Effectof supplementation of spirulina (*Spirulina platensis*) on growth performance of broiler in Konkan region, India

ABSTRACT

The experimental trial of six weeks was conducted on 200 broiler chicks. They were randomly distributed into five experimental treatment groups. Eachtreatmentgroupwasreplicatedintofourwith 10birdsperreplication.The control (T_1) group was fed standard ration and T_2, T_3, T_4 and T_5group 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_5 (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 performanceof 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. It is currently one of the fastest growingsections in Indian agriculture. It is conclusive to the country's economic growth.

According to the 20th 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 101eggs 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. Spirulina is considered a natural antioxidant that is less expensive than produced goods (Abdel-Daim et al., 2014). The use of spirulina in feed regimens for major agricultural species has been shown to improve productivity, health and product quality.

It may be more advantageous to use herbs, other medicinal plants and their extracts in chicken feed as a growth promoter and a defense 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

Theexperimental trialwasconductedon200,day-oldbroilerchicks,obtainedfromIshaPoultryServices, Chiplun, District-Ratnagiri. The chicks were from the same hatch and reared under uniformmanagement condition up to the sixth weeks of age. On arrival, the chicks were weighed individually andrandomly divided into five treatments including control were formulated.The experiment was conductedinaRandomizedBlockDesignwithfollowingdietarytreatments.The control (T_1) group was fed standard ration and T_2, T_3, T_4, T_5 group were provided same standard ration supplemented with 1.00 g, 2.00 g3.00 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.

Managementpractices

The brooders, waterers and feeders were thoroughly cleaned, washed and disinfectedbefore the arrival of chicks. The experimental birds were reared on deep litter system up to 4 daysofageforbroodingpurpose.Thebroodingtemperaturewasregulatedfrom85to95^{0}F(26.6to 35^{0}C). Ten chicks per replication *i.e.*, fourty chicks per treatment were reared and broodedseparatelyon deep litter system up tothe ageof sixweeks.

Allthebirdsduringbroodingperiodwerefedcrumbleforthe firstthreedays.Afterthat,birds were offered

commercial broiler 'starter' crumbles from 4th day to end of 3rd weeks of agefollowedbybroiler'finisher'crumblestillendof6thweek.Theexperimentalfeedwasin a powdered form and then supplemented from the start of 4th dayto end of 6th week. The birds of different groups were fed separately throughout the experimentalperiod; birds were fed twice a day.The leftover was collected and weighed next day morning.Freshandcleanwaterwasoffered*adlibitum*toallthebirds.Adequatehealthcoverwasprovidedto allthe birds.

Feedconsumption(g/day)

The daily feed consumption of each group was estimated as difference between the totalquantity of feed offered and quantity of feed left over during 24 hours period. Feed consumptionso recorded was added together for seven days of the week and was considered as weekly feedconsumption.

Bodyweight(g/week)

Individualbodyweightofthebirdsfromeachgroupwastakenatweeklyintervals,starting fromtheday-oldstage. Thebirds were weighedduringmorninghoursbeforefeeding.

Bodyweightgain(g/week)

The growth rate of the birds was reflected through the weekly weight gain. The averageweeklyweightgainofthebirdsofvariousgroupswascalculatedbysubtractingthepreviousweek averageweight ofthegroup ofbirds fromthepresent weekaverageweightof thegroupofbirds.

RESULT AND DISCUSSION

Growth Performance

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

Throughout the six-weektrial, 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_1, T_2, T_3, $T_4$and T_5, respectively. Higher feed intake was noted in T_1 than treatments T_2, T_3, T_4 and T_5. Treatment T_5 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_1, T_2, T_3, T_4 and T_5, 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_1, T_2andT_3,wereatpartoeachother.

