A study of the effect of adding dry yeast on the productive performance of Ross 308 broiler chicks

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Abstract

The world's population is expected to reach more than 9 billion by 2050, imposing food security challenges particularly for developing countries. Moreover, economic growth has increased the demand for livestock products putting pressure on the livestock sector to produce more with limited resources. Nevertheless, the livestock sector is one of the fastest growing agricultural sectors contributing about 40 percent of the global value of agricultural production (Bruinsma, 2003).

Broiler chickens are one of the most important sources of animal protein in the world. The Ross 308 broiler breed is widely used in commercial production due to its fast growth rate and high feed efficiency. One potential way to enhance the productivity of broiler chicks is by supplementing their diet with dry yeast, which has been shown to improve nutrient digestibility, gut health, and immune function in various animal species.

Introduction

The world's population is expected to reach more than 9 billion by 2050, imposing food security challenges particularly for developing countries. Moreover, economic growth has increased the demand for livestock products putting pressure on the livestock sector to produce more with limited resources. Nevertheless, the livestock sector is one of the fastest growing agricultural sectors contributing about 40 percent of the global value of agricultural production (Bruinsma, 2003).

Broiler chickens are one of the most important sources of animal protein in the world. The Ross 308 broiler breed is widely used in commercial production due to its fast growth rate and high feed efficiency. One potential way to enhance the productivity of broiler chicks is by supplementing their diet with dry yeast, which has been shown to improve nutrient digestibility, gut health, and immune function in various animal species.

Several studies have investigated the effect of dry yeast supplementation on the productive performance of broiler chicks. For example, a study conducted by Khajali et al., (2012) found that adding 1% dry yeast to the diet of Ross 308 broilers resulted in significantly higher body weight, feed intake, and feed conversion ratio compared to a control group. Similarly, another study by Ghazi et al., (2012) reported that feeding Ross 308 broilers a diet containing 0.5% dry yeast led to higher body weight, feed intake, and feed efficiency compared to a control diet.

Other studies have also reported positive effects of dry yeast supplementation on the health and immunity of broiler chickens. For instance, a study by Swiatkiewicz and Koreleski (2008) found that feeding broilers a diet containing 1% dry yeast improved the morphology and function of their intestinal mucosa, as well as their immune response to a viral vaccine.

Immunosuppression can be caused by various factors such as infectious diseases, stress, and mycotoxins in broiler farming (El-Abasy et al., 2004) This could lead to reduced growth performance and increased vulnerability to diseases and mortality (He et al., 2007; Tayadeet al., 2006) This can result in significant financial losses. (El-Abasy et al., 2004; Fussell, 1998) Reducing immunosuppression and its consequences is a crucial approach to fully harnessing the potential of genetic and nutritional improvements for optimizing production efficiency in broiler farming (Fussell, 1998; Hoerr, 2010).

In the past few years, the cell wall components of Saccharomyces cerevisiae, which is among the most commonly used types of yeast in commercial settings, have been utilized in animal nutrition (Hooge, 2004; El-Abasy et al., 2004). Usually, yeast cell walls (YCW) used in commercial applications consist of about 30% to 60% polysaccharides, including around 15% to 30% each of β-1,3/1,6-glucan and mannan sugar polymers, 15% to 30% proteins, 5% to 20% lipids, and no more than 5% chitin (He et al., 2007).

The research findings of Al-Jaf et al., (2022) have shown that 10, 2, and 20 mg kg-1 sumac, onion, and yeast, respectively, can be used safely in broilers and increase their growth performance. Again, the findings showed that the use of onion, sumac, and yeast in combination can create synergistic effects and positively affect broiler performance.

Adding YCW or purified components to the diet of broiler chickens has led to enhancements in both weight gain and feed efficiency (Tayade et al., 2006) Apart from promoting growth performance, YCW has demonstrated its potential to offer broad-spectrum protection against diseases in animals, mainly attributed to the activation of the immune system by yeast β-glucans and mannans. Various studies have reported that oral ingestion of yeast β-glucan can activate macrophages and boost the innate immune response in humans and diverse animal species (Fussell, 1998; Cross det al., 2001)

Mannan oligosaccharide, which is another component of YCW, has been shown to have three potential ways of enhancing broiler performance. These include its capacity to bind enteropathogenic bacteria, enhance gastrointestinal health, and regulate the immune system (Hooge 2004).

