

## Effect of supplementation of spirulina (*Spirulina platensis*) on growth performance of broiler in Konkan region

### ABSTRACT

The experimental trial of six weeks was conducted on 200-day-old broiler chicks. They were randomly distributed into five experimental treatment groups. Each treatment group was replicated into four with 10 birds per replication. The control (T<sub>1</sub>) group was fed standard ration and T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> group were provided same standard ration supplemented with 1.00 g, 2.00 g, 3.00 g and 4.00 g spirulina powder, respectively. The result of experimental trial showed that supplementation of spirulina powder was significantly highest live body weight in treatment T<sub>5</sub> (1944.50 g/bird) as well as average live body weight gain (277.79 g/bird). It is concluded that, 4.00 g of spirulina powder significantly improved growth performance of broiler chicks than other treatments groups.

**Keywords:** Spirulina powder, Broiler chicks, Growth performance, Body weight.

### INTRODUCTION

The word "poultry" is derived from the French word "poule," meaning a small animal. Poultry (*Gallus domesticus*) has been domesticated since over 150 million of years ago, when the first wild jungle fowl evolved on earth. Poultry encompasses chickens, ducks, geese and other types of fowl. It is currently one of the fastest growing section in Indian agriculture. It is conclusive to the country's economic growth.

According to the 20<sup>th</sup> livestock census (2019), there are 851.8 million poultry birds in India, increased by 16.8% over previous census. This makes India to second largest poultry market in world. The total backyard poultry in the country is 317.07 million in 2019. The total commercial poultry in the country is 534.74 million in 2019, increased by 4.5% over previous census. In India Tamilnadu state having highest poultry population (120.80 million). Chickens, turkeys, ducks, geese, etc. are reared in poultry farms for meat and egg purpose. In 2022-2023, India produced 138.38 billion eggs, which is increased by 7.35% over previous nine years. This puts India as the world's third largest producer of eggs and poultry meat and the per capita availability of eggs in India is 101 eggs per year. Andhra Pradesh is highest egg producer state in the country. The 6-8% increase in layers and the 10-12% increase in broilers have a detrimental influence on agriculture's total growth, which is approximately 4.5%. The total meat production in the country is 9.77 MT in the year 2022-23. The per capita availability of meat is reached 6.82 kg/annum in the year 2022-23. Nearly 51.44% of meat production is contributed by poultry respective to total meat production of country. Nutritionists suggested that humans consume 11 kilograms of meat and 180 eggs per year. Broiler production is increasing at an annual pace of 12-15%. (Anonymous, 2022).

The researchers are currently focusing on locally available natural feed resources that can be employed as feed additives to improve broiler performance. Furthermore, the discriminating use of antimicrobials and other medications to increase growth rate has a variety of negative consequences for both the health of birds and customers. As a result, poultry experts are once again focusing on the use of our old medicinal system to identify beneficial herbs and plants that can be safely utilized to improve productivity. The use of herbs and other medicinal plants, as well as their extracts in poultry food may be more advantageous as a growth booster and prevention of many common chicken diseases. Furthermore, these herbs would be freely available, widely known among laymen.

Therefore, experts studying poultry are **once** more focusing on using our traditional medical system to uncover useful herbs and plants that can be utilised safely to improve production. It may be more advantageous to use herbs, other medicinal plants and their extracts in chicken feed as a growth promoter and a defence against many common poultry diseases. Additionally, these herbs would be easily accessible, well-known by laymen and capable of being used in poultry diet.

## MATERIAL AND METHODS

### Treatments and Experimental design

The experimental trial was conducted on 200, day-old broiler chicks, obtained from Isha Poultry Services, Chiplun, District-Ratnagiri. The chicks were from the same hatch and reared under uniform management condition up to the sixth weeks of age. On arrival, the chicks were weighed individually and randomly divided into five treatments including control were formulated. The experiment was conducted in a Randomized Block Design with following dietary treatments. The control (T<sub>1</sub>) group was fed standard ration and T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> group were provided same standard ration supplemented with 1.00 g, 2.00 g, 3.00 g and 4.00 g spirulina powder, respectively. The experimental trial was conducted at poultry unit of instructional farm, Department of Animal Husbandry and Dairy Science, College of Agriculture, Dapoli. District – Ratnagiri, Maharashtra.

