IMPROVING THE NUTRITIONAL VALUE OF WATER HYACINTH LEAVES (WHL) AND ADDING IT TO BROILER DIETS AND ITS EFFECT ON THE PRODUCTIVE PERFORMANCE.

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ABSTRACT

This study was conducted at the poultry farm , Animal Production Department , Shatrah Technical Institute / Southern Technical University for the period from 13/11/2020 to 25/12/2020 (42 days), to find out the effect of improving the nutritional value for water hyacinth leaves (WHL) fermented with *Saccharomyces cerevisiae* yeast (Sc) and fermented with Iraqi probiotic at different levels and its effect on the productive performance of broilers chickens. In the experiment, 300 day old unsexed Ross 308 broiler chicks were. The chicks were fed on a starter ration for 1-21 days of age and a finisher ration form 22-42 days of age. The birds were randomly distributed in to 10 treatments, with 3 replicates for each treatment (10 birds for replicates),the treatments were as follows: T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat, The results showed an improvement in live body weight, weight gain, feed consumption and food conversion ratio for all addition treatments compared with control. Treatments T2,T6 and T7 recorded the best results in productive characteristics.

Keywords: water hyacinth. value improvement. productive performance. broilers. yeast. probiotic .
*** The paper is a part of Ph.D dissertation of the 1st author.**

تحسين القيمة الغذائية لأوراق زهرة النيل (*Eichhornia crassipes*) وأضافتها لعلائق فروج اللحم وتأثيرها في الاداء الانتاجي

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المستخلص

اجريت هذه الدراسة في حقل الدواجن التابع الى قسم الانتاج الحيواني/ المعهد التقني الشطرة /الجامعة التقنية الجنوبية للفترة من 2020/11/13 إلى 2020/12/25 لمدة 42 يوماً , لمعرفة تأثير تحسين القيمة الغذائية لأوراق زهرة النيل المخمر بخميرة الخبز والمخمر بالمعزز الحيوي العراقي بمستويات مختلفة وتأثير ذلك في الاداء الإنتاجي لفروج اللحم, أستخدم في التجربة 300 فرخاً من فروج اللحم سلالة Ross 308 غير مجنسة بعمر يوم واحد، غذيت الافراخ على عليقة بادئ لمدة 1–21 يوم من عمر الطير وعليقة نهائي لمدة 22–42 يوماً من عمر الطير، وزعت الطيور عشوائيا على 10 معاملات وبواقع 3 مكررات (10 طير/المكرر) وكانت المعاملات كالاتي : T1 Control خالي من اي احلال , 2T احلال مسحوق اوراق زهرة النيل بمستوى 6 % بدلا من الحنطة , 3T احلال مسحوق اوراق زهرة النيل المعامل بخميرة الخبز بمستوى 6 % بدلا من الحنطة , 4T احلال مسحوق اوراق زهرة النيل المعامل بالبروبايوتك بمستوى 6 % بدلا من الحنطة , 5T احلال مسحوق اوراق زهرة النيل بمستوى 12 % بدلا من الحنطة ,6T احلال مسحوق اوراق زهرة النيل المعامل بخميرة الخبز بمستوى 12 % بدلا من الحنطة, 7T احلال مسحوق اوراق زهرة النيل المعامل بالبروبايوتك بمستوى 12 % بدلا من الحنطة , 8 T احلال مسحوق اوراق زهرة النيل بمستوى 18 % بدلا من الحنطة ,9T احلال مسحوق اوراق زهرة النيل المعامل بخميرة الخبز بمستوى 18 % بدلا من الحنطة و10T احلال مسحوق اوراق زهرة النيل المعامل بالبروبايوتك بمستوى 18 % بدلا من الحنطة , اظهرت النتائج حصول تحسنا في وزن الجسم الحي, الزيادة الوزنية, استهلاك العلف ومعامل التحويل الغذائي لجميع معاملات الاضافة مقارنة بمعاملة السيطرة وسجلت المعاملات 2T و 6Tو 7Tافضل النتائج في الصفات الانتاجية.

