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Research Article

NUTRITIONAL EVALUATION OF *SPIRULINA PLANTENSIS* ENRICHED POULTRY FEEDS ON BROILER MEAT QUALITY

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ABSTRACT

In the present study, an attempt has been made in broilers on a large scale manner with a count of sixteen thousand and three hundred eighty nine, day-old commercial broiler chicks were randomly distributed into five dietary treatments (T1 to T5). The average body weight, feed intake and feed conversion ratio were recorded biweekly during experimental period of 42days respectively. Mean live weight of six weeks of the experiment and live weight at the end of experiment were found to be the Cumulative feed conversion ratio (CFCR) during entire experimental period was significantly ($P<0.05$) better in T3 group. In conformity to the present reports, comparatively better mean weekly weight gain and feed efficiency were also observed in spirulina supplemented groups (T2, T3, T4, and T5) with increased feed consumption as compared to control (T1) group of broilers. It can be concluded that the spirulina in broiler diet as an herbal feed additive is beneficial in improving the live weight and weight gain. The *Spirulina platensis* offers a good alternative to improve poultry production.

Keywords: Broiler, Feed profile, *Spirulina platensis*, CFCR.

INTRODUCTION

The algae are a biomass of cyanobacteria (blue-green algae) that can be used up by human beings and animals. It's also second-hand as a feed complement in the poultry and aquaculture industries. Growing population and earning have driven up call for animal-based proteins, leading to an elevated want for animal feed for rooster, incorporating a excessive exceptional protein source in feed is vital to make sure green production. (OECD/FAO, 2015).Spirulina used as the meals supply and boom promoter for the cattle inclusive of chicken due to its splendid nutrient profile and excessive carotenoid content. Spirulina contains excessive awareness of iron, phosphorus and proteins which includes all essential and non-critical amino acids. Spirulina is a non-poisonous, nutritious meal accountable for enhancement of increase, duplicate and immune function of animals and fowl. Spirulina also improves both, mobile mediated and mononuclear phagocytic gadget potential in chook letting them withstand illnesses. The natural increase promoters for rooster can create premiere condition for regular energetic boom through acting various methods. The successful use of herbal boom promoter will fetch more income to chicken farmer via green conversion of feed consumed to frame materials. The nutritional use of natural increase promoter increase the overall performance of broiler by means of increasing live weight gain, FCR, Prasad and Sen (1993) and Samarth *et al*. (2002)

Spirulina is a cyanobacterium that has been commercially cultivated for extra than 10 years because of its high nutritional content; e.g. protein, amino acid, vitamin, minerals, vital fatty acid and b- carotene (Vonshak, 1997). Spirulina can be taken into consideration a nutritional supplement that has various health benefits for humans, and a feed supplement for animals having monetary blessings. So far, there may be a restrained quantity of information that might be used to enhance the increase of the broiler performance. It has also been suggested that Spirulina has health blessings in conditions which includes diabetes mellitus and arthritis (Parikh, *et al*, 2001; Rasool *et al*, 2006)

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Antibiotics are used within the chicken enterprise to save you disorder in order to improve meat and egg manufacturing. But, using antibiotics in feed led to development of drug-resistant bacteria (Sorum and Sunde, 2001), drug residues inside the frame of the birds (Burgat, 1999) and imbalance of everyday micro plants (Andremont, 2000). In addition, the banded use of nutritional antibiotics had pushed the global implantation of alternative strategies to prevent proliferation of pathogenic bacteria. Thus, it has become important to develop alternatives using either useful animal growth.

The rapid increase of hen meat intake within the previous couple of many years is associated with consumer beliefs that fowl meat is 'healthful' and expenses less than beef. The absence of cultural and religious restraints to rooster meat consumption is also crucial (Cavani *et al*., 2010; Petracci *et al*., 2013). The inclusion of Spirulina in broiler nutrients, except having viable favourable outcomes on fitness and performance (Ravi *et al*., 2010; Kharde *et al*., 2012; Holman &Malau-Aduli, 2013; Shanmugapriya & Saravana Babu, 2014), might be a simple and convenient approach to introduce its bioactive compounds into the meat and produce purposeful products in step with consumer demand for healthy natural foodstuffs (Jimenez-Colmenero *et al*., 2001). Therefore, the present study was undertaken to determine the effects of dietary *Spirulina*, as a natural functional ingredient, on the growth performance of broiler chickens, and their meat quality.