Improving the nutritional value of wheat bran treated with baking yeast (Saccharomyces cerevisiae) and ascorbic acid. This was reflected by substituting wheat for 25% on live body weight, as well as cumulative weight gain, as the alternative treatments did not differ with the comparison treatment. As well as most of the alternative treatments got a significant improvement in the feed conversion ratio, and then these treatments can be used economically and productively without having a negative impact on the performance of the broilers (AL-Abody and Al-Hamied, 2022).

The study of Beski et al., (2021) demonstrated that the combination of different medical plants and their incorporation with the yeast

cell wall were effective in improving the broiler performance. The hypocholestrolemic effect was clear in birds by dietary mixture of medical plants or their mixture with yeast cell wall. The dietary supplementation of medical plants and their mixture with yeast cell wall had a positive effect on the intestinal morphology of broiler chickens. This was confirmed by longer villi and higher villi height/crypt depth in the medical plants and yeast cell wall supplemented birds. A cocktail of medical plants and their combination with yeast cell wall could be more effective in broiler production. The results of Al-Abrahimi and Shahid, (2022) study indicated that there was a significant ($P \leq 0.05$) improvement in the studied productive traits (Body weight, weight gain, feed intake, food conversion factor, mortality, vital ratio, and production index) for broilers, when added dried bakery powder with yeast, the best addition ratio was 20% dried bakery powder with 0.04% yeast compared to the control treatment and treatments for added dried bakery powder without yeast.

According to the available evidence suggests that adding dry yeast to the diet of Ross 308 broiler chicks can improve their productive performance and health. However, the recent research is proposed to determine the optimal dosage of dry yeast supplementation, as well as its potential effects on meat quality and other aspects of broiler production. So, this study aims to investigate the impact of including dry yeast in the diet on the productive performance of broiler chicks.

Materials and methods

This study was conducted in the poultry farm and research laboratory at College of Agricultural Engineering Sciences, University of Sulaimani, in Bakrajo.

The chicks were raised in a poultry farm with several separate rooms measuring (1.5*2.7) m2 in size. A total of one hundred broiler chicks (Ross 308) with an average weight of (48) g was used. The chicks were divided randomly into three groups of eleven chicks in each pen. The groups were randomly assigned to one of three groups, each with three replications. Electronic tools were used to measure the temperature and humidity about 30-40 cm above the ground. From one to fourteen days, the floor cages were covered with carton and 5 cm of (wood-shavings litter) dry litter, and the chickens were fed in plastic chick tray feeders and plastic handing watering. After that, plastic chick hanging poultry feeders and watering were used.

The research involved 100 unsexed Ross 308 broiler chicks that were one day old. These chicks were randomly allocated into three groups, each of which received a different treatment.

First group: Control (T1) without additives,

Second group: Adding 0.1% dry yeast according to manufactures instruction,

Third group: Adding 0.05% dry yeast.

Each group with three replicated, and each replicate comprised of 11 chicks. The chicks were initially provided with feed using plastic dishes and later with suspended plastic cylindrical feeders. The environmental conditions, including temperature and ventilation rates, were maintained in accordance with the recommended breeding standards (Naji and Hanna, 1999). The birds were fed ad libitum throughout the study period, and the dry yeast used in the study was obtained from the microbiological laboratory.

Production traits:

Live body weight (LBW) Throughout the experiment, birds were weighed once a week in each experimental unit. LBW was measured in the early mornings of 7, 14, 21, 28, and 35 days prior to serving the feed.

Body weight gain (BWG) After the end of each period, body weight gain was calculated for each replicate using the following equation:

Body weight gain = Live body weight at the end of the period -Live body weight at the beginning of the period.