الكلمات المفتاحية: زهرة النيل . تحسين القيمة. اداء انتاجي. فروج لحم. خميرة. بروبايوتك.
*** البحث مستل من اطروحة دكتوراه للباحث الاول.**

Received:2/12/2021 Accepted:2/3/2022

INTRODUCTION

The shortage of grain and feed and the entry of the element of competition between humans and animals led to a significant in rise in the prices of grains, which negatively effects on poultry industry by increasing the cost of manufacturing feed, as feeding constitutes 70-75% of total production cost, so the search is constantly looking for alternatives to feed It can reduce the value of nutrition (8). Recently the great development witnessed by the poultry industry as a result of the increase in the demand for white meat compared to red meat (48), has been accompanied by several problems, including the rapid infection of poultry with diseases as a result of their high growth rate and a decrease in the efficiency of their immune as a result of the excessive use of antibiotics and some chemical drugs, which led to the emergence of disease-resistant microbes (10).The rapid spread of diseases and continuous deaths have become one of the most important problems facing poultry farming, so the challenge and attempts by the pharmaceutical industries to develop a new generation of antibiotics to resist microorganisms and the use of alternative methods of resistance began (28). One of these methods is the use of medicinal plants, which are commonly used as food additives as an alternative to chemical industrial additives, as they work to raise the body's immunity by stimulating the immune system (2), also its work is related to improving the environment of the bird's gut environment by obstructing the growth of pathogenic bacteria and increasing the growth of beneficial bacteria (34). All this was an incentive for researchers to use different plants that may have the ability to improve the productive, physiological, and immune traits of domestic birds (38). Water hyacinth (*Eichhornia crassipes*) (Mart.) *Solms*. is the most dangerous plant in the world, spread in most tropical and subtropical countries. It is a free-moving, floating aquatic plant that has a superior ability to grow and vegetatively reproduce, and its productivity may reach more than 200 tons/ha per year (27), and it is considered an alien plant to the Iraqi aquatic environment, the first appearance of this plant in Iraq was recorded in the mid-eighties of the last century based on its use as an ornamental plant as it floats freely on the surface of the water, and is characterized by the beauty of its flowers, as this plant has spread in several nurseries located on the banks of the Army Canal located in the eastern province of Baghdad, which flows into the nearby Diyala River, which flows into the Tigris River (20). The plant varies greatly in its chemical composition depending on the species, season, and location. It is characterized by low dry matter and high crude protein and ash content. The light green leaves and petioles contain a higher percentage of protein than those of the mature plant (4,32), the protein in the leaves contains most of the essential amino acids and is particularly rich in glutamine, asparagine, and leucine, and is rich in minerals so that it serves as a suitable economical feed (43). Numerous studies have been conducted on the water hyacinth plant to benefit from it and use it in animal nutrition, as it was added as a protein supplement in ruminant animals and as a source of feeding for beef cattle, goats, lambs, rabbits, ducks, broilers and laying hens (5,6,22,29,30,44,45). Many researchers have resorted to conducting some treatments aimed at improving the nutritional value of these non-traditional fodders (the water hyacinth plant) to increase their palatability and improve their digestion coefficient. These operations include adding enzymes or adding a mixture of enzymes (29), physical treatments (cutting, crashing, freezing, and evaporation), or chemicals (sodium and potassium hydroxide or organic acids such as citric) (23), or conducting fermentation processes with yeasts or fungi. These studies have achieved many positive goals, which led to an increase in their nutritional value, because these treatments lead to the breaking of the lignocellulosic bonds in their cell walls between cellulose and hemicellulose, thus raising the coefficient of digestion and increasing the palatability of animals (3). Therefore, the current aimed to ferment the water hyacinth leaves (WHL) using *Saccharomyces cerevisiae* yeast (Sc) and Iraqi probiotics to improve their nutritional value and replace them with wheat in different percentage and study the productive characteristics of broilers.

MATERIALS AND METHODS

This experiment was conducted at the poultry farm, Animal Production Department at Shatrah Technical Institute , Southern Technical University for the period from 13/11/2020 to 25/12/2020, Three hundred day old unsexed Ross 308 chicks were used in this experiment. All vaccinations were given to birds during the period from one day old to 42 days. Water was available ad libitum, but the ration was weight and offered to the birds, as in experimental treatments to calculated feed consumption, live body weight, weight gain and feed conversion ratio, experiment treatments were as follow: T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat. The birds were fed nutritional diets as shown in Tables 1 and 2, the experiment was carried out using a completely random design (CRD) and the averages were compared using Duncan's test (19).

