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The Effect of Treatment Soybean Meal with Azolla (Azolla pinnata var.) Fortified with Mixture and Fermentation on the Productive Characteristics of Local Duck

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Abstract:
This study was carried out in the animal field of the College of Agriculture, University of Basra, for the period from 14/1/2024 to 25/3/2024; 240 non-naturalized local duck chicks were raised at one day old with an initial weight of 45g. The chicks were distributed randomly over eight transactions and by three repeaters and each repeater 10 chicks according to the complete random design (CRD). The model as follows T1. Control treatment (standard diet). A diet supplemented with 5 g/kg of the synergy mixture per kg of T2 standard diet. T3 Azolla plant (unfermented) + soybeans meal- 25%. Synergy mixture of fermented Azolla plant fortification Treatment T4 is 5 g/kg soybean meal greater than 25%. T5 Treatment of Azolla (With no Fermentation) plant at the rate of 50% with soybean meal. T6 Treatment of fermented Azolla plant enriched with symbiotic mixture 5 g / kg soybean meal 50%. Unfermented Azolla soybean meal T7 75% treatment. Treat the treatment t8 of fermented Azolla plant and fortified with the synergy mixture by 5 g / kg to replace soybean meal by 75% The results of the experiment showed a that have a high nutritional value of the fermented Azolla plant and fortified with the tazi mixture through a high percentage of protein and improving the flavor of the feed. A marked superiority in body weight and weight increase with reduced feed consumed from fermented Azolla and fortified synergy mixture. Furthermore, an increase in feed conversion ratio and production index.

Keywords, *Azolla plant, synergy mixture, fermentation, duck*

INTRODUCTION:

The global poultry production is of paramount importance for food security because chicken meat and eggs are key sources of inexpensive protein. Nonetheless, the high prices of traditional feedstuffs is a top concern for poultry producers worldwide. Feed contributes around 60-70% to broiler overall production cost, Fish protein along with soybean meal are the most widely used protein sources in commercial poultry diets (Musigwa *et al*., 2021). These feeding components are costly and the prices these are very volatile due to the changes in supply-demand and climatic conditions. Consequently, there is an increasing demand to investigate alternative cost effective and sustainable feed resources for enhancing Profitability and sustainability of poultry production. Over the past few years while looking for alternative feed ingredients, several unconventional but less explored feed sources have emerged, one of which is the floating aquatic fern plant Azolla pinata. Azolla pinnata is a fast growing and very productive species which is able to double its biomass within 3-5 days under good conditions. It can grow entirely in nutrient-poor environments thanks to a symbiotic relationship with nitrogen-fixing cyanobacteria (a species of blue-green algae Anabina Azoulay) and has emerged as a potential supplier of food, animal feed, particularly when ordinary feed ingredients are scarce. (Kouchakinejad *et al*., 2024) Present in the Protocol. Because of its high nutritional quality, azolla is a good alternative for poultry feed, reducing feed costs. Recent research indicates that it improves growth performance, feed conversion rates, and health status across species. Hence, azolla could serve as the new animal feed because of its high organic matter and nutrient content and its crude protein content ranging from 25-35%, 10-15% minerals, 7-10% amino acids, and bioactive substances, with an average of 15% of total ash At the same time, in dry matter, azolla contains 7% dry matter, 15.4% crude