MATERIALS AND METHODS

The research was conducted in the various commercial farm of10.6609° N, 77.0048° E, Pollachi, Coimbatore district. Tamil Nadu. India. (Figure1) during the period from June to August 2020 mainly focused on the broiler meat quality. The control (T1) group was fed standard broiler ration and T2, T3, T4, and T5 group were provided same broiler ration supplemented with 0.25/kg (Starter), 050%/kg (Grower) and 0.75%/kg (Finisher)Spirulina powder respectively. All the experimental chicks were reared on deep litter system of rearing with paddy husk as a litter material in a well-ventilated shed. All the birds reared under standard managerial conditions and provided sufficient drinking water. Weekly body weight of individual broiler and feed intake of chicks under different groups were recorded. The data was recorded analyzed by using Completely Randomized Design (CRD).

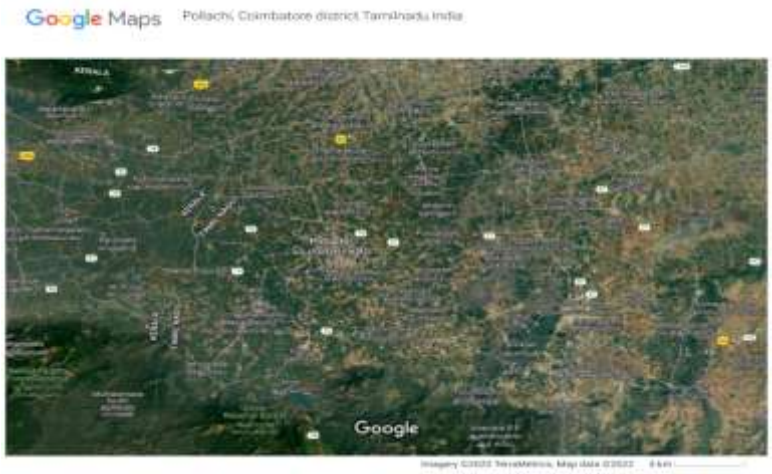

Figure 1.Various commercial farms in Pollachi, Coimbatore district, Tamil Nadu. India.

Test 1(T1)

Test 2(T2)

Test 3(T3)

Test 4(T4)

Test 5(T5)

Figure 2. Sixteen thousand and three hundred eighty nine, day-antique business broiler chicks were randomly allotted into 5 dietary remedies (T1 to T5).

Test 1(T1)

Test 2(T2)

Test 3(T3)

Test 4(T4)

Test 5(T5)

Figure 3. Fifteen thousand and eight hundred twelve, 42-day-antique business broiler chicks were randomly allotted into 5 dietary remedies (T1 to T5).

Table 1.Comparitive protein profile of *Spirulina platensis* and other feed additives.

S.No	Feed additives	Protein (%)
1.	Spirulina powder	60–70
2.	Whole dried egg	47
3.	Beer yeast	45
4.	Skimmed powdered milk	36
5.	Whole soybean flour	36
6.	Parmesan cheese	36
7.	Wheat germ	27
8.	Peanuts	26
9.	Chicken	19–24
10.	Fish	19.2–20.6
11.	Beef meat	17.4

Table 2. Profile feed formula ratio of broilers with added % Spirulina powder.

S.No	Age	Broiler feed stage	*Spirulinaplatensis*% / kg	1000 kg
1.	1 to 14	I-Starter	0.25% / kg	2.5 kg
2.	15 to 28	II-Grower	0.50% / kg	5.0 kg
3.	29 to 42	III-Finisher	0.75% / kg	7.5 kg

Table 3. First day of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments1	T1	T2	T3	T4	T5
Age (Days)	1	1	1	1	1
Average weight (gm)	59	53	60	63	62
Cumulative-feed conversi..	0.72	0.7	0.67	0.66	0.18
Feed conversion ratio	0.24	0.22	0.19	0.18	0.18
Feed intake (gm)	0.014	0.011	0.011	0.011	0.011
Mortality %	-5	-3	-8	-4	-3
Temperature (C°)	90	92	90	92	90
Total birds (Live)	2,795	3,399	3,395	3,400	3,400