Table 1. The ingredients and chemical composition for starter diet during period(1-21 days).

Ingredients	Control T1	6% T2 powder	6% T3 yeast	6% T4 probiotic	12% T5 powder	12% T6 yeast	12% T7 probiotic	18% T8 powder	18% T9 yeast	18% T10 probiotic
Corn	47.80	47.80	47.80	47.80	47.80	47.80	47.80	47.80	48.00	48.00
Wheat	10.00	9.40	9.40	9.40	8.80	8.80	8.80	8.20	8.20	8.20
Soybean meal (48% C.P)	35.50	35.50	35.50	35.50	35.50	35.50	35.50	35.50	35.00	35.00
pure protein*	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.50	2.10	2.10
Corn oil	2.10	2.10	2.10	2.10	2.10	2.40	2.50	2.10	2.70	2.80
Di Calcium Phosphate**	0.60	0.60	0.60	0.60	0.60	0.70	0.60	0.60	0.70	0.60
limestone	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Mixture of vitamins and minerals	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Water Hyacinth leaves (WHL)	0.00	0.60	0.60	0.60	1.20	1.20	1.20	1.80	1.80	1.80
Total	100	100	100	100	100	100	100	100	100	100
Calculated chemical composition ***										
Crude Protein%	23.25	23.27	23.43	23.42	23.28	23.46	23.42	23.29	23.41	23.37
ME Kcal/Kg feed	3021	3033	3011	3011	3007	2020	3029	2999	3032	3041
Lysine%	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
% Methionine	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Cysteine%	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Cysteine %+ Methionine	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
% Calcium	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
% Available phosphorous	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32

*** Protein concentrate of Dutch origin Brocon-5 Special W contains 40% crude protein, represented energy 2107 kcal, lysine 3.85%, methionine 3.7%, methionine and cysteine 9.5%, crude fat 5%, crude fiber 2.2%, calcium 4.2%, phosphorous Available 4.68%.**

****Dicalcium phosphate contained 21.8% calcium and 18% phosphorous.**

*****According to the chemical composition of the diet components, according to what was reported by the NRC for the year 1994.(36)**

Table 2. The ingredients and chemical composition for finisher diet during period (22-42 days)

Ingredients	Control T1	6% T2 powder	6% T3 yeast	6% T4 probiotic	12% T5 powder	12% T6 yeast	12% T7 probiotic	18% T8 powder	18% T9 yeast	18% T10 probiotic
Corn	53.00	53.00	53.00	53.00	53.00	53.00	53	53.00	53.50	53.00
Wheat	10.00	9.40	9.40	9.40	8.80	8.80	8.80	8.20	8.20	8.20
Soybean meal (48% C.P)	28.00	28.00	28.00	28.00	28.00	28.00	28	28.00	27.50	27.50
Protein concentrate*	2.50	2.50	2.50	2.50	2.50	2.00	2.50	2.50	2.00	2.50
Corn oil	4.20	4.20	4.20	4.20	4.20	4.70	4.20	4.20	4.70	4.70
Di Calcium Phosphate**	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
limestone	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Mixture of vitamins and minerals	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
salt	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Water Hyacinth leaves (WHL)	0.00	0.60	0.60	0.60	1.20	1.20	1.20	1.80	1.80	1.80
Total	100	100	100	100	100	100	100	100	100	100
Calculated chemical composition ***										
Crude Protein%	20.33	20.11	20.27	20.26	20.19	20.26	20.40	20.27	20.24	20.35
ME Kcal/Kg feed	3200	3194	3192	3192	3205	3216	3200	3217	3211	3205
Lysine%	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
% Methionine	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Cysteine%	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Cysteine %+ Methionine	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
% Calcium	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Avai phosph	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41

*** Protein concentrate of Dutch origin Brocon-5 Special W contains 40% crude protein, represented energy 2107 kcal, lysine 3.85%, methionine 3.7%, methionine and cysteine 9.5%, crude fat 5%, crude fiber 2.2%, calcium 4.2%, phosphorous Available 4.68%.**