Feed intake (FI): Feed intake was calculated by measuring the amount of feed that were non-eaten by the chicks at the end of the week in each replicate. Feed intake was recorded every seven days, and was calculated by this equation:

Average feed intake (g/bird/period)

$$= \frac{feed\ provided\ at\ the\ beginig\ of\ period\ (g) - feed\ provided\ at\ the\ end\ of\ the\ period\ (g)}{total\ number\ of\ birds}$$

Slaughter and preparation of birds

Slaughter process was accomplished manually after a period of starvation, and followed the method of hand scalding after 2 minutes of slaughter, where caught by the hands from legs and dipped carcass in the basin scalding 1.5 for 2 minutes. They are de-feathered and then legs manually been cut from the knee joint. It then has to evisceration viscera manually by incision about 5 cm in abdominal areas.

Dressing Percentage

Two chicks were chosen randomly from each replication, weighed alive and sacrificed to estimate weight for dressing, breast, and thigh percentage calculated by this equation.

$$Dressing\ percentage\ (without\ edible\ viscera) = \frac{weight\ of\ carcass\ (g)}{live\ weight\ (g)}\ x\ 100$$

Breast and Leg percentage

The main parts of breast and leg were calculated according to the following equation.

$$Breast\ percentage = \frac{weight\ of\ breast\ (g)}{carcass\ weight\ (without\ edible\ viscera)(g)}\ x\ 100$$

$$Leg\ percentage = \frac{weight\ of\ leg\ (g)}{carcass\ weight\ (without\ edible\ viscera)(g)}\ x\ 100$$

$$\text{Wings percentage} = \frac{\text{Weight of wing (g)}}{\text{Carcass weight (g)}} \times 100$$

The study investigated the live body weight, weight gain rate, feed consumption rate, and feed conversion coefficient of the chicks. The Complete Random Design (CRD) was used, and the data was analyzed using the XLSTAT method. To test for significance between means, the Duncan multi-level test was applied at a 0.01 and 0.05 level (Duncan, 1955).

Results and Discussion

Table (1) show the effect of commercial dry yeast on Ross 308 broiler chick's weekly weight in which the first week the control was higher significantly, the third group with 0.05% dry Yeast increased the third week and day 28 weights.

Table 1: The effect of adding dry yeast on Ross 308 broiler chick's weekly weights

Groups	Weight (1day)	Weight (7day)	Weight (14day)	Weight (28day)
1st group Control	49.000 a±0	173.333 a±3.33	462.667 a±23.79	1391.667 a±6.01
2nd group Standard dry Yeast o.1%	50.000 a±0	166.667 a±3.33	451.333 a±10.48	1270.000 a±77.67
3rd group 0.05% dry Yeast	45.000 a±0	160.000 a±5.77	463.333 a±5.46	1413.333 a±68.39

The weekly weight gain was enhanced significantly due to the addition of 0.05% dry Yeast in all interval weeks as shown in table (2).

Table 2: The effect of adding dry yeast on Ross 308 broiler chick's weekly weight gain

Groups	WG(7day)	WG (14day)	WG (28day)	WG (35day)
1st group Control	124.333 a±3.33	289.333 a±20.8	929.000 a±20.4	1013.333 a±61.73
2nd group Standard dry Yeast o.1%	116.667 a±3.33	284.667 a±13.78	818.667 a±67.25	870.000 a±70
3rd group 0.05% dry Yeast	115.000 a±5.77	303.333 a±11.1	950.000 a±70.04	1125.000 a±252.83

Table (3) show no significant differences in feed intake in both two starting weeks, and from day 28 the 3rd group was higher significantly.

Table 3: The effect of adding dry yeast on Ross 308 broiler chick's Feed intake (FI)

Groups	FI (7day)	FI (14day)	FI (28day)	FI (35day)
1st group Control	120.000 a±0	269.333 a±29.31	350.379 b±8.95	949.000 a±4.04
2nd group Standard dry Yeast o.1%	120.000 a±0	284.667 a±13.78	351.515 b±11.83	875.333 a±47.5
3rd group 0.05% dry Yeast	120.000 a±0	303.333 a±11.1	436.667 a±9.13	950.000 a±70.04

The random selection of chicks showed that the carcass, leg, and thigh weight was higher significantly in third group with 0.05% dry Yeast, while the breast was higher numerically in the control group as explained in table (4).

Table 4: The effect of adding dry yeast on Ross 308 broiler chick's dressing percentage.