fiber, 2.8% ether extract, 20.4% total ash, 47.4% inorganic raw materials, 1.5% calcium, and 0.4% phosphorus (Rohmah *et al*., 2024). Azolla has almost all necessary amino acids, vitamins (Vitamin A, beta-carotene, B12), growth-stimulating intermediates, and minerals including iron, calcium, potassium, magnesium, phosphorus, and manganese, among others. In addition to probiotics, carotenoids, and biopolymers, it can be an antibacterial and antioxidant because of the high percentage of phenols and avonoids it contains (Kamel and Hamed, 2021) Many studies have demonstrated the effects of Azolla supplementation of broiler chickens on growth performance and carcass properties. Generally, it was concluded that azolla was able to enhance growth performance, improve feed conversion efficiency and produce broiler chickens with good carcass characteristics and meat quality, especially when fed at the appropriate treatment level. Although the use of azolla, like many alternative feed sources, has its Challenges. One of these major challenges are anti-nutritional factors like tannins, oxalates and phytates that could hinder nutrient absorption and digestibility of the diet (Danayit 2024). Azolla is rich in various antinutrients, including protein antigen factor (ANFs), trypsin inhibitor, phytic acid, and oligosaccharides, which impair nutrient absorption and digestion, ultimately leading to the decline of growth performance. Fermentation, that enhances nutrition digestion and increases poultry feed conversion ratio by activating obeeseantigen protein, can get rid of these above-mentioned influences (Wizna et al., 2025). In recent years, fermentation has been recognized as an effective approach for degrading ANFs, enhancing the nutrition value of feed (Brouwer *et al.,* 2019). Fermentation can reduce ANFs and unwanted compounds while improving digestibility because of changes in biochemical profiles and metabolic activity of microorganisms. Fermentation can also improve the nutritional value and promote growth performance as well as meat production and improve meat quality characteristics (Sun *et al*., 2022).

So, the objective of the present study was to assess the impact of varying levels of dried and fermented Azollas supplemented with azure mixture replacing soybean meal growth performance and economic performance of laying domestic ducks.

MATERIALS AND METHODS

Azolla plant:

Azolla plants were collected from the Azolla field of the Department of Animal Production, College of Agriculture, University of Basra. Sun-dried the same plants for 72 hours mixing them with a synergistic mixture of probiotics and beta-glucan and then fermented the mixture as the following:

Fermentation method

Synbiotic Mixture the use of *Lactobacillus Acidophilus*, *Bacillus Subtills*, Saccharomyces Sevisiae, *Aspergillus Oryzae*, Beta Glcanus. The dried Azolla was fermented by using fermentation equipment consisting of plastic tank with a capacity of 20 kg, a plastic lid containing a valve that allows gases to leave but not enter the tank, and the tank was closed tightly with a locking belt to ensure that air does not enter the tank and keep the tank airtight, it also contains a temperature gauge, 20 kg of dried azolla was added to the fermentation device with 100 g of synergistic mixture, 0.5 liters of water were added per 1 kg of feed, and the tank was closed tightly with a locking belt to prevent air from entering and leaving through the valve on top of the tank cover. The substance is kept within the tank at 37 °C for 72 hours, and then it is taken out and dried in a drying oven at 50 °C for two days, after which the fermented feed is mixed with the remaining diet components, as indicated in the diet table (1), and it was offered to the birds according to the treatments.

Management and feeding

Experimental groups:

This study was conducted in the animal field of the College of Agriculture at the University of Basra from 14/1/2024 to 25/3/2024, during which 240 local ducklings that were not domesticated were raised at one day old and with an initial weight of 45 g, the chicks were procured from one of the private hatcheries in Basra Governorate and were evenly divided into eight transactions of three repeats, each with 10 chicks per repeat, according to the complete random design (CRD). Birds were reared in cages (1×1.5 m) considering all administrative procedure Provide feed and water ad libitum during the period of experiment that lasted for 70 days Birds were fed with two feeds, the starter and the finisher, and according to Table 1 chicks were fed on Badi's diet from 1-14 days, for all experimental chicks and the growth diet was supplied from 22-70 days Completing these diets was calculated according to the recommendations of the (NRC, 1994). Food transactions go like this:

T1:-Standard diet (control treatment). T2 : - Control diet supplemented with synergy mixture (5 g/kg)

T3: - 25% non-fermented Azolla as treatment of soybean meal

T4:- Fermented Azolla plant treatment with soybean meal in 5 g / kg and synergy mixture (5 g / kg)

T5:- 50% Replacement of soybean meal with Azolla (unfermented) plant

T6: - 50% soybean meal fortified fermented Azolla plant + synergistic mixture 5 g / kg

T7:- 75% soybean meal over Azolla plant (unfermented)

T8:- Fermented Azolla powder supplemented with synergistic mixture of 5 g / kg

75% soybean meal

Table 1 Proportions of feed materials involved in the formation of feeds and growth of domestic ducks and calculated chemical analysis.