****Dicalcium phosphate contained 21.8% calcium and 18% phosphorous.**

*****According to the chemical composition of the diet components, according to what was reported by the NRC for the year 1994.(36)**

RESULTS AND DISCUSSION

Chemical analysis of water hyacinth leaves (WHL): The results of the laboratory analysis shown in Table (3) of (WHL) powder samples before and after fermentation by using 3 gm of (Sc) yeast /kg powdered (WHL) and 10gm of the Iraqi probiotic/kg powdered (WHL) showed a significant improvement in the nutritional value of the fermented leaf powder treatments compared to the raw powder, as it was found that there were high differences in the ratios of crude protein and ether extract in favor of the fermentation treatments. A high percentage of crude protein was observed in the treatment of fermented (WHL) with (Sc) yeast and Iraqi probiotics. The protein percentage was 41.7 and 39.1%, respectively. with unfermented (WHL) was 13.73%, as it was noted that the fermentation treatments with (Sc) yeast and Iraqi probiotics had the highest levels in the ether extract, recording 7.0 and 8.1%, respectively, compared to the unfermented powder 2.37%. The increase in the percentage of ash in the fermentation treatments of (Sc) yeast and Iraqi probiotic, which amounted to 9.2 and 10.3%, respectively, and this indicates the high mineral elements present in both treatments. While the unfermented raw (WHL) treatment recorded 6.63%. The results showed a decrease in crude fiber percentage in the (Sc) yeast and Iraqi probiotic fermentation treatments, as it recorded 2.8 and 3.58%, respectively compared to 9.60% for raw leaf

powder treatments compare. It was also found that the percentage of starch decreased for the fermentation treatments with Iraqi probiotic and (Sc) yeast, and the percentages were 35.0 and 34.17%, respectively, when compared with the treatment of raw, unfermented (WHL) 60.48%. The microscopic used and produced as a result of fermentation processes consumes the carbohydrates (fibers) present in the (WHL) and converts them into nitrogenous compounds due to metabolic processes. Therefore, the percentage of protein in them increases while the level of fibers decreases in the fermented material (7).

Table 3. Chemical analysis of (WHL) powder before and after fermentation with (Sc) yeast and Iraq Probiotics on the basis of dry matter %.

Treatment	moisture %	Protein %	Ether extract%	Ash %	crude fiber%	NFE %	Total
water hyacinth leaves (WHL) powder	7.33	13.73	2.37	6.63	9.60	60.34	100
(WHL) powder fermented with (Sc)yeast	4.3	41.7	7.0	9.2	2.8	35.0	100
(WHL) powder fermented with Iraqi probiotics	4.75	39.1	8.1	10.3	3.58	34.17	100

*** The chemical analysis was carried out in the Environmental Laboratory of the Shatrah Technical Institute**

Productive and economic qualities

1 –Live body weight

Table (4) indicate the effect of improving the nutritional value of the (WHL) added to the diets on the average weekly live body weight (gm), there were no significant differences between the experimental treatments in the first and second weeks, while the treatments T2, T6, and T7 recorded significant increase($P \leq 0.05$) in body weight compared with other treatments during the third week. At fourth , fifth and sixth weeks treatment T6 recorded highest significant ($P \leq 0.05$) live body weight then T7 and T2 compared to other treatments.

Table 4. Effect of improving the nutritional value of (WHL) added to the diet on the average weekly live body weight for broilers during 1- 6 weeks old.

