Performance of broiler chickens supplemented with dried mushroom in their diet

ABSTRACT

In this study, it was evaluated that the growth performance of broiler chicken supplemented with the edible *P. florida* mushroom, 20g/kg of dried *P. eoes* mushroom, and 20g/kg of dried *P. sajor caju* mushroom. day-old broiler chicks from a single hatch were weighed individually and divided into 4 groups of six birds each at random. The birds will be given a basic diet for starter and finisher rations for 0–3 and 4-6 weeks, respectively. One group (G1) was kept as the control, while the remaining three groups (G2, G3, and G4) given their chicks the same basic food as G1 combined with various types of mushrooms. Groups G2, G3, and G4 were fed 20g/kg of dry *P. florida* mushroom, 20g/kg of dried *P. eoes* mushroom, and 20g/kg of dried *P. sajor caju* mushroom. Throughout the six-week testing period, food and drink were freely available. Feed consumption, Body weight, and feed conversion ratio values were monitored weekly. It was found that, the application of *Pleurotuus* sp.mushroom (*P. florida*, *P.eoes*, *P.sajor* caju respectively) in different groups in the diet of broiler chicks did not show any effect on feed consumption but improved the growth rate in summer season. The *Pleurotous florida* mushroom is therefore required for an improvement in growth performance during the summer, according to G2.

Key words: antibiotic, broiler, feed, mushroom

1. INTRODUCTION

The poultry firm is a part of agriculture that is expanding very rapidly. About 70 to 80 percent of the entire cost of production in the production of poultry is spent on feed. Therefore, economy in feed expenses can bring better return to poultry farmers. India now ranks 5rd largest country for egg production. Annual growth rates are now 8.35% for broiler industry. India is the 6th largest producer of poultry meat in the world **[1]**, producing about 3.9 million ton of poultry meat in 2020-21. With the advancement in science and knowledge of people, the animal sector in our country gained momentum. A remarkable aspect about poultry is that it is in an efficient converter of low fibre feed stuffs into highly nutritive animal protein for human consumption.

In many countries, poultry farming has grown to be a significant economic sector. When diseases and environmental conditions worsen in large-scale rearing facilities where poultry are subjected to stressful circumstances, there are significant financial losses. The usage of veterinary pharmaceuticals has significantly increased during the past few decades as a result of disease prevention and control measures. However, significant research on the development of antibiotic resistance among harmful microorganisms is useful. Therefore, there is an environment where both the consumer and the manufacturer are looking for alternatives due to the potential that antibiotics won't be employed as growth promoters for chicken and the concern over their usage as therapeutic agents. The nutritionist has been compelled to develop and give an economical diet in order to assure optimum performance due to the unheard-of rising increase in feed prices, which alone represents around 75% of the cost of broiler production. Due of the negative impact on consumers, the use of chemical feed additives as growth promoters to reduce feed and production costs by boosting feed efficiency has come under fire. With so many breakthroughs in the "No Chemical Era" the knowledge of herbs and their medicinal properties had made forays in the poultry industry and attracted to quantify reliable effects for maximizing better production in poultry without residual toxicity as side effects on consumers. Typically, herbal growth enhancers are liver tonics that enhance the bird's hepatic functions. They contribute to better feeding, amino acid synthesis, and aflatoxin reduction, all of which improve broiler performance. Feeding of herbal promoter improves the protein content with the significant decrease in blood cholesterol level. Due to the rising demand for poultry meat, breeders, nutritionists, and growers are under pressure to improve bird growth rates, feed efficiency, breast muscle size, and stomach fatness. Numerous studies have shown that fast-growing strains have higher rates of spontaneous or idiopathic myopathies (such as deep pectoral muscle disease) and are more susceptible to stress-induced myopathies, which may have significant effects on the quality of the meat and the frequency of abnormal conditions like pale, soft, and exudative (PSE)-like meat. In addition, it is thought that selection for muscle growth has increased issues with toughness and poor cohesion, colour, and water retaining characteristics in meat. The annual growth for meat production 2020-21 was 9.62%. With production expected to reach a record 4.8 million tonnes in 2020, India's broiler production growth is predicted to increase by 7.85 percent annually. With an estimated 7% annual average growth, the broiler industry is characterised by robust but unstable growth. Around 3.1 kg of poultry