Hadeel A. Abed et al. (2023) conducted experiment on effect of *spirulina platensis* algae supplementation on growth performance, physiological status of broilers during summer season they reported that control (S_0) which was fed standard broiler diet had lower feed consumption 2.057±0.033 than S_1 2.764±0.071 and S_2 2.852±0.054

Table 1: Weekly feed consumption (g/bird)

Treatment	Week1	Week2	Week3	Week4	Week5	Week 6	Total	Mean
T_1	155.25	303.00	491.25	823.00	981.00	1115.50	3869.00	644.83[a]
T_2	154.50	303.00	490.25	821.00	975.50	1124.00	3868.25	644.70[a]
T_3	154.25	301.75	488.50	819.00	974.00	1122.00	3859.50	643.25[a]
T_4	152.50	301.25	482.25	817.00	969.00	1118.00	3840.00	640.00[b]
T_5	152.00	301.50	475.25	810.00	955.00	1112.00	3805.75	634.29[c]
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

2.Body Weight (g)

From birth of the chicks to the age of sixweeks,eachtreatmentgroup was weighed by weighing balance at weekly interval, liveweightmeasurementsweretakenandare shownin Table No.2 and graphically in Fig No.1

TheOne day-oldexperimental broiler chicks have averagebodyweightsforthefivedifferenttreatments i.e. T_1, T_2, T_3, T_4 and T_5 were 48.50, 48.00, 48.50, 47.00 and 48.00 g, respectively. The experimental chicks atsix weeks of age had an average body weight of 1612.75, 1653.25, 1712.00, 1818.75 and 1944.50 g, respectively. Up tothefirsttwoweeksofthe experimental trial,therewasnosignificant difference observed betweenthetreatmentgroupsbased on the weekly body weight variations of the experimental chicks. However, beginning in the third week, there was significant ($P<0.05$)difference.

At the end of the six weeks, the T_5group had significantly ($P<0.05\%$) higherbodyweight.Ithasbeen determined 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 (2300.00 g/bird)comparedto untreatedcontrol (1700.00 g/bird)group.

Table 2: Weeklylivebodyweight(g/bird)

Treatment	Initial	Week1	Week2	Week3	Week4	Week5	Week 6	Mean
T_1	48.50	179.75	370.75	672.75	945.50	1271.00	1612.75	728.71[e]
T_2	48.00	182.50	378.00	678.00	992.00	1301.00	1653.25	747.54[d]
T_3	48.50	181.00	376.25	680.00	1016.50	1393.00	1712.00	772.46[c]
T_4	47.00	185.00	373.75	687.75	1077.25	1462.00	1818.75	807.43[b]
T_5	48.00	183.25	380.25	724.00	1094.00	1506.25	1944.50	840.04[a]
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)

Thebodyweightgainof experimental broilerchicksatweeklyintervalon the inclusionofspirulina (*Spirulina platensis*) powderin the feed hasbeenpresentedinTable no.3

The results showed that the one day-old experimental broiler chicks in the treatment groups had an average initial liveweightof48.5,48.0, 48.5, 47.0and48.0g.,for T_1, T_2,T_3,T_4andT_5,respectively.Theaverage of weekly body weight gain were 230.39, 236.18, 244.57, 259.82, 277.79 g for the treatment groups T_1, T_2, T_3, T_4 and T_5, 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 asignificant (P<0.05) difference between the treatments. After the data being analyzed by statistical methods Randomized Block Design, it was observed that the average live body weight gainin treatment group T_5 (4 g spirulina) – 277.79 g shown significantly higher live body weight gain than other treatment groups followed T_1 (control) – 230.39, T_2 (1 g

spirulina) – 236.18, T_3 (2 g spirulina) – 244.57, T_4 (3 g spirulina) – 259.82 g. The lowest average live body weight gain among the treatment groups was observed in T_1 control (230.39 g/bird). In the sixth week, the T_5 registered significantly (P<0.05%) higher bodyweightgain.

The findings of present study are lower than the result of Pisariwar (2023) 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 % spirulina powder, 0.1 % spirulina powder, 0.2 per cent spirulina powder and 0.3 % spirulina powder.

Table 3:Weeklylivebodyweightgain(g/bird)

Treatment	Initial	Week1	Week2	Week3	Week4	Week5	Week 6	Mean
T_1	48.50	131.25	191.00	302.00	272.75	325.50	341.75	230.39^{e}
T_2	48.00	134.50	195.50	300.00	314.00	309.00	352.25	236.18^{d}
T_3	48.50	132.50	195.25	303.75	336.50	376.50	319.00	244.57^{c}
T_4	47.00	138.00	188.75	314.00	389.50	385.25	356.25	259.82^{b}
T_5	48.00	135.25	197.00	343.75	370.00	412.25	438.25	277.79^{a}
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

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 weight gain and better economic returns.

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1.

2.

3.

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