treatment	body weight					
	first week	second week	third week	fourth week	fifth week	sixth week
T_1	5.69 ± 135.43	4.44 ± 303.50	5.77 ± 610.00 e	1143.33 ± 2.6 f	1663.33± 18.55 g	2325.67 ± 51.26 f
T_2	0.76± 137.00	4.05± 337.33	3.17 ± 750.33 a	1346.00 ± 4.76 b	2133.00± 8.14 b	2942.67± 3.71 b
T_3	3.76± 135.33	4.66± 317.83	4.91 ±649.83 c	1175.50 ± 5.77 cd	1860.83 ±4.60 d	2581.67± 4.40 cd
T_4	0.92± 137.67	9.86± 328.00	671.67± 7.26 b	1190.00 ± 5.77 c	1912.17± 7.58 c	2595.00 ± 5.77 cd
T_5	1.855± 138.33	35.47± 309.50	631.67± 2.77 d	1160.83± 5.94 def	1845.00± 17.95 de	2561.67± 8.81 d
T_6	4.45 ± 140.10	5.92 ± 340.53	758.33 ± 7.26 a	1365.16 ±5.09 a	2165.33± 2.90 a	3024.00 ± 5.85 a
T_7	1.60± 138.00	8.80± 340.17	750.50± 6.00 a	1350.17 ± 5.77 ab	2143.00± 6.55 ab	2950.00± 5.77 b
T_8	1.00± 138.10	6.78± 316.50	652.00 ± 4.44 c	1183.33± 6.00 c	1900.33± 6.00 c	2618.33±4.40 c
T_9	1.74± 137.83	4.63± 315.33	620.83 ± 6.50 e	1146.67± 8.81 ef	1824.50± 7.21 e	2576.67±8.81 cd
T_{10}	0.60± 138.67	0.70± 299.50	637.00± 5.53 cd	1163.33± 8.81 de	1762.50± 5.20 f	2498.00 ±360 e
sig	N.S	N.S	*	*	*	*

T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat *N.S indicates that there are no significant differences between the averages of the transactions. * The different letters within the same column indicate that there are significant differences between the treatments at the 0.05 . probability level

2- Weight gain

Table 5 indicates the effect of improving the nutritional value of (WHL) added to the diet on the rate of weekly weight gain (gm) for broilers, there were no significant differences between the experimental treatments in the first and second weeks of age, while a significant increase occurred for the treatments T2, T6 and T7 (replacement of (WHL) powder at the level of 6% instead of wheat and the replacement of powdered (WHL) treated with (Sc) yeast at the level of 12% instead of wheat and the replacement of powdered (WHL) powder treated with Iraqi probiotic at the level of 12% instead of wheat respectively) in comparison with the experimental treatments, this significant increase (P≤0.05) continued for the same treatments in third, fourth and fifth weeks of age in comparison with the other treatments.

Tabe 5. Effect of improving the nutritional value of (WHL) added to diet on the average weekly weight gain (g) for broilers during 1-6 weeks old

T	weight gain						
	first week	second week	third week	fourth week	fifth week	sixth week	Cumulative 0 - 6
T_1	5.98 ± 95.33	168.07 ±9.20	306.50 ± 1.75 b	533.33 ± 7.31 b	± 520.00 20.95 f	±662.3433.38 e	±2285.57 50.58 f
T_2	97.30± 1.41	200.33 4.69±	413.00 ± 1.00 a	595.67 ± 6.09 a	± 787.00 9.56 a	± 809.6711.05 b	± 2902.973.16 b
T_3	94.93 ± 3.71	182.50 1.32±	332.00 ± 6.65 b	525.67 ± 6.88 b	± 685.33 8.33 dc	± 720.84 6.67 cd	± 2541.274.23 cd
T_4	97.37± 1.37	190.33 ± 9.04	343.67 ± 8.95 b	518.33 ± 7.26 b	± 722.17 5.08 b	± 682.835.08 ed	± 2554.706.02 cd
T_5	98.23± 1.50	171.17 34.57±	322.17 ±35.54 b	±529.163.17 b	17.58± 684.17 dc	± 716.6723.66 cd	± 2521.57 8.42 d
T_6	100.04± 4.48	200.43 ± 10.6	417.80 ±7.24 a	± 606.839.44 a	± 800.17 2.61 a	± 858.673.17 a	± 2983.945.72 a
T_7	98.40± 2.21	202.17± 9.90	410.33 ±12.99 a	± 599.6711.77 a	792.83± 8.27 a	± 807.0012.09 b	±2910.40 6.11 b
T_8	97.70± 1.11	178.40 ± 7.76	335.50± 5.13 b	±531.33 7. 41 b	11 ± 717.00.54 bc	± 718.0010.40 cd	4 ± 2577.93.44 c
T_9	98.33± 1.96	177.50 ± 6.37	305.50 2.02± b	± 525.84 8.70 b	± 677.83 6.82 d	± 752.1715.96 c	± 2530.178.47 cd
T_{10}	98.47± 1.01	160.83 ± 0.57	337.50 ± 5.58 b	± 526.3313.22 b	± 599.17 13.41 e	1± 735.50.60 c	± 2457.803.80 e
Sig	N.S	N.S	*	*	*	*	*