meat are consumed annually per person in India, with chicken becoming the most popular non-vegetarian protein choice. Poultry farming is employed by about 1 million farmers, 85% of whom have less than 2 ha of land or are landless. Poultry production in India now tops all other subsectors with 851.8 million birds produced annually. With an anticipated production of 103.3 billion eggs and 4.1 million tonnes of grill meat, India is the world's fourth-largest producer of eggs and grill meat **[2]**. The upsurge of a wide range of diseases and bacterial resistance have both been brought on by the increased productivity in the chicken companies. Probiotics are used to prevent bacterial infections in poultry and to show how they may affect their immune system, growth, and performance. Dressed poultry meat is also shown to be safe and healthy, protecting the consumer. It has long been recognised that mushrooms are a significant source of bioactive substances with therapeutic potential. Extracts made from different mushrooms are particularly interesting because they are known to impart health-promoting advantages because they include a variety of antioxidant-rich chemicals. According to recent reports, Chinese herbal and mushroom extracts used in combination with Chinese antibacterial, immune-boosting, and stress-reducing qualities can function as an alternative to antibiotic growth promoters in grill chicken **[3]**. Pleurotus ostreaus and Ganoderma lucidium, two edible and therapeutic mushrooms, are used in Asia and several tropical African countries to enhance many aspects of human health and immunological function in specific medical circumstances **[4]**. Similar to probiotics, mushrooms are natural ingredients that contain bioactive chemical compounds or polysaccharides proteins, unprocessed fibres, unsaturated fats, minerals, vitamins, essential amino acids, organic acids, and antioxidants. These nutrients make mushrooms suitable as a source of supplemental food as well as a form of medicine to improve health and productivity. Natural antioxidants that may take the place of synthetic ones and satiate customer expectations for food products devoid of residues from compounds that have the potential to impair human health would be much appreciated by the poultry business. While the phenolic antioxidants variegate acid and dibiviquinoine are also present in mushrooms, ergothionine has been isolated and quantified as the primary antioxidant ingredient in several genera of mushrooms. Keeping the above facts in view, the present study entitled as "Performance and of broiler chickens supplemented with dried mushroom in their diet" was undertaken.

2. MATERIAL AND METHODS

The experiment was conducted at poultry farm of Chandra Shekar Azad University, KANPUR during summer season. The climate of Kanpur is semi-arid and sub-tropical type. Geographically, Kanpur is situated at 26 29' 25" nor the latitude and 80 18' 25" east longitude. The elevation of Kanpur from sea level is 125.9 mt. In this experiment, day-old broiler chicks from a single hatch were weighed individually and divided into 4 groups of six birds each at random. The birds will be given a basic diet for starter and finisher rations for 0–3 and 4-6 weeks, respectively. One group (G1) was kept as the control, while the remaining three groups (G2, G3, and G4) given their chicks the same basic food as G1 combined with various types of mushrooms. Groups G2, G3, and G4 were fed 20g/kg of dry *P. florida* mushroom, 20g/kg of dried *P. eoes* mushroom, and 20g/kg of dried *P. sajor caju* mushroom. Throughout the six-week testing period, food and drink were freely available.

2.1 Duration of study: The experiment was carried out for 42 days on broiler chickens at Chandra Shekhar University of Agriculture and Technology, Poultry Farm, Kanpur in summer season 17th February to 29th march.

2.2 Management and Housing: The broilers of group G_1, were fed according NRC feeding standard (1985). This group was used as a controlled feeding, whereas the chicks in group G_2 were fed with dried mushroom. G_3 *P. florida*, and G_4 *P.sajora caju* respectively.

A weighed quantity of ration was offered individually to the experimental animals twice in a day once in morning at 8:30 AM and again in evening 4:30 P.M and water was offered thrice daily in the morning at 8:30 A.M and in afternoon 1:00 P.M and again in evening 6:00P.M.