Feed material	**Starter's diet (14-1)**	**Grower diet (15-80) day**							
		T1	T2	T3	T4	T5	T6	T7	T8
Yellow corn	52	51	51	51	51	51	51	51	51
Soybean meal %48	23.5	14	13.5	10.5	10.5	7	7	3.5	3.5
Ozola 24.43%	------	------	-------	3.5	------	7	------	10.5	------
Ozola fermented %29.21	------	------	------	------	3.5	------	7	------	10.5
wheat	10	10	10	10	10	10	10	10	10
Protein concentrate 40%	6	6	6	6	6	6.7	6	6	6
Wheatgrass bran	5	8	8	8	8	6.045	8	8	8
Vegetable oil	1.5	3.8	3.8	2.6	1.3	0.3	2.9	2	1.2
Calcium carbonate	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Table salt	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Azri mixture	------	-----	0.5	-------	-------	----	0.5	0.5	0.5
Filler	------	5.4	4.9	3.215	1.13	-----	3.55	2.2	0.75
Chemical Analysis									
for protein %	19.97	16	16	16	16	16	16	16	16
Energy represented by kilocalories/kg feed	2901	3002	3002	3006	3001	3003	3000	3000	3004

Measurements Performance:

Chicks were weighed at the beginning of the study to record initial body weights. weekly using an electronic scale for up to 10 weeks, ducks were fasted 12 h and then weighed. Amounts of offered and refused feeds were also recorded daily during the study to calculate feed consumption. For the statistical performance analysis, data on body weight, average daily gain, average daily intake and feed conversion rate according to Al-hummod *et al.* (2024).

Statistical Analysis:

Analyze the effects of different coefficients on the traits studied using complete random design (CRD). A multi-band test (Duncan 1955) was used to compare the differences between the averages and determine significant differences at a level of $P<0.05$. Statistical analysis was done using the program (SPSS, 2021).

RESULTS AND DISCUSSION:

1- The chemical composition of Azolla: - Table 2 illustrates that the chemical composition of Azolla before and after fermentation, from this table, it is clear that Azolla has high protein percentage, it reached the 29.21% in Azolla treated with a mixture of synergy and fermented compared to untreated and unfermented Azolla and this value was 24.43 %, this could be attributed to the fact that fermentation and the synergistic mixture increased the nutritional value of fermented Azolla. As the table also indicates, there is a variation in the proportions of the rest of the elements because of the rise in the percentage of protein, which weighed on the percentages of the rest of the elements fermentation and synergistic mixture contribute to the increase in protein content.

Table (2) Chemical composition of Azolla based on dry matter before and after fermentation with synergistic mixture

%**Ingredients**	**Before fermentation**	**After fermentation**
Crude protein	24.43	29.21
Ether extract	3.21	2.95
Crude ash	13.11	14.45
Crude fiber	12.45	10.35
NFE.	46.8	43.04

According to (Irawan et al., 2022), fermentation can also enhance the nutritional value of some close ingredients, such as crude protein and fat and lower the content of carbohydrates and crude fiber. It also enhances bioavailability, antioxidant activities and organoleptic characteristics.

2: body weight: -The data presented in table (3) illustrates the impact of white ground Zola plant fortified with a mixture of leaves and microbial synthesis on the average body weight of local ducks (g /duck). At the age of 14 days there were no significant differences ($P< 0.05$) between all the treatments of the experiment, while at the age of 28 days there was an increase in average body weight (g /duck) in the favor T4, which did not significantly differ from the T2 and T6 treatments with comparison to the control treatment (T1), and there was a significant increase in the T2, T4 and T6 treatments compared to the T1 treatment ($P< 0.05$), which also showed significant superiority over T7 and T8 at the ages of 42, 56 and 70 days respectively. The control treatment did not significantly differ from the T3 transaction and the T5 transaction at 42 and 70 days old respectively, However, table shows that the T2 transactions were still on. And T4 and T6 with a marked superiority over the control treatment until the end of the experiment, followed in effect by the T3 and T5 coefficients. Compared to other treatments, the average body weight decreased reflected the lowest coefficients T7 and T8.