T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat *N.S indicates that there are

no significant differences between the averages of the transactions. * The different letters within the same column indicate that there are significant differences between the treatments at the 0.05 . probability level

3- Weekly feed consumption

Table 6 showed the effect of improving the nutritional value of (WHL) added to the diet on the weekly feed consumption rate (gm) for broilers, there were no significant differences in feed consumption between the experimental treatments during the 1st week of the experiment, but in the 2nd week, the control and T7 treatments were significant (P≤0.05) increase in feed consumption compared to the T10 treatment, while these three treatments T1, T7, and T10 did not differ from the othe treatments, and in the third week, the consumed was significantly higher (P≤0.05) in T6 treatment, compared to T3 and T10 also, feed consumption in T6 continuance increasing significant in fourth, fifth and sixth weeks of age and in cumulative period compared with other treatments.

Table 6. Effect of improving the nutritional value of (WHL) added to diet on the average weekly feed consumption for broilers during 1-6 weeks old

T	Average weekly feed consumption						
	first week	second week	third week	fourth week	fifth week	sixth week	Cumulative 0 - 6
T_1	± 126.671.45	± 317.80 4.19 a	± 529.335.20 ab	± 846.67 1.66 abc	± 1030.005.77 e	± 1130.00 5.77 e	± 3980.47 14.38 f
T_2	± 126.670.67	± 311.432.02 ab	± 533.33 4.37 ab	± 850.473.01 ab	1 ± 1108.67.85 a	5 ± 1200.00.77 b	± 4130.575.03 ab
T_3	±128.001.15	± 314.33 1.85 ab	± 500.00 5.00 b	± 843.70 1.41 bc	± 1086.67 6.00 bc	±1190.00 5.77 bc	± 4062.7017.96 cd
T_4	±126.002.08	± 311.33 1.85 ab	33 ± 531.33.79 ab	± 836.77 4.39 c	4 ± 1073.33.409 c	± 1173.33 4.41 d	± 4052.1035.36 de
T_5	± 125.472.24	± 314.001.15 ab	± 506.676.00 ab	± 846.93 2.25 ab	7 ± 1055.00.63 d	± 1178.334.40 cd	± 4026.40 5.53 de
T_6	± 125.531.77	± 312.67 1.85 ab	± 544.007.09 a	± 855.333.17 a	± 1114.332.33 a	3 ± 1214.00.05 a	± 4165.87 4.04 a
T_7	±126.672.33	±317.70 0.90 a	± 535.00 2.88 ab	2 ± 847.33.18 ab	± 1110.333.18 a	± 1201.00 2.08 b	± 4138.03 5.51 ab
T_8	± 123.601.67	± 316.20 1.40 ab	± 524.772.47 ab	± 826.33 3.17 d	± 1075.672.33 c	± 1191.004.93 bc	± 4057.573.58 cde
T_9	±127.671.45	± 315.202.71 ab	± 531.676.00 ab	± 841.334.67 bc	± 1094.005.56 b	± 1192.00 3.05 bc	± 4101.8716.59 c
T_{10}	± 127.235.49	± 309.17 1.49 b	6 ± 497.67.48 b	2 ± 845.00.88 bc	± 1047.67 1.76 d	± 1183.67 1.85 cd	± 4010.407.91 e
Sig	N.S	*	*	*	*	*	*

T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat *N.S indicates that there are no significant differences between the averages of the transactions. * The different letters within the same column indicate that there are significant differences between the treatments at the 0.05 . probability level

4-Feed conversion ratio

Table 7 showed the effect of improving the nutritional value of (WHL) added to the diet on the feed conversion ratio of broilers, as the results showed that there were no significant differences between the experimental treatments in the first and second weeks, while a significant improvement (P≤0.05) in the feed conversion ratio in treatments T2, T6, and T7 compared to other treatments that showed a deterioration in the feed conversion ratio, which did not differ than control treatment, and the following weeks continued to have a significant (P≤0.05) improvement in the feed conversion ratio for these three treatments T2, T6 and T7 compared experimental treatments and in the fourth, fifth and sixth weeks, and

even in the general average (age week to 6 weeks), the control treatment also recorded a deterioration in the feed conversion ratio throughout these weeks. In general, all treatments for improving the nutritional value of Nile flower leaves added to the diet recorded the best nutritional conversion ratio compared to the control treatment.