## RESULT AND DISCUSSION

### Growth Performance

#### 1. Feed Consumption (g/bird)

Throughout the six-week trial, the average feed intake of the broiler chicks was noted at weekly intervals. The average weekly feed consumption of broiler chicks presented in Table 1.

In the present study, the total amount of feed consumed throughout the experimental trial of six weeks was 3869.00, 3868.25, 3859.50, 3840.00 and 3805.75 g/bird for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively.

**Comment [r21]:** Introduction lacks the aim of the study and nearly devoid of references

**Comment [r22]:** Where is the statistical analysis

**Comment [r23]:** The discussion is poor and all the manuscript has only four references, three of which are old (2001, 2002, 2012). However, many recent studies have been conducted on the effect of SPIRULINA on general health of poultry not only the growth performance.

1-Abou-Zeid, A., El-Damarawy, S., Marley, Y., & El-Mansy, M. (2015). EFFECT OF USING Spirulina platensis AND/OR Chlorella vulgaris ALGAE AS FEED ADDITIVES ON PRODUCTIVE PERFORMANCE OF BROILER CHICKS. *Journal of Animal and Poultry Production*, 6(10), 623-634. <https://doi.org/10.21608/japmu.2015.52940>

2-Mahmoud, R., El-Rayes, T., & Eldamrawy, S. (2016). EFFECT OF STOCKING DENSITY AND SPIRULINA PLATENSIS ALGAE SUPPLEMENTATION AS A FEED ADDITIVE ON PERFORMANCE AND PHYSIOLOGICAL STATUS OF BROILER CHICKS. *Egyptian Journal of Nutrition and Feeds*, 19(3), 535-547. <https://doi.org/10.21608/ejnf.2016.74995>

3-El-Shall, N. A., Jiang, S., Farag, M. R., Azzam, M., Al-Abdullatif, A. A., Alhotan, R., Dhama, K., Hassan, F., & Alagawany, M. (2023). Potential of Spirulina platensis as a feed supplement for poultry to enhance growth performance and immune modulation. *Frontiers in Immunology*, 14. <https://doi.org/10.3389/fimmu.2023.1072787>

4-Abed, H., Ahmed, A., Abdel-Azeem, F., & Shourrap, M. (2023). EFFECT OF SPIRULINA PLATENSIS ALGAE SUPPLEMENTATION ON GROWTH PERFORMANCE, PHYSIOLOGICAL STATUS OF BROILERS DURING SUMMER SEASON. *Egyptian Journal of Nutrition and Feeds*, 26(1), 101-107. <https://doi.org/10.21608/ejnf.2023.298115>

5-Mirzaie, S., Zirak-Khattab, F., Hosseini, S. A., & Donyaei-Darian, H. (2018). Effects of dietary Spirulina on antioxidant status, lipid profile, immune response and performance characteristics of broiler chickens reared under high ambient temperature. *Asian-Australasian Journal of Animal Sciences*, 31(4), 556-563. <https://doi.org/10.5713/ajas.17.0483>

6-Attia, Y. A., Hassan, R. A., Addeo, N. F., Bovera, F., Alhotan, R. A., Al-qurashi, A. D., Al-Baadani, H. H., Al-Banoby, M. A., Khafaga, A. F., Eisenreich, W., Shehata, A. A., & Basioni, S. (2023). Effects of Spirulina platensis and/or Allium sativum on Antioxidant Status, Immune Response, Gut Morphology, and Intestinal Lactobacilli and Coliforms of Heat-Stressed Broiler Chicken. *Veterinary Sciences*, 10(12), 678. <https://doi.org/10.3390/vetsci10120678> And many others

Higher feed intake was noted in T<sub>1</sub> than treatments T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>. Treatment T<sub>5</sub> resulted in lower feed consumption than other four treatment groups. This is because of herbs, spices and various plant extracts have appetite and digestion stimulating properties and antimicrobial effects that's why birds fed with spirulina powder shows lower feed consumption (Kamel, 2001). In treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, the average feed consumption(g/bird) at the end of the six week was 644.83, 644.70, 643.25, 640.00 and 634.29 g. However, treatments T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, were at par to each other.