2- Weight gain rate:-The effect of replacing soybean meal with fermented Zola plant fortified with synergy mixture on the rate of weight gain of local ducks (g) at different ages is shown in Table (4) It is noted from the table that there were no significant differences in the rate of weight gain at the age of 1-14 days between all the experimental treatments. The table indicated that the transactions T2, T4 and T6 significantly improvement in comparison of the transaction T1, which significantly to transactions T3, T5, T7, at the

period 14-28 days (P< 0.05). However, there is a statistically significant increase (P< 0.05) as compared to T7 transaction for all the experiment coefficients at 28-42 days. Whenever transactions took place during the mentioned range of 42-56 days, transactions T8, T6, T3, T2. T1 significantly beats the remaining experiment transactions. Transactions T6, T5, T4 demonstrated a significant increase (P< 0.01) outcome compared to the control transaction T1 during period 56-70 days. From the table, it was found that statistically significant superiority (P< 0.05)) was found among the coefficients T2, T4 and T6 in comparison with the control coefficient T1, which was statistically superiour to the coefficients T3, T5 and T7 in the cumulative period of 1-70 days. The improvement and rate of increase in the body weight**(3)** Effect of Substitution of Soybean Meal with Fermented Azolla Plant Fortified with Synobiotic on Mean Live Body Weight of Local Ducks **(g)** at Different Ages **(Mean ± SE.)**

Transactions	14 days	28 days	42 days	56 days	days 70
T1	377.00 ±4.62	1072.41cd ±9.22	1614.00bc±4.54	2109.41b ±13.22	2466.64c ±13.2
T2	389.50 ± 13.04	1128.67from ± 12.91	1680.50a ± 5.00	2174.03a ± 6.97	2590.33a ± 2.91
T3	385.48 ± 14.23	1064.50d ± 8.67	1594.37c± 4.02	2076.89c ± 7.57	2457.33c ± 8.97
T4	387.76 ± 11.15	1146.00a ± 6.66	1698.17a ± 3.65	2145.52a ± 7.01	2601.47a ± 6.32
T5	386.72 ± 8.77	1048.83d ± 27.67	1594.20c ±13.29	2014.87d ± 8.75	2444.07cd ± 18.19
T6	384.69 ± 10.55	1129.00from ± 10.20	1685.50a± 5.77	2169.33a ± 12.35	2594.83a ± 4.20
T7	379.83 ± 8.80	1052.17d ± 6.37	1550.89d± 9.40	2006.00d ± 11.37	2421.07d ± 10.17
T8	375.00±7.70	1096.45bc ± 3.05	1620.50b± 7.64	2099.26bc ± 4.39	2518.00b ± 9.02
Morale level	NS.	*	*	*	*

Table (3) and the rate of weight gain (Table 4) for local ducks at various ages or growth rate could be for the, synergistic mixture and fermentation, especially in the T6 and T4 in which Azolla, was replaced by soybean meal by 25 and 50% respectively and two approached did not differ significantly with treatment T2 which was treated with the synergistic mixture only and the results showed that fermentation and the synergistic mixture improved the health of the body, by promoting the secretion of myosin and increasing the exclusion of pathogenic microbes. This, from the secretion of lactic acid and acetic acid, also lowers the pH within bacterial cells (Al-Hmedawy and Al-Asadi, 2023). It is also known that the synergistic mixture could have beneficial growth-promoting properties on the immune system and the performance of birds, modifying bowel function, modulating intestinal pathogens, and improving digestibility and absorption

(Wu *et al.*, 2022). The cause of the improvement or increase in growth can be explained by the synergistic mixture Improves the digestion and availability of several nutrients, including fats, carbohydrates, some minerals and proteins (Dahiya and Nigam 2022). This is likely attributed to the higher growth, weight gain demand of the fermented Azolla supplemented with synergistic combination in the feed provided to replace soybean meal because of lower levels of ANFs in soyabean meal, improved intestinal morphology and enhanced digestive enzymes(Yan *et al.*,2022; Lo *et al.*, 2022)

