College of Agriculture - University of Baghdad

17. Nagy, Saad Abdul-Hussein and Hanna, Aziz Kabru (1999). Laying hens breeding guide. Arab Federation for Food Industries, Heba Library.

18.Jin, L. Z.; Ho, Y. W.; Abdulah, N. and Jalaludin, S. (1997). Probiotics in poultry: Modes of action. World's Poultry Science Journal, 53(4): 351- 368.

19.Nahashon, S. N.; Nakaue, H. S. and L. W. Mirosh. (1994). Production variables and nutrient retention in single comb white Leghorn laying pullets fed diets supplemented with direct fed microbial. Poultry Science, 73(11):1699-711.

20.Hassanein, S. M. and Soliman, N. K. (2010). Effect of probiotic (Saccharomyces cerevisiae) adding to diets on intestinal microflora and performance of Hy-Line layers hens. Journal of American Science, 6(11): 159-169.