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Effect of Fennel *(Foeniculum vulgare)* Seed Powder and Furazolidone Supplementation on Growth Performance of Broilers

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ABSTRACT

Backgroud: Residues of AGPs (antibiotic growth promoters) caused bacterial resistance in humans. This study has been conducted to assess how broiler chicks responded to various amounts of fennel seed powder as a natural growth promoter and as an alternative to antibiotics. Furazolidone was fed as an antibiotic growth promoter to evaluate the effects of this substance on the feed consumption, feed conversion ratio, and body weight gain of chickens.

Materials and Methods: 120-days-old broiler chicks were used in this study. They were placed into five groups randomly with three replicates in each group and eight chicks in each replication, over the course of 35 days. From these five groups, the T1 (control) group was given a normal diet, the T2, T3, and T4 groups were given one, two, and three grams of fennel seed powder per kilogram of diet, respectively. However, the T5 group was given 0,2 g furazolidone per kilogram of diet. The feed which used in this study was obtained from Habib Hassam trading company and it was of two types (4 number feed and 9 number feed).

Findings: It was found that the experimental groups who received 2 and 3 grams of fennel seed powder per kilogram of diet not only ate less food overall, but also had the best feed conversion ratio, and the greatest weight gains ($P<0.01$). There was no significant difference between the group given 1gr of fennel seed powder per kilogram of a diet with the control group ($P>0.05$). On the other hand, the group that was fed 0,2 g of furazolidone was not significant as compared to the first (control) group.

Conclusion: As a natural growth promoter, feeding broiler chicks 2-3 grams of ground fennel seed per kilogram of diet will have the best effects on growth performance as well as avoiding furazolidone.

Keywords: Fennel, Furazolidone, Broiler, Growth performance.

INTRODUCTION

The use of poultry products as a food source is increasing regularly, the reason for this is the high production of chickens at low cost in a short period of time, high nutritional value, and low capital and it leads to the economic development of farmers. The primary goal of the poultry industry nowadays is to transform low-value nutrients into high-value ones (Parks et al., 2000; Ahmed, 2015). As a result of the poultry industry in the past few years, chicken meat represents 80 percent of all meat production, which is the rapid grower segment in the meat industry. The development of the poultry industry has a vital role in increasing the production of eggs and meat.

People can find employment in poultry farming, which is often regarded as a reliable source of income. Chicken meat is the best food in terms of health because it has low fat and high protein. On the other hand, it has good taste, low cost, and short production period (Lemrabt et al., 2018).

Growth-promoting feed additives are of the ingredients that are very rarely added to chicken feed, accelerate the process of growth and weight gain, and also have a significant influence on egg production, nutrition utilization efficiency and lowering mortality rate in order to bring out desirable features or to minimize weak characteristics (AL-Zuhairi et al., 2018; Leeson & Summers, 2001).

The poultry industry in hot regions is extraordinarily vulnerable to high ambient temperatures, the optimum temperature for broilers is 32-34, 28-32, 26-28, 24-26, 18-24, and 18-24 degree centigrade in the first, second, third, fourth, fifth and sixth weeks, respectively. Therefore, it is necessary to manage the temperature in a proper way to save the chickens from the threat of high temperatures. When the temperature rises above 30 degrees Celsius, symptoms of heatstroke appear in chickens, high temperatures can result in severe physiological disturbances because chickens do not have sweat glands and evaporate their excess sweat by panting, It takes 0.5 kcal of energy to evaporate one gram of water, In the second method, excess body heat is released through the urinary system as a result of drinking too much water, with this there is a decrease in chicken production and less income is obtained economically, In addition, diet and proper management are essential to alleviate high temperature (heat) stress (Al-Sagan et al., 2020; Nasir & Grashom, 2006; Ruberto et al., 2000).

Feeding additive antibiotics as health and growth promoters have played a major role in animal production, but the use of antibiotics as growth promoters has been banned by the European Association since January 2006. A significant result has been done in the last two decades to find out alternatives for antibiotic growth promoters (AGPs), different categories of non-antibiotic growth promoters has recommended as natural growth promoters (NGPs) which are used as alternatives to antibiotic growth promoters. The advantage of natural growth promoters is the prevention of bacterial resistance in consumers, no harmful chemical remains in chickens' eggs and meat, Vis versa in antibiotic growth promoters as well. The addition of natural growth promoters in poultry feed has some beneficial effects with itself as the rapid growth of microflora, digestive stability, quick development of the immune system, reduction in the incidence of diarrhea and etc. Organic acids, probiotics, prebiotics, symbiotic, dietary enzymes are including in natural growth promoters (NGPs), (Ahmed., 2015; Dibner & Richards, 2005; Griggs & Jacob, 2005).