Table (4) Effect of Substitution of Soybean Meal with Fermented Azolla Plant with Synobiotic on Weight Gain Rate of Domestic Ducks **(g)** at Different Ages **(Mean ± SE.)**

Transactions	**1-14 days**	**14-28 days**	**28-42 days**	**42-56 days**	**56-70 days**	**1-70 days**
T1	332.00 ± 4.62	695.41c ± 7.46	541.59a ± 13.63	495.41a ± 17.75	357.23c ± 6.91	2421 .64c ± 9.07
T2	344.50 ± 13.04	739.17a ± 9.18	551.83a ± 15.60	493.53a ± 2.98	416.30b ± 5.34	2545.33a ± 2.65
T3	340.48± 14.23	679.02d ± 18.67	529.87from ± 7.93	482.52a ± 5.37	480.44c ± 1.55	2412.33d ± 6.35
T4	342.76 ± 11.15	758.24a ± 6.43	552.17a ± 6.67	447.35c ± 3.43	455.95a ± 1.97	2556.47a ± 9.12
T5	341.72 ± 8.77	662.11d ± 21.62	545.37a ± 15.73	420.67d ± 5.23	429.20from ± 10.90	2399.07d ± 9.62
T6	339.69 ± 10.55	744.31a ± 15.20	556.50a ± 15.02	483.83a ± 9.61	425.50from ± 12.82	2549.82a ± 5.72
T7	334.83 ± 8.80	672.33d ± 12.92	498.72b ± 3.11	455.11bc ± 6.23	415.07b ± 20.11	2376.06d ± 10.21
T8	330.00 ± 7.70	721.45b ± 8.36	524.05from ± 4.60	478.76from ± 8.75	418.74b ± 4.96	2473.00b ± 10.93
Sig.	NS.	*	*	*	*	*

3- Amount of feed intake: - Table (4) illustrates the impact of substitution of the fermented Azolla plant fortified with the synergist compound with soybean meal on the average quantity of consumed feed for local ducks (g) at various ages, whereas the table indicates no significant differences in the quantity of feed consumed at the age of 1-14 days among various experimental treatments. It can be seen from the table that the transactions T2 and T4 showed the highly significant superiority ($P< 0.05$) on the control

transaction T1 which significantly surpassed the transactions T3, T5, T7 during the period from 14 to 28 days.

Table (4) Effect of Substitution of Soybean Meal with Fermented Azolla Plant with Synobiotic on Average Amount of Feed Consumed for Local Ducks (g) at Different Ages **(Mean ± SE.)**

Transactions	1-14 days	14-28 days	28-42 days	42-56 days	56-70 days	1-70 days
T1	625.40 ± 4.99	1468.22c ± 11.07	1896.67bc ± 12.14	1920.33bc ± 4.91	2368.67c ± 9.40	8279.29e ± 9.13
T2	661.80 ± 10.79	1516.12from ± 12.11	1936.33a ± 8.19	1942.33from ± 4.81	2407.67from ± 6.49	8464.25b ± 6.36
T3	652.25 ± 16.01	1452.56de ± 12.37	1881.00c± 16.19	1902.66cd ± 8.51	2359.33c ± 9.33	8247.81e ± 14.19
T4	668.95 ± 8.39	1546.70a ± 5.92	1942.00a ± 12.29	1952.33a ± 10.27	2426.33a ± 5.21	8536.32a ± 7.69
T5	642.72 ± 7.59	1428.44e ± 7.73	1835.67d ± 11.89	1889.67d ± 9.26	2280.33d ± 26.29	8076.82e ± 9.85
T6	633.48 ± 19.39	1498.73bc ± 7.15	1938.00a ± 12.49	1946.00from ± 6.81	2395.67abc ± 5.92	8411.88c ± 12.41
T7	646.97 ± 19.72	1385.91f ± 15.33	1781.00e ± 10.41	1883.67d ± 11.05	2290.33d ± 8.25	7987.88e ± 10.91
T8	628.27 ± 18.18	1486.77bc ± 11.40	1922.67ab ± 13.62	1936.00from ± 6.56	2372.33bc ± 8.84	8346.04d ± 8.95
Morale level	NS.	*	*	*	*	*