2.3 Weight of chicks: Body weight was recorded for 42 days at weekly intervals Weighing of the animals was carried out before feeding and watering at 8: 00A.M only.

Table 1: Composition of broiler ration

Ingredient	**Starter ration**	**Finisher ration**
Yellow maize	60.0(g)	61.50(g)
Wheat bran	6.00(g)	10.75(g)
Soya bean meal	22.00(g)	18.50(g)
Fat	1.00(g)	1.00(g)

Fish meal	8.00(g)	2.25(g)
Mineral mixture	2.00(g)	2.25(g)
Common salt	0.25(g)	0.25(g)
Vitamin mixture	0.25(g)	0.50(g)
L-lysine	0.15(g)	0.10(g)
DL- methionine	0.10(g)	0.15(g)

Table 2: Chemical composition of ration fed to different groups (%)

Feed offered	**D.M.**	**Ash**	**C.F.**	**C.P.**	**E.E.**	**N.F.E.**
Starter	83.56	4.2	6.0	22.50	1.45	65.50
Finisher	85.46	3.3	8.5	19.72	1.83	67.03

2.4 Chemical Analysis of feed, Residues and Faeces: During present investigation analytical techniques followed for the estimation of dry matter and for other ingredients and proximate principles those recommended by **[5]**.

2.5 Statistical analysis: Calculation of mean, standard error and analysis of variance has been carried out according to the method described by **Snedecor and Cochran 1968**.

3. RESULT AND DISCUSSION

3.1 Feed consumption:

During summer season the average weekly feed consumption was calculated by subtracting the amount of feed residue from the amount of feed offered in a week and was expressed in terms of g per bird. The weekly feed consumption per bird in G□, G_2, G_3 and G_4, groups was 81.10, 112.16, 112.50, 109.56, in (g) in 1st week 150.76, 195.83, 185.56 and 185.63 in G_1 , G_2 , G_3 , and G_4 in (g) 2nd week ; 365.70, 388.50, 385.36 and 372.50 in (g) in 3rd week ; 614.96, 728.50, 728.56 and 713.03 in 4th week ; 830.10, 844.29, 820.90 and 990.63 in (g) in 5th week; 990.96, 987.96, 987.10 and 990.10 (g) in 6th week respectively.

Weekly feed consumption from 1st to 6th week was 81.10, 150.76, 365.70, 614.96, 830.10 and 990.96 (g) in G_1; 112.16, 195.83, 388.50, 728.50, 833.29 and 987.96 (g) in G_2 ; 112.50,

185.56, 385.36, 728.56, 820.90 and 987.10 (g) in G_3 ; 112.50, 185.56, 385.36, 728.56, 820.90 and 987.10 (g) in G_4respectively.

Feed consumption was always higher in control group as compared to treatment groups. Difference between control and treatment groups was due to the higher medicinal value of self-compounded herbal drug.

The analysis of variance table-3 indicates that the weekly feed consumption during different periods showed significant($p<0.05$) difference amongst various groups. The results revealed that the G_2 group had higher feed intake than G3 group followed by G4 group and G□ group on cumulative feed consumption. The results are similar to **[7]** the effects of phytase supplementation on growth performance and nutrient utilisation rate in broilers fed diets with various levels of inorganic phosphorus. The findings showed that the no inorganic phosphate group's average daily feed intake (ADFI) and average daily gain (ADG) were considerably lower than those of the control group (P0.05). The group with 50% calcium phosphate dibasic had the highest ADG and the lowest feed gain ratio. **[8]** A evaluation was made of the proximate and chemical makeup of the wild mushroom Ganoderma sp. This demonstrated that adding mushrooms to supplements improved feed efficiency and that the impact is dosage dependant. **[9]** conducted an investigation into the results of adding Levucel SB yeast to brewer's dried grains. The results of a study on nutrient retention revealed that whereas broilers' retention of protein and fat was similar across all groups, fibre retention was considerably improved by yeast supplementation (P 0.05). Finally, Levucel SB yeast, administered at either 250 or 300 mg/kg to augment 26% inclusion of brewer's dried grains in grill starter diets, may improve feed conversion. The expense of feeding could potentially be reduced by such supplementation. **[10]** evaluated the impact of dietary black cumin seed (*Nigella Sativa* L.) or its extract on growth efficiency, a few carcass traits, and total caecal coliform bacteria count. The present study's findings suggested that by boosting feed intake, adding BCS to the broiler diet improves feed conversion ratio. The total coliform bacteria count in the caecal colon of the treated broilers likewise indicated a tendency to decline in response to this diet.