Aromatic plants are important in stimulating the digestive system to secret more digestive enzymes and have antimicrobial activities. It is proved that fennel *(Foeniculum vulgaris L.)* is one of the aromatic plants which has a high percentage of fatty acids, linolenic and citric in composition (Hassan & Mukhtar, 2015; Mohammed et al., 2009; Ostad et al., 2001). Fennel is a plant that has been used as an aromatic plant in the Mediterranean zone, and it also has some medical traits such as antispasmodic, carminative, diuretic, analgesic, antioxidant, antimicrobial, antifungal, anti-parasitic, and growth-stimulating effects in poultry, also using against heat stress as well (AL-Zuhairi et al., 2018; Ragab, 2007; Rezq, 2012). There are a lot of carbohydrates, proteins, fats, minerals (calcium, phosphorus, iron, potassium), and vitamins (thiamin, riboflavin, niacin) in the composition of fennel seeds (Ahmed, 2015).

Furazolidone is a nitrofuran antimicrobial agent used in human and veterinary medicine against bacteria and protozoa, Nitrofurans specifically furazolidone, furaltadone, nitrofurantoin, and nitrofurazone, belong to a class of broad-spectrum synthetic antibiotics that all contain a 5-nitrofuran ring, with use of antibiotics as growth promoters, the main problem is their residues in meat and eggs and thus the increase of bacterial resistance in humans (Bywater, 2005; Sahin et al., 2002; Vass et al., 2008). Therefore, based on this reason, we have conducted this research, the purpose of this experiment is to determine and clarify the effects of fennel seed powder and furazolidone on the growth performance of the broiler.

MATERIALS AND METHODS

Experimental Location

This experiment was conducted in 2022, in the poultry research farm of Nangarhar University, agriculture faculty, with the ambient temperature of 27-40 ^{o}C.

Housing

The poultry research farm in Nangarhar University is built of concrete. First, the farm was washed with water and disinfected with lime and sanitizer, and all hygienic rules had applied before and during of experiment. Fan, air cooler, heater, and dry bulb were used to control temperature, moisture and lighting of the farm, shown in (Table 1). There were fifteen cages with disinfected feeders and drinkers in the farm for different groups of broilers, and the farm temperature, moisture, lighting, and ventilation were adjusted before chicks' arrival.

Experimental Design and Birds

Totally 120-days-old chicks were purchased from SB hatchery of Peshawar, after being brought to the farm divided into five groups (T1, T2, T3, T4 & T5) in a complete randomized design. There were three replicates in each treatment and 8 chicks in each replication. Feed for chicks obtained from Habib Hasaam trading company which has the best quality feed. The chicks were fed with 4 number (commercial Name) feed as a starter till the 14th day, and from 14th to 16th day has fed with a mix of 4 and 9 number feed, after 16th days till the end of the experiment has fed with 9 number feed. Fennel seed was purchased from the market and ground by machine, Furazolidone antibiotic (Furazole 24.4%) was purchased from the market which has been produced by (Hilton Pharma Pvt Ltd) and used in the experiment.

The chicks were fed with normal feed first day to control initial stress and adapt well, from the second day till the end of the experiment the control group (Treatment 1) has fed with normal feed, treatment two (T2) has fed with normal diet plus 1gr fennel seed powder per kg diet, treatment three (T3) has fed with normal diet plus 2gr fennel seed powder per kg feed, treatment four (T4) has fed with normal diet plus 3gr fennel powder per kg feed and treatment five (T5) has fed with normally fed plus 0,2 g furazolidone per kg feed.

Table 1. Shows farm's temperature, lighting and humidity.

Age of Bird/Week	Temperature	Lighting	Humidity
1	34-31	23/24	40%
2	31-30	22/24	50%
3	30-28	20/24	55%
4	28-27	22/24	60%
5	28-26	23/24	60%

Statistical Analysis

Data were statistically analyzed using SPSS one-way analysis of variance (ANOVA). Data in the tables presented as mean ± standard deviation. Different letters in a column indicated significant difference at 0.05 probability level based on Duncan grouping test.

RESULTS

Feed Intake

The results of total five weeks' feed intake of T1, T2, T3, T4, and T5 are 3303 gr, 3263 gr, 3242 gr, 3234 gr and 3294 gr, respectively. The fennel powder-fed groups (T3) and (T4) have significant difference ($p<0.01$) with control group (T1) and furazolidone fed group (T5). There is no significant difference among fennel powder fed groups (T2, T3, and T4). In addition, the group which is fed with 1gr fennel powder per kg diet (T2) was not significant different with other groups. There was no significant difference between control (T1) and furazolidone fed groups (T5). These results are presented in the Table 2.

Weight Gain

The results of total five weeks' weight gains of T1, T2, T3, T4 and T5 are 2078± 4.24 gr, 2088.2± 6.93 gr, 2118.2± 7.21 gr, 2119.3± 4.45 gr and 2079.8± 6.22 gr, respectively. T3 and T4 had significant difference ($p<0.01$) with control, T2 and T3 groups. On the other hand, there were no significant differences between the control group, T2 and T5. The results are illustrated in the Table 3.