A higher growth (P< 0.05) also in favor of the experiment parameters T2, T4 and T6, compared to the T1 transaction took place at all storage periods. The T4 transaction significantly surpasses the rest of the experiment transactions on the period of 1-70 days**.**

4- Feed conversion efficiency:- Table (5) the effect of replacing soybean meal with fermented Azolla plant fortified by synergy mixture on the rate of food conversion efficiency rate for local ducks (g) at different ages, it has been mentioned in the table there are no significant differences in the rate of nutritional conversion efficiency at age (1-14) days between the treatments of all the experimental. There was a significant (P< 0.05) improvement in favor of T6 coefficients against control T1. At the 28-day period, the T8, T7, T4, T2 coefficients significantly outperformed T3 and T5 coefficients, and there were no significant differences observed between this latter set of coefficients. Where there is a notable efficacy improvement

(P< 0.05) for the T5 treatment when compared to all trial coefficients at day 42. The T6 showed a significant increase in efficiency of feed conversion at the age of 56 and 70 days, while the T6, T4, T2 coefficients also showed a significant improvement (p<0.05) at the age of 1-70 days compared to control treatment. It is based on what is seen and compared from the table (4) and table (5) of the increasing amount of feed consumed and the improvement of the nutritional conversion efficiency of the substitution of 25 and 50% of the Azolla replaced soybean meal fortified with synergy mixture and fermented with improving the nutritional value of the feed consumed with improved palatability and increased protein content and inhibition an anti-NAFS factor as a result of browning (Soumeh *et al*., 2019). The efficiency of food conversion improvement may be attributed to the action of the bacteria of the synergy mixture in keeping the microbial equilibrium in favor of beneficial bacteria at the cost of harmful bacteria and in this way lifting the advantage of the eaten and converting it into a load increase. Study of (Al-Rekabi *et al*., 2020) showed that adding 12% Azolla to soybean meal improved digestibility of ether extract and crude fiber in Awassia lambs. This study confirms the promising potential of Azolla as a feed additive to improve the performance of broilers, especially in feed consumption, weight gain and nutritional conversion ratio. In the present study, it was shown that the group treated with Azolla supplementation, it significantly performed better with the lowest feed consumption, improved nutritional conversion efficiency (FCR), and the highest percentage of weight gain. Fueled with low levels of soybean meal, surprisingly, the efficiency of feeding was less affected. Overall, a clear dose-related response was observed with the 50% median level yielding the highest improvements in weight gain and metabolic conversion ratio, suggesting a dose that was specific to the range being studied had the most favourable effects. The enhanced digestion and absorption of feed nutrients, specifically protein, has been reported to be responsible for the improved growth performance observed in the present study. In fact, the Azolla plant replaced It is also worth noting that digestion speed decreased when soybean gain derived from increased fiber in the diet, thereby observing a decrease in dietary bite transfer that favors nutrient absorption. Another positive contributor to Azolla is its high crude protein content of 23.25%, which serves as an easily digestible food source containing essential amino acids for muscle tissue synthesis. This is in line with studies performed by (Al-Rekabi *et al*., 2020; shambhvi *et al*., 2021). Likewise, the increased average fourth and sixth feed intake in spite of significant increase in weight gain reduces proving better use of nutrients. The findings may be related, at least in part, to the action of Azolla supplementation on the intestinal microbiota, as (Ibrahim *et al*., 2024) noticed growth performance, intestinal morphology, and colonic microbes in broiler chickens by adding Azolla leaf meal to their diet. Azolla have the potential to positively impact the animal gut microflora as these results strongly collectively suggest. Its strengths are a clear dose-based response and statistical significance of the results. However, a limitation is the very limited research into the specific mechanisms behind the Azolla effect. The potential experimental effects on gut microbes, more subtle enzyme activity, or possible long-term metabolic effects would help solidify this claim. If Azolla failed to induce a considerable effect at lower levels, this result could be explained by the lack of a dose and/or by the pool did not reach the minimum activation of the mechanisms involved. (Refaey *et al.,* 2023). Another option was testing a larger number of doses. Protein intake can influence liver or kidney function, this was not observed in this study; however, an extreme intake of Azolla may lead to problems in these organs. More definitive studies examining long-term effects and optimal protein balance are warranted. (Khan *et al*., 2024).