Table 4.I[st] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	8	8	8	8	8
Average weight (gm)	172	179	178	180	175
Cumulative-feed conversi..	1.32	1.28	1.29	1.31	1.33
Feed conversion ratio	0.87	0.83	0.84	0.86	0.88
Feed intake (gm)	0.174	0.166	0.191	0.19	0.196
Mortality %	-6	-2	-4	-2	-6
Temperature (C°)	92	90	90	90	90
Total birds (Live)	2,756	3,360	3,343	3,357	3,355

Table 5. II[nd] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	15	15	15	15	15
Average weight (gm)	401	427	441	412	446
Cumulative-feed conversi..	1.58	1.44	1.5	1.53	1.53
Feed conversion ratio	1.18	1.04	1.1	1.13	1.13
Feed intake (gm)	0.609	0.528	0.566	0.539	0.528
Mortality %	-1	-2	-1	-2	-1
Temperature (C°)	90	90	90	90	90
Total birds (Live)	2,740	3,348	3,330	3,347	3,342

Table 6. III[rd] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	22	22	22	22	22
Average weight (gm)	830	830	800	750	800
Cumulative-feed conversi..	1.54	1.52	1.54	1.8	1.65
Feed conversion ratio	1.25	1.23	1.24	1.5	1.35
Feed intake (gm)	0.1144	0.1136	0.1118	0.1206	0.1207
Mortality %	-3	0	-4	-1	-4
Temperature (C°)	90	90	90	90	90
Total birds (Live)	2,729	3,327	3,318	3,331	3,334

Table 7. IV[th] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	29	29	29	29	29
Average weight (gm)	1,250	1,320	1,280	1,200	1,230
Cumulative-feed conversi..	2	1.88	1.91	2.01	1.98
Feed conversion ratio	1.54	1.42	1.45	1.54	1.52
Feed intake (gm)	0.2067	0.2021	0.2013	0.1974	0.1999
Mortality %	0	-1	-2	-2	-2
Temperature (C°)	90	90	90	90	90
Total birds (Live)	2,719	3,321	3,307	3,320	3,327

Table 8. V[th] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	36	36	36	36	36
Average weight (gm)	1,850	1,820	1,800	1,780	1,770
Cumulative-feed conversi..	2.09	2.04	2.04	2.07	2.07
Feed conversion ratio	1.64	1.59	1.59	1.62	1.62
Feed intake (gm)	0.3182	0.3052	0.3112	0.2937	0.3071
Mortality %	-2	-1	-3	0	-1
Temperature (C°)	90	90	90	90	90
Total birds (Live)	2,714	3,310	3,301	3,307	3,319

Table 9.VI[th] week of spirulina enriched dietary supplementation ratio.

	Dietary remedies				
Experiments	T1	T2	T3	T4	T5
Age (Days)	42	42	42	42	42
Average weight (gm)	2.376	2.395	2.422	2.347	2.383
Cumulative-feed conversi..	3.17	3.09	3.03	3.14	3.12
Feed conversion ratio	1.77	1.69	1.64	1.73	1.72
Feed intake (gm)	4.217	4.057	3.993	4.075	4.106
Livability %	96.45	97.35	96.31	96.38	95.88
Mortality %	3.55	2.65	3.69	3.62	4.12
Temperature (C°)	90	90	90	90	90
Weight gain	2.317	2.342	2.362	2.284	2.321
Total birds (Live)	2,696	3,309	3,270	3,277	3,260

RESULTS AND DISCUSSION

Sixteen thousand and three hundred eighty nine, day-antique business broiler chicks were randomly allotted into 5 dietary remedies (T1 to T5). The common body weight, feed consumption and feed conversion ratio were recorded biweekly at various stages in experimental period of 42 days.(Table 1 to Table 9) and Figure 2T1- 2696 birds, T2-3309 birds, T3- 3270birds, T4-3277 birds and T5-3260 birds had been recorded inside the final day experimental period.T1 to T5 broilers in forty two days age had been analyzed.T1- 2.376gm, T2-2.395gm, T3-2.422gm, T4-2.347gm and T5-2.383gm had been analysed. Common frame weight of the experimental birds changed into recorded biweekly. The Feed conversion ratio (FCR) during entire experimental period was significantly ($P<0.05$) better in T3 group followed by T2, T5, T4 and T1groups. In conformity to the present reports.