Table 3: Effect of Pleurotus sp. Mushroom on feed consumption of different groups of broiler in summer season.

WEEK	Groups				
	G_1	G_2	G3	G4	Mean
First	81.10	112.16	112.50	109.56	103.83
Second	150.76	195.83	185.56	185.63	179.44
Third	365.70	388.50	385.36	372.50	378.01
Fourth	614.96	728.50	728.56	713.03	696.26
Fifth	830.10	844.29	820.90	990.63	871.41
Sixth	990.96	987.96	987.10	990.10	989.03
Mean	505.59	592.87	536.66	560.24	

Factor	C.D.	S.E. (D)	S.E. (M)
Week	12.07	6.00	4.24
Groups	9.87	4.90	3.46
Week X Groups	24.15	12.01	8.49

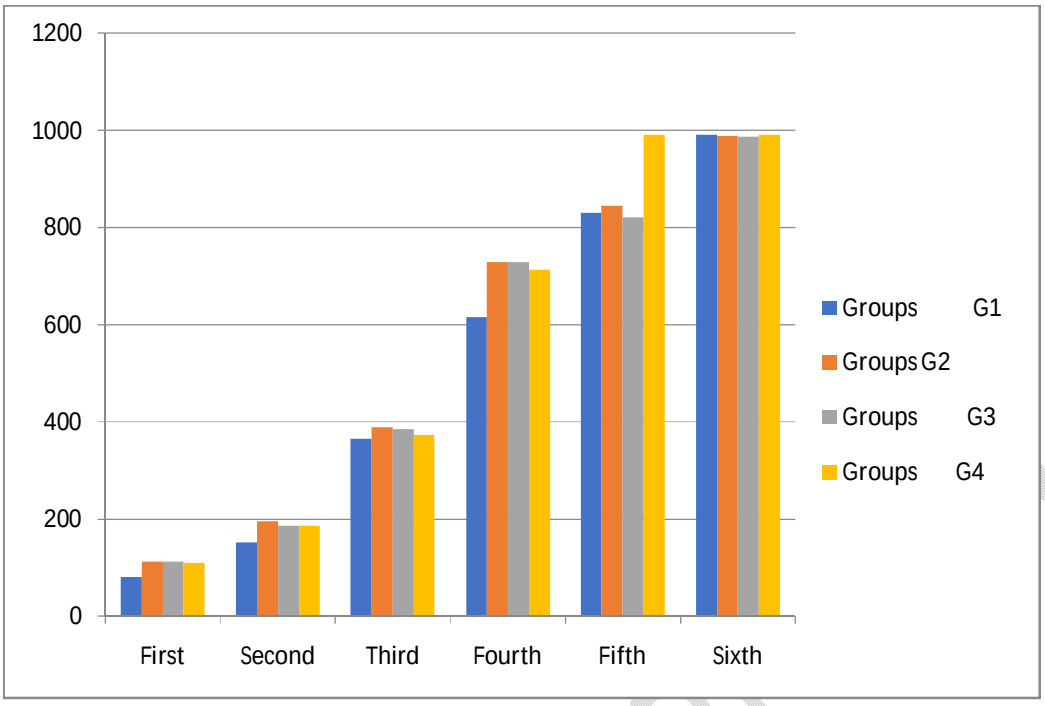

Figure 1.Feed consumption of different broiler

3.2 Body weight gain:

During summer season (table -3) the average weekly body weight gains of broiler chicks in G_1, G_2, G_3, and G_4 from 1st to 6th weeks were found 40.30, 61.76, 57.76 and 57.83 (g) in 1st week; were found 70.63, 101.03, 95.16 and 90.16 (g) in 2nd week; 178.30, 200.83, 197.03 and 188.36 (g) in 3rd week; 306.70, 404.36, 383.96 and 364.70 (g) in 4th week; 391.36, 428.70, 424.92 and 394.61 (g) in 5th week and 418.91, 424.85, 421.49 and 421.55 (g) in 6th week respectively.

When the data arranged group wise weekly body weight gain from 1st to 6th week were 40.30, 70.63, 178.30, 306.70, 391.36 and 418.91; 61.76, 101.03, 200.83, 404.36, 428.70, 424.85; 57.76, 95.16, 197.03, 383.96, 424.91 and 421.49; 57.83, 90.16, 188.36, 364.70, 394.61 and 421.55(g) in G_1, G_2, G_3 and G_4 respectively. Further it was also observed that the maximum body weight gains were founded in 5th week in G_2 (428.70g) followed by G_3 (424.91g), G_4 (394.61g) and minimum in G_1(391.36g).

The analysis of variance table-4 indicates that the weekly body weight gain during different periods showed significant ($p < 0.05$) difference amongst various groups. The result revealed that the G_2 had higher significant effect than G3 group followed by G4 and G□ on