Kharde (2012) conducted experiment on effect on spirulina supplementation on growth performance of broilers. He reported that control (T<sub>0</sub>) which was fed standard broiler diet had higher feed consumption (660.92 g.) than T<sub>1</sub> and T<sub>2</sub> which were provided same broiler diet supplemented with 300 and 500 mg of spirulina per kg feed had lower values T<sub>1</sub>(657.82 g.) and T<sub>2</sub> (659.82 g.).

**Table 1. Weekly feed consumption(g/bird)**

Treatment	Week1	Week2	Week3	Week4	Week5	Week 6	Total	Mean
T <sub>1</sub>	155.25	303.00	491.25	823.00	981.00	1115.50	3869.00	644.83 <sup>a</sup>
T <sub>2</sub>	154.50	303.00	490.25	821.00	975.50	1124.00	3868.25	644.70 <sup>a</sup>
T <sub>3</sub>	154.25	301.75	488.50	819.00	974.00	1122.00	3859.50	643.25 <sup>a</sup>
T <sub>4</sub>	152.50	301.25	482.25	817.00	969.00	1118.00	3840.00	640.00 <sup>b</sup>
T <sub>5</sub>	152.00	301.50	475.25	810.00	955.00	1112.00	3805.75	634.29 <sup>c</sup>
S.E. m	0.85	0.55	1.53	1.64	1.95	1.82	3.28	0.61
CD	NS	NS	4.71	5.06	6.01	5.60	10.11	1.87

Comment [r24]: Full name

## 2. Body Weight (g)

Throughout the duration of the six-week trial, the experimental birds were weighed by weighing balance at weekly interval. From birth of the chicks to the age of six weeks, each treatment group was weighed by weighing balance at weekly interval. Live weight measurements were taken and are shown in Table No.2 and graphically in Fig No.1

Comment [r25]: repeated

The day-old experimental broiler chicks have average body weights for the five different treatments i.e. T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> were 48.50, 48.00, 48.50, 47.00 and 48.00 g, respectively. The experimental chicks at six weeks of age

Comment [r26]: one day old chick

had an average body weight of 1612.75, 1653.25, 1712.00, 1818.75 and 1944.50 g, respectively. Up to the first two weeks of the experimental trial, there was no significant difference observed between the treatment groups based on the weekly body weight variations of the experimental chicks. However, beginning in the third week, there was significant ( $P < 0.05$ ) difference.

The body weight in the treatment T<sub>5</sub> was considerably ( $P < 0.05$ ) greater than the control group in the fourth week. In the fifth week of taking T<sub>5</sub>, the birds' average body weight was higher. Treatments T<sub>1</sub> and T<sub>2</sub> were comparable to one another. At the end of the six weeks, the T<sub>5</sub> group had significantly ( $P < 0.05$ ) higher body weight. It has been determined that spirulina, a algae-based feed supplement had a better effect on body weight in broilers due to higher protein content.

Higher values were observed by Hanafy (2022) than present investigation. He documented that the broilers supplemented with 0.7 g/kg spirulina powder gained the significantly higher ( $P < 0.05$ ) live body weight (2300.00g/bird) compared to untreated control (1700.00g/bird) group.

Comment [r27]: should be rephrased I can't understand

**Table 2. Weekly live body weight (g/bird)**

Treatment	Initial	Week1	Week2	Week3	Week4	Week5	Week 6	Mean
T <sub>1</sub>	48.50	179.75	370.75	672.75	945.50	1271.00	1612.75	728.71 <sup>e</sup>
T <sub>2</sub>	48.00	182.50	378.00	678.00	992.00	1301.00	1653.25	747.54 <sup>d</sup>
T <sub>3</sub>	48.50	181.00	376.25	680.00	1016.50	1393.00	1712.00	772.46 <sup>c</sup>
T <sub>4</sub>	47.00	185.00	373.75	687.75	1077.25	1462.00	1818.75	807.43 <sup>b</sup>
T <sub>5</sub>	48.00	183.25	380.25	724.00	1094.00	1506.25	1944.50	840.04 <sup>a</sup>
S.E.m	0.99	5.78	5.84	5.05	6.97	11.38	5.88	2.24
C.D.	NS	NS	NS	15.57	21.47	35.07	18.13	6.91