Table 7. Effect of improving the nutritional value of (WHL) added to diet on the average weekly feed conversion ratio (feed/ weight gain) for broilers during 1-6 weeks old

T	The weekly feed conversion ratio						
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Average from 1-6
T1	±1.328 0.068	±1.8900.090	± 1.7270.260 a	± 1.5870.200 a	±1.9800.075 a	±+1.7060.085 a	1.741± 0.034 a
T2	±1.301 0.067	±1.5540.090	± 1.2910.260 c	± 1.4270.200 b	0±1.408.075 e	±+1.4820.085 cd	1.422± 0.034 c
T3	±1.348 0.041	±1.7220.020	± 1.5060.020 abc	0 ±1.605 .023 a	±1.5850.019 cd	±1.6500.017 ab	1.598± 0.010 b
T4	±1.294 0.032	±1.6350.090	± 1.546 0.122 ab	0 ± 1.614.019 a	0±1.486.015 ed	0±1.718.008 a	1.586± 0.009 b
T5	±1.277 0.041	±1.8340.504	0 ± 1.572.17 ab	0± 1.600.012 a	0±1.542.049 cd	0±1.644.051 ab	1.596± 0.058 b
T6	±1.254 0.049	±1.5600.087	± 1.3020.012 c	0 ±1.409 .023 b	±1.3620.006 e	0±1.413.002 d	1.396± 0.007 c
T7	±1.2870.049	±1.5710.075	± 1.303 0.036 c	0±1.413.027 b	±1.4000.013 e	±1.4880.023 cd	1.421± 0.005 c
T8	±1.2650.017	±1.7720.085	±1.5640.030 ab	±1.555 0.022 a	0±1.500.026 ed	±1.6580.030 ab	1.574± 0.007 b
T9	±1.298 0.040	0±1.775.060	±1.740 0.016 a	±1.6000.030 a	±1.6140.024 c	0±1.584.030 b	1.621± 0.006 b
T10	±1.2920.042	±1.9220.015	±1.4740.043 cb	± 1.6050.034 a	±1.7480.037 b	0 ±1.609.005 ab	1.631± 0.005 b
Sig	N.S	N.S	*	*	*	*	*

T1 Control without any replacement, T2 replacement (WHL) powder at a level 6% instead of wheat, T3 Replacement (WHL) powder treated With (Sc) yeast at a level 6% instead of wheat, T4 replacement (WHL) powder treated with probiotics at a level of 6% instead of wheat, T5 replacement (WHL) powder at a level 12% instead of wheat, T6 replacement (WHL) powder treated with (Sc) yeast at a level 12% instead of wheat, T7 replacement (WHL) powder treated with probiotics at a level 12% instead of wheat, T8 replacement (WHL) powder at a level 18% instead of wheat, T9 replacement (WHL) powder treated with (Sc) yeast at a level 18% instead of wheat and T10, replacement (WHL) powder treated with probiotics at a level 18% instead of wheat *N.S indicates that there are no significant differences between the averages of the transactions. * The different letters within the same column indicate that there are significant differences between the treatments at the 0.05 . probability level The results of tables 4, 5, 6, and 7 indicated that all addition treatments gave the best results as they were the most weight, increase in weight, feed consumption and improvement in the feed conversion ratio, especially the coefficients of adding leaf powder fermented with (Sc) yeast and fermented with Iraqi probiotic by 12% and the treatment of adding powdered Nile flower leaves by 6%, and this may be due to the role of fermentation with (Sc) yeast or probiotics, as it indicates that the birds benefited from the added substance to the fullest extent and led to an improvement in all productive characteristics of these treatments compared to the control treatment without addition. This may be due to:-

1 - Active substances in the leaves (phenols, alkaloids, flavonoids, and Carroll, Linalool, and geraniol) (24) and their different roles, Flavonoids work to increase the absorption of iodine necessary for the construction of thyroid hormones (21) and so these hormones major role in the processes of construction and demolition within cells