Table (5) Effect of Substitution of Soybean Meals with Fermented Azolla Plant with Synobiotic on Conversion Efficiency of Local Ducks **(g)** at Different Ages **(Mean ± SE.)**

Transactions	**14 days**	**28 days**	**42 days**	**56 days**	**days 70**	**1-70**
T1	1.88 ± 0.02	2.11a ± 0.03	3.50b ± 0.07	3.88c ± 0.15	6.63a ± 0.10	3.60a ± 0.02
T2	1.92 ± 0.05	2.05b ± 0.03	3.52b ± 0.11	3.93c ± 0.03	5.78b ± 0.09	3.44c ± 0.01
T3	1.92 ± 0.07	2.14a ± 0.04	3.55b ± 0.03	3.94c ± 0.03	6.20a ± 0.05	3.55b ± 0.01
T4	1.95 ± 0.05	2.04b ± 0.02	3.52b ± 0.04	4.37a ± 0.02	5.32c ± 0.02	3.46c ± 0.02
T5	1.88 ± 0.04	2.16a ± 0.06	3.37c ± 0.10	4.49a ± 0.08	5.31c ± 0.20	3.44c ± 0.04
T6	1.87 ± 0.01	2.01c ± 0.01	3.49b ± 0.10	4.03b ± 0.07	5.64c ± 0.17	3.40d ± 0.02
T7	1.93 ± 0.01	2.06b ± 0.01	3.57b ± 0.01	4.14b ± 0.05	5.51c ± 0.26	3.44c ± 0.03
T8	1.90 ± 0.01	2.06b ± 0.03	3.67a ± 0.06	4.05b ± 0.09	5.66c ± 0.05	3.47c ± 0.04
Sig.	NS.	*	*	*	*	*

CONCLUSIONS

1- The fermentation of Azolla plant and treatment with the synergy mixture was increased its nutritional value, percentage of protein, and reduced percentage of fiber in it.

2- The study also found that the performance of domestic duck fries was significantly improve by using Azolla powder in the bird's diets. Importantly, the replacement of 50% fermented Azolla powder with the synergy mixture had a prominent effect on various factors. In conclusion, replacement of Azolla for soybean meal in the domestically grown ducks resulted in tremendous improvement of feed performance parameters as compared to control. The most significant finding was the relatively high improvement in the trophic conversion factor (FCR) of the group supplemented with 50% levels of Azolla, which demonstrates the need for precise optimization of feed formulations to attain cost-effective feed efficiency in domestic duck production.

Novelty Statements

This study focuses on improving fermentation conditions to improve the nutritional quality of the Azolla plant as a poultry taste using Synbiotic. It includes fermentation improvement to improve optimal nutrition. The modernity of this research lies in combining the improvement of fermentation with the use of *Lactobacillus Acidophilus*, *Bacillus Subtills*, Saccharomyces Sevisiae, *Aspergillus Oryzae*, Beta Glcanus. Which is not widely explored in poultry feeding on Azolla plant as a substitute for soybean meal. Previous studies often highlighted the benefits of fermenting other nutrients, such as barley and wheat bran, but rarely focused specifically on the Azolla plant as poultry food. In addition, the microorganisms used to improve nutrition in previous research were Lactobacillus SPP. Or Saccharomyces Spp., With a limited exploration to improve fermentation parameter.

Conflict of Interests

The authors declare no conflict of interest regarding the publication of this article. All authors affirm that there are no personal, professional, or financial relationships that could influence the work reported in this manuscript.

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