### 3. Body Weight Gain (g)

The body weight gain of experimental broiler chicks at weekly interval on the inclusion of spirulina (*Spirulina platensis*)

powder in the feed has been presented in Table No.3 and graphically presented in the Fig No.2

The results showed that the day-old experimental broiler chicks in the treatment groups had an average initial live weight of 48.5, 48.0, 48.5, 47.0 and 48.0 g., for T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. The average of weekly body weight gain were 230.39, 236.18, 244.57, 259.82, 277.79 g for the treatment groups T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively.

During the first two weeks of the trial, the weekly live body weight gain of the chicks showed no significant difference between each of the treatment groups. From the third week of age, there is a significant (P<0.05) difference between the treatments. After the data being analyzed by statistical methods, it was observed that the average live body weight gain was seen in treatment group T<sub>5</sub> (4 g spirulina) – 277.79 g. It shown significantly higher live body weight gain than other treatment groups followed T<sub>1</sub> (control) – 230.39, T<sub>2</sub> (1 g spirulina) – 236.18, T<sub>3</sub> (2 g spirulina) – 244.57, T<sub>4</sub> (3 g spirulina) – 259.82 g. The lowest average live body weight gain among the treatment groups was observed in T<sub>1</sub> control (230.39g/bird). In the sixth week, the T<sub>5</sub> registered significantly (P<0.05%) higher body weight gain.

The findings of present study are lower than the result of Pisariwar (2005) who observed the body weight gain for the treatments varied significantly and ranged between 321.58 ± 11.10 to 366.44 ± 14.04 g, g/bird for control, treatment group 0.05 per cent spirulina powder, 0.1 per cent spirulina powder, 0.2 per cent spirulina powder and 0.3 per cent spirulina powder.

**Table 3. Weekly live body weight gain (g/bird)**

Treatment	Initial	Week1	Week2	Week3	Week4	Week5	Week 6	Mean
T <sub>1</sub>	48.50	131.25	191.00	302.00	272.75	325.50	341.75	230.39 <sup>e</sup>
T <sub>2</sub>	48.00	134.50	195.50	300.00	314.00	309.00	352.25	236.18 <sup>d</sup>
T <sub>3</sub>	48.50	132.50	195.25	303.75	336.50	376.50	319.00	244.57 <sup>c</sup>
T <sub>4</sub>	47.00	138.00	188.75	314.00	389.50	385.25	356.25	259.82 <sup>b</sup>
T <sub>5</sub>	48.00	135.25	197.00	343.75	370.00	412.25	438.25	277.79 <sup>a</sup>
S.E.m	1.00	2.11	6.78	7.09	8.51	13.50	13.00	0.94
C.D.	NS	NS	NS	21.84	26.23	41.59	40.06	2.90

Comment [r28]: One day old

Comment [r29]: What statistical method is the data has been tested for normality and homogeneity before analysis. Also, The method of analysis should be identified

Comment [r210]: Rephrased

## Conclusion

In comparison to control and other treatment groups, it was shown that adding 4.00 g/kg of spirulina powder to the feed significantly enhanced the growth performance in terms of feed intake, live body weight, body weight gain. Hence, it can be concluded that commercial broiler feed can be successfully added with spirulina powder up to the level of 4.00 g/kg of feed without affecting productive performance of broiler birds that results in good health and better economic returns.

**Comment [r211]:** Studying the effect of Spirulina on growth performance only not enough to determine its impact on general health

## References

- Hanafy A (2022) *Spirulina platensis* a promising growth promoter for poultry industry.10(1): 27-33
- Kharde S D ,Shirbhate R N, Bahiram K B and Nipane S F (2012) Effect of Spirulina supplementation on growth performance of broilers. Indian J.Vet. Res.21(1): 66-69
- Kamel C (2001) Tracing methods of action and roles of plant extracts in non-ruminants.Recent Adv. Ani. Nutri. 130 – 150
- Pisariwar GN (2023) Effect of supplementation of spirulina on performance of broilers.M. V. Sc. thesis submitted to MAFSU, Nagpur. (Maharashtra state)