2- The role of fermentation in (Sc) yeast and the micro-organisms present in the bio-enhancer, as it worked in more than one direction to improve the nutritional value of the leaf powder through its growth, and these

neighborhoods also enhanced the vital environment of the digestive canal the bird's, considering that most of the neighborhoods used are microorganisms beneficial to the bird, and it has worked to exclude the living Harmful microorganisms and colonization of beneficial microorganisms in the gut is called (competitive exclusion) (35). Microbial communities inhabiting the chicken's digestive system are essential for gut homeostasis and host metabolism, influence many physiological functions within the bird's body and health, and play an important role in nutrient digestion, pathogen inhibition, and interaction with each other as well as with the gut-associated immune system (25).

3- The role of yeast, probiotics, and the microorganisms that make it up by increasing the readiness of the nutrients found in the feed and increasing the digestibility of various nutrients such as organic matter, nitrogen, amino acids, fiber, and calcium (16), because some of the existing organisms and fungi that make up the probiotic are or encourage the activation of Digestive enzymes (Amylase, trypsin, chymotrypsin, and lipase) in addition to their role in binding nutrients to the intestinal cell wall and then increasing their absorption by the intestinal villi (1,9,17,31).

4- The role of (Sc) yeast, as the yeast improved the intestinal health of birds by modifying the structure of the intestine and inhibiting the bacteria that cause intestinal diseases (12,46,47), In addition, yeast is a rich source of small peptides with free amino acids that have a high rate of digestion and absorption which can effectively improve feed utilization in broilers (15).

5- Fermentation with yeast or probiotics causes an increase in the palatability of the feed materials (39,49).

6- Fermentation with (Sc) yeast or probiotics improves the nutritional quality of the feed by decreasing the fiber content (26,40,42(.Improving the digestibility of fibers and stimulating the intestinal villi, especially in the jejunum, is probably the mechanism through which *S. cerevisiae* improves the growth rate, (13), Increasing crude protein and fat content, improving vitamin availability, and improving protein solubility and amino acid patterns (14,49). Dry yeast given as an addition to broilers fed a high-fiber diet can improve weight gain and feed consumption efficiency in broilers fed 0.15% and 0.45% dry yeast (37). Yeast and its cell wall are used as food additives in poultry rations and lead to an increase in the average body weight gain, with a decrease in the feed conversion factor in the treatments fed live yeast at the end of the experiment period, and when broilers are fed with 6% yeast that results in the highest increase in Weight with a low feed conversion factor at the end of the experiment, but no differences were observed in feed consumption in broilers (41), and yeast-derived products can be these included in the feed of broiler broilers, as it leads to an increase in body weight and an improvement in the feed conversion coefficient (18). The superiority of the leaf powder supplementation treatment by (6%) over the rest of the addition treatments (12 and 18%) for all productive traits may be due to the relatively low fat content in the leaf powder, which may reduce the palatability of the feed, or due to the high fiber content in the addition treatments (12 and 18%), or it may be due to the fact that the amount of non-starch polysaccharides (cellulose and hemicellulose) in the second treatment (6%) was lower compared to the rest of the powder treatments, and thus the viscosity of the intestinal contents decreased in this treatment, and that the non-starchy polysaccharides in the feed additives It causes indigestion in poultry and leads to an increase in the viscosity of the contents of the intestines (33), and the high viscosity of the contents of the intestines led to a decrease in the rate of proliferation of enzymes and a decrease in their interaction and performance in digesting the feed, as well as the increase in viscosity leads to a decrease in the rate of oxygen and an increase in the activity of harmful anaerobic organisms such as *E. Coli* and salmonella (11).

C0NCLUSION

1- Based on the results obtained in the laboratory, the process of fermentation with (Sc) yeast and fermentation with Iraqi probiotic improved the nutritional value of the Nile flower powder by increasing the protein level and decreasing the proportion of crude fibers present in the leaf powder

2- Obtaining a significant increase in the productive traits (increasing the final weight rate, increasing feed consumption, and improving the efficiency of feed conversion ratio) especially when using leaf powder at a rate of 6% and leaf powder fermented with (Sc) yeast and Iraqi probiotics at a rate of 12% in place of the wheat

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