weekly body weight gain of broiler chicks. The weekly body weight gain obtained in this study is in close agreement with the reports of **[11]** broiler chickens' growth and health when shiitake mushroom (Lentinus edodes) extract and probiotics (Primlac) were combined, it was discovered that there was no combination potential for weight gain, which was compromised in this study, but rather potential health enhanced attributes. **[12]** effect of dried whey and probiotic dietary supplements on broiler performance. The findings of this study **[13]** demonstrated that adding dry whey to meals up to 15 g/Kg, particularly in growth diets, can increase chicks' body weights (BW) and Antibiotic growth promoters (AGPs) are used in conjunction with various coccidiosis control programmes to evaluate the effects on broiler chicken growth and host immunological responses. The findings imply that the combination of AGPS with in ovo coccidiosis vaccination or coccidiostat drug treatment programmes affects chicken growth and immunological state in an Eimeria-contaminated environment. The growth-promoting effects of the enzymes Rovabio, the organic acids Euroguard SVB, and the prebiotics Agrimoss were studied by **[14]**. As compared to group 1, the results showed that grill chicken body weight increased by 2% and feed conversion fell by 6% in groups 2 and 3. 75 Anak broiler chickens were used to evaluate the effects of cooked and toasted lima bean meal in boiler finisher diets. The cut-parts demonstrated that the test diet birds' values were comparable to those of the control diet birds. Based on the aforementioned findings, typical market live weight, and cost per kilogramme weight gain, it is advised to substitute soybean meal with 5% cooked and toasted lima bean meal without negatively impacting growth performance. Inclusion of mushrooms and probiotics alone resulted in lower growth performance, but their combination had no positive benefits on birds' performance, according to **[15]**. According to this study, adding CS and Fermacto to broiler meals had no discernible impact on performance, however adding CSM increased the birds' ultimate BW. At day 42, birds fed diets containing Fermacto, CS, and/or CSM had identical relative organ weights and blood metabolite levels, although these supplements may have an impact on the differentiation of white blood cells as evaluated at day 28.

Table 4: Effect of Pleurouts sp. Mushroom on body weight gain (g) of different groups of broiler in summer season.