The Cumulative feed conversion ratio (CFCR) during entire experimental period was significantly ($P<0.05$) better in T3 group followed by T2, T5, T4 and T1groups. In conformity to the present reports.T1-4.217 gm,T2-4.057gm,T3-3.993gm, T4-4.075gm and T5-4.106gm were analysed feed consumption of the experimental birds were recorded biweekly.T1 to T5 broilers in 42 days experiments maintained at 90°C were analysed. T1- 2.317gm,T2-2.342gm,T3-2.362gm, T4-2.284gm and T5-2.321gm were recorded in the present experimental period, weight gain was significantly increased in the groups fed the supplements. The highest weight gain (1st day to 42 days) was observed in the group fed (T3), followed by (T2), (T5), (T1) with the lowest weight gain observed in the fed group (T4).T1- 96.45%, T2-97.35%,T3-96.31%, T4-96.38% and T5-95.88% were recorded. In the present experimental period; liveability was significantly increased in the groups fed the supplements. The highest liveability (1 at 42 days) was observed in the group fed (T2), followed by (T1), (T4), (T3) with the lowest liveability observed in the fed group (T5) (Figure 2)

T1- 3.55%, T2-2.65%, T3-3.69%, T4-3.62% and T5-4.12% were recorded. In the present experimental period, mortality was significantly reduced in the groups fed the supplements. The lowest mortality (1 at 42 days) was observed in the group fed (T2), followed by (T1), (T4), (T3) with the highest mortality observed in the fed group (T5).The number one position of feed isn't continually best to provide sufficient nutrients to meet metabolic requirements of the body but additionally to modulate diverse abilities of the frame. This may be simply harnessed via the meals manufacturers and keep extensive promise for the health care company. The results of spirulina supplementation in broiler performance parameters are offered in table 1 to 9.Those consequences are in settlement with those of previous researchers (Ross & Dominy, 1990; Venkataraman *et al*., 1994; Qureshi *et al*., 1996; Gongnet *et al*., 2001; Toyomizu *et al*., 2001), who recorded non-significant consequences of dietary spirulina supplementation on performance parameters, even though it has been mentioned that spirulina inclusion over one hundred g/kg may want to depress the birds' growth (Ross & Dominy, 1990).

In contrast, other researchers (Kharde *et al*., 2012; Shanmugapriya & Saravana Babu, 2014) pronounced that nutritional spirulina notably advanced weight advantage and feed efficiency of chickens compared with the manipulate businesses. Moreover, Bellof & Alarcon, 2013) stated that underneath organic farming, nutritional spirulina supplementation advanced increase and carcass overall performance parameters of broilers significantly. Contradictory effects are in all likelihood due to the exclusive spirulina inclusion ranges and exceptional within the present trials. Further, secondary parameters, along with feed composition, housing conditions and production systems, might be reasons for the version in the outcomes of the present. Slight numerical improvement in feed conversion ratio in spirulina fed birds reported by Baikovaskaya *et al*. (1993).In our study is well-intentioned to note that the improvement in final body weight (BW) and weight gain(WG) which occurred in broiler chickens managed *Spirulina plantensis* may be attributed to the biological functions of the main components of the residual essential amino acids in *Spirulina plantensis*. Our obtained results were in accordance with those of other research carried out by Kaoud (2012) who noticed an improvement in the body weight (BW) and weight gain (WG) at the end of the experiment (d 42), when *Spirulina plantensis* was added to the diet of broiler chicken.

CONCLUSION

The present assessment had discovered that great studies were achieved on Spirulina to establish its potential use as a meals supplement, meals additive.Our experiment clearly portrays the resulting poultry meat quality between a partially-defatted *Spirulina plantensis* based diets, compared to a soy-fed control. Results show that the alternative protein sources can be viably included in broiler chicken production, as investigated from a multi-faceted meat quality perspective. From this experimental it emerged that the great attributes of meat obtained from bird breeds could be make this product perfect to purchasers. However, the common body weight, feed consumption and feed conversion ratio those factors may also be considered a power factor in developing suitable strategies for product advertising. Another power factor is the farming machine that is extensive and lets in chickens to specific their behavioural repertoire. These are all characterizing factors that could be exploited for marketing functions and to opportunity markets, aimed toward achieving protein customers who are to the above-stated functions. Consequently, spirulina could be a promising functional factor in broiler bird nutrition. Though, greater multidisciplinary research is needed since this microalga suits the criteria for the improvement of ability functional elements in broiler vitamins. Breast, thigh, and skin

pigmentation increased significantly ($P < 0.005$) in both experiments (Table 9).

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