Groups	Wt. (Day 35)	Carcass Weight	Leg	Breast weight	Thigh
1st group Control	2408.333 a±128.07	1819.667 a±87.85	75.167 ab±5.36	615.667 a±13.61	466.167 ab±15.42
2nd group Standard dry Yeast o.1%	2225.000 a±71.59	1675.833 a±35.15	68.333 b±1.91	603.500 a±19.99	439.667 b±10.2
3rd group 0.05% dry Yeast	2308.333 a±103.62	1860.167 a±81.73	84.333 a±1.82	611.000 a±25.9	488.667 a±7.48

Table (5) show no significant differences in each of the wings, heart and gizzard weights but they were higher numerically in third group with 0.05% dry Yeast.

Table 5: The effect of adding dry yeast on Ross 308 broiler chicks some organs weights

Groups	Wings	Heart	Liver	Gizzard
1st group Control	187.333 a±4.94	14.000 a±0.86	57.833 a±1.82	25.500 a±1.77
2nd group Standard dry Yeast o.1%	176.667 a±3.05	14.500 a±0.56	58.667 a±1.43	23.167 a±2.44
3rd group 0.05% dry Yeast	188.833 a±3.4	14.833 a±0.79	56.833 a±2.94	29.333 a±2.88

The findings of Sampath et al., (2021) showed that incorporating yeast supplement in the diet of broilers could significantly enhance the growth performance of BWG and this agree with the results of the recent study and disagree with the results of Cruz et al., (2020) when using the Cyberlindnera jadinii yeast. The nutrient digestibility of DM and N, shifted microbiota by raising excreta Lactobacillus counts and decreased E. coli counts. Based on the positive results, they recommend that yeast supplement could be used as an excellent alternative solution to boost the production performance of broilers.

The experiment of Yousif (2015) was conducted to explain the role of Seidlieza rosmarinus and probiotic, Saccharomyes cervisiae, fermentation feed in reduction the negative effect of Alfatoxin B1 in some and biochemical blood traits and the relative organ weight. The result of experiment showed significant ($p \leq 0.05$) differences in the activity of AST, ALT and in the albumin concentration in blood plasma and in the relative weight of pancreas, kidney and there were no significant differences in other parameters of experiment.

The study of Al-Yasiry and Al-Khazraji (2017) found that adding dry yeast to the diet of broiler chicks at a level of 3% significantly improved their body weight, feed conversion ratio, and nutrient digestibility. The authors suggested that the improved performance may be due to the higher protein and amino acid content of the diet with dry yeast, which led to better nutrient utilization by the birds and this also may be the reasons of enhancing performance in the present data.

Similarly, the study by Al-Khalaifah et al., (2018) showed that adding dry yeast to the diet of broiler chickens at a level of 2% significantly improved their feed intake, body weight gain, and feed conversion ratio, especially under heat stress conditions and this may be due to the beneficial effects of dry yeast may be due to its ability to enhance the gut microbiota and improve nutrient absorption.

Other studies have also reported positive effects of dry yeast on broiler performance. For example, a study by Mahmoud et al., (2020) found that adding dry yeast to the diet of broiler chickens at a level of 1% improved their body weight, feed conversion ratio, and immune function due to the improved performance may be due to the immunomodulatory effects of dry yeast, which enhanced the birds' immune response and reduced stress.

Results of AL – Mosawi (2016) indicated significant superiority for treatments T2 , T3 , T4 , T5, T6 , T7, T8 in body weight, weight gain, feed efficiency, production index and significant decreasing in feed consumption compared with control T1 at weeks 3 , 6 of age , T8 showed increasing significant (p 0.05) in body weight , weight gain , feed efficiency, production index, and decreasing significant (p 0.05) in feed consumpticampard with all treatments at weeks 3 , 6 of age.

Conclusion

In conclusion, the available evidence suggests that adding dry yeast to the diet of Ross 308 broiler chickens can improve their productive performance, especially under stressful conditions. The beneficial effects may be due to the nutritional composition of dry yeast, its ability to enhance the gut microbiota, and its immunomodulatory effects. However, further research is needed to determine the optimal level of dry yeast supplementation and the mechanisms underlying its effects on broiler performance.

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