Week	**Groups**	**Mean**

	G_1	G_2	G_3	G_4	
Initial	39.43	39.68	38.90	40.16	39.54
First	40.30	61.76	57.76	57.83	54.41
Second	70.63	101.03	95.16	90.16	89.24
Third	178.30	200.83	197.03	188.36	191.13
Fourth	306.70	404.36	383.96	364.70	364.93
Fifth	391.36	428.70	424.91	394.61	409.89
Sixth	418.91	424.85	421.49	421.55	421.70
Mean	206.52	237.31	231.31	222.48	

Factor	**C.D.**	**S.E. (D)**	**S.E. (E)**
Week	2.78	1.40	0.99
Groups	2.10	1.06	0.75
Week X groups	5.56	2.81	1.99

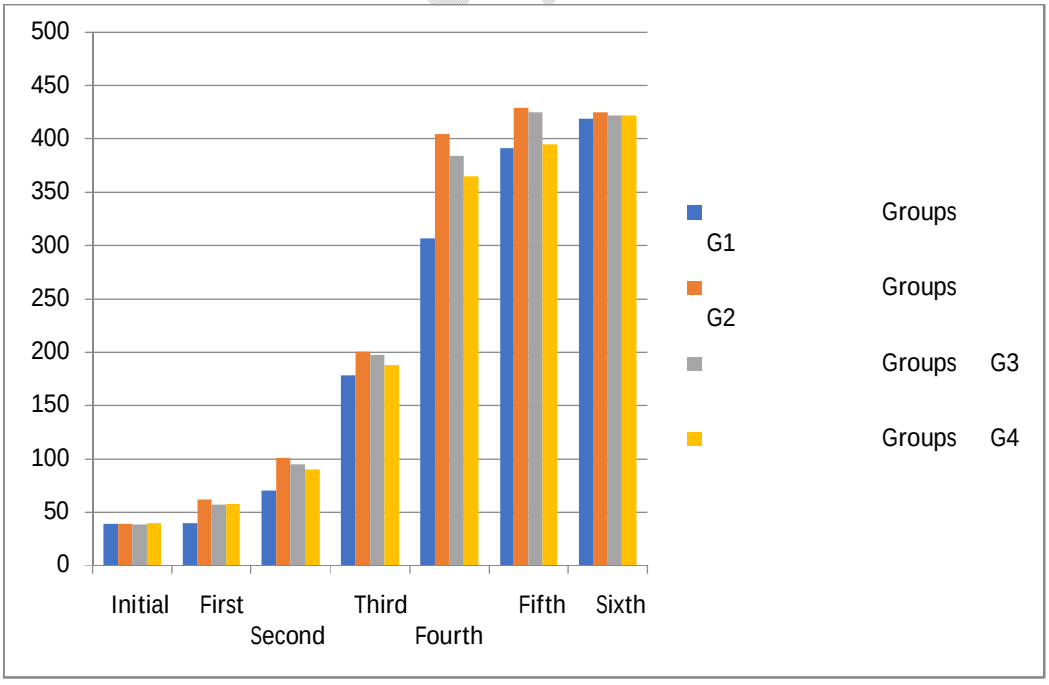

Figure 2. Broiler weight gain of different broiler

3.3 Feed conversion ratio (FCR):

Weekly feed conversion ratio has been calculated as the ratio between weekly feed consumed and weight gram weekly amongst different groups. Weekly feed conversion ratio (g of feed for every g of body weight) from 1st week to 6th week was 2.08, 2.19, 2.10, 2.05, 2.16 and 2.37 in G_1; 1.88, 1.99, 1.98, 1.842.20 & 2.38 in G_2; 1.98, 2.03, 2.04, 1.93, 2.01 & 2.38 in G_3; 1.85, 2.04, 2.00, 1.98, 2.14 & 2.38 in G_4 group respectively

The weekly feed conversion ratio per bird in G_1, G_2, G_3 and G_4 groups was 2.03, 1.88, 1.98, 1.85 in 1st week; 2.19, 1.99, 2.03&2.04 in 2nd week; 2.10, 1,98, 2.04 and 2.00 in 3rd week; 2.05, 1.84, 1.93 and 1.98 in 4th week 2.16, 2.20, 2.01 and 2.14 in 5th week; 2.37, 2.38, 2.38 and 2.38 in 6th week respectively. The weekly fed conversion ratio in 5th week of G_3 group at the end of experiment was greater than G_4 group followed by G_1, and G_2 group (table-5).

In the present study the better performance observed in FCR in treatment groups as compared to control group. Our results are comparable to those of **[7]**, who looked at the effects of consuming Agaricus bisporus mushrooms on turkey pullets. The addition of dietary mushrooms boosted growth performance and feed effectiveness. Results **[16]** show that the dietary inclusion of B. subtilis spores improve the weight growth and the food efficiency in broilers, likely through the selection of beneficial bacteria to the detriment of pathogen germs in the caecal microflora, according to **[17]** study on the effects of dietary probiotic supplementation with B. subtilis spores (strain DSM 17299) on the growth performance and carcass traits in broiler chickens. Rovabio enzymes, Euroguard SVB organic acids, and Agrimoss prebiotics were studied by **[14]** in relation to the feed conversion ratio. As compared to group 1, the results showed that broiler chicken body weight increased by 2% and feed conversion fell by 6% in groups 2 and 3.

Table 5: Effect of pleurotus sp. Mushroom on feed conversion ratio amongst different group of broiler in summer season.

Week	Group				Mean
	G_1	G_2	G_3	G_4	
First	2.08	1.88	1.98	1.85	1.94

Second	2.19	1.99	2.03	2.04	2.06
Third	2.10	1.98	2.04	2.00	2.03
Fourth	2.05	1.84	1.93	1.98	1.95
Fifth	2.16	2.20	2.01	2.14	2.12
Sixth	2.37	2.38	2.38	2.38	2.37
Mean	2.15	2.04	2.06	2.06	

Factor	**C.D.**	**S.E.(d)**	**S.E. (m)**
Week	0.014	0.007	0.005
Groups	0.011	0.006	0.004
Week X Groups	0.028	0.014	0.010

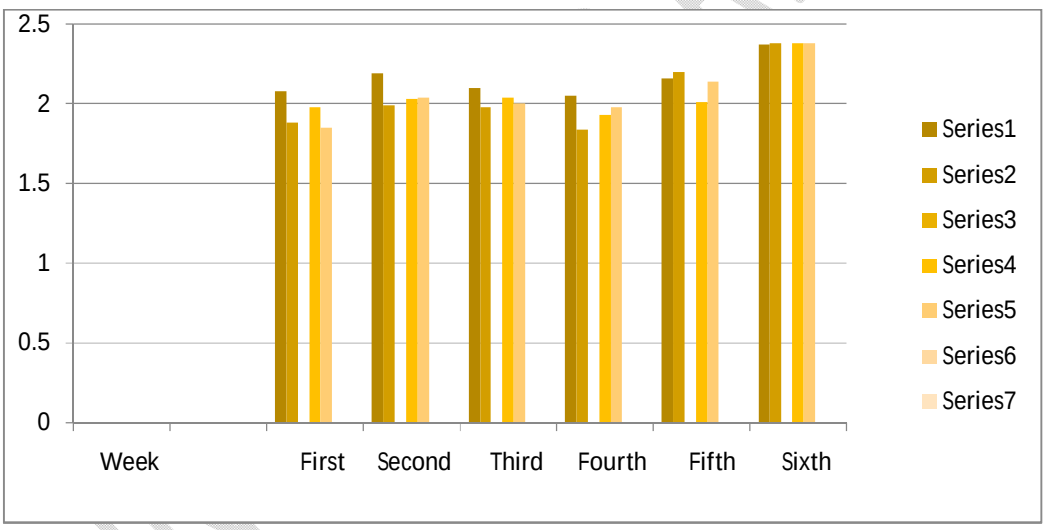

Figure 3. Feed conversion ratio amongest different broiler

4. Conclusion

From present investigation, it is concluded the application of *Pleurotuus* sp.mushroom (*P. florida*, *P.eoes*, *P.sajor* caju respectively) in different groups in the diet of broiler chicks did not show any effect on feed consumption but improved the growth rate in summer season. Therefore, G_2 revealed the *Pleurotous florida* mushroom is necessary for improvement in growth performance in summer season.

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