Feed Conversion Ratio

The final results of feed conversion ratio have been achieved in such a way by the formula shown below and are summarized in the Table 4:

FCR = Feed given / Chick weight gain

The results showed that the T3 and T4 groups had significant better ($p<0.05$) FCR than the control, T2, and T5 groups.

Table 2. Shows weekly and total feed intake results.

Treatments	1st week	2nd week	3rd week	4th week	5th week	Total food intake
Control (T1)	187.5±2.6	430.9±4.7^{a}	755.3± 5.87^{a}	1033± 3.90^{a}	896.5± 5.46^{a}	3303± 4.38^{a}
T2	188.3±2.3	426.3±2.2^{ab}	744.3± 3.48^{ab}	1025± 4.12^{ab}	879.8± 1.37^{ab}	3263± 2.29^{ab}
T3	186.8±4.1	418.0±3.2^{b}	738.2± 6.58^{b}	1023± 2.93^{b}	876.6± 1.24^{b}	3242± 3.25^{b}
T4	187.5±5.8	417.6±3.5^{b}	733.2± 7.86^{b}	1021± 2.11^{b}	875.4± 6.94^{b}	3234± 6.15^{b}
T5	189.4±2.9	425.8±7.7^{ab}	749.1± 6.94^{ab}	1032± 3.57^{a}	894.0± 10.64^{a}	3294± 5.44^{a}
Significant differences	Ns	*	*	**	**	**
	Ns=non-significant, *=significant difference at P<0.05, **=significant difference at p<0.01.					

Table 3. Shows weekly and total weight gain results.

Treatments	Initial weight (gr)	1st week	2nd week	3rd week	4th week	5th week	Total weight gain (gr)
Control (T1)	49.5	147.1±1.24^{ab}	327.4± 1.03^{ab}	510.0± 1.48^{b}	612.4± 1.48^{b}	481.1± 2.30^{b}	2078± 4.24^{b}
T2	51.5	146.0±1.70^{ab}	330.5± 1.89^{ab}	515.8± 1.63^{ab}	615.4± 1.14^{b}	480.5± 1.63^{b}	2088.2± 6.93^{b}
T3	50.0	153.8±3.28^{a}	332.8± 2.93^{ab}	520.2± 3.97^{a}	622.6± 1.53^{a}	488.8± 1.20^{a}	2118.2± 7.21^{a}
T4	50.9	148.6±1.65^{ab}	335.0± 2.64^{a}	523.7± 2.07^{a}	623.0± 2.87^{a}	489.0± 1.41^{a}	2119.3± 4.45^{a}
T5	51.3	145.9±2.44^{b}	326.6± 2.71^{b}	510.6± 3.96^{b}	614.3± 4.64^{b}	482.4± 1.68^{b}	2079.8± 6.22^{b}
Significant differences		*	*	**	**	**	**
	Ns=Non-significant, *=significant difference at P<0.05, **=significant difference at p<0.01.						

Table 4. Shows weekly and average FCR results.

Treatments	1st week	2nd week	3rd week	4th week	5th week	Average FCR
Control (T1)	1.301 ± 0.030^{a}	1.302± 0.010^{a}	1.454± 0.012^{a}	1.680± 0.061^{a}	1.846± 0.019^{a}	1.516± 0.007^{a}
T2	1.300 ± 0.029^{a}	1.293± 0.017^{ab}	1.456± 0.020^{a}	1.683± 0.013^{a}	1.832± 0.013^{ab}	1.512± 0.005^{a}
T3	1.204± 0.045^{b}	1.249± 0.014^{c}	1.410± 0.010^{b}	1.592± 0.018^{b}	1.790± 0.021^{bc}	1.449± 0.008^{b}
T4	1.270± 0.036^{ab}	1.253± 0.016^{bc}	1.409± 0.010^{b}	1.587± 0.013^{b}	1.779± 0.010^{c}	1.459± 0.014^{b}
T5	1.295 ± 0.034^{ab}	1.282± 0.017^{abc}	1.440± 0.015^{ab}	1.676± 0.010^{a}	1.841± 0.026^{ab}	1.506± 0.014^{a}
Significant difference	*	**	**	**	**	*
	Ns=Non-significant, *=significant difference at P<0.05), **=significant difference at p<0.01)					

DISCUSSION

Based on this study, there was a significant difference in the consumption of chicken feed among all groups, the T1 (control) group had the most food consumption, followed by the T5 and T2 groups, while on the contrary, the T3 and T4 groups had consumed the least amount of food, which is different from the T1 and T5 groups, according to (P<0.01). Similar findings were obtained from the research of AL-Zuhairi et al., (2018) that 5% fennel seed powder has a significant difference (P<0.05) in the feed intake and body weight gain (BWG) with the control group.

There was significant difference in the BWG among all groups, the T3 and T4 groups had highest BWG than T1, T2 and T5 groups. The T3 and T4 had significant difference with control, T2 and T5 groups according to (P<0.01). Similar result was presented by Lembert et al. (2019) that 750 gr fennel seed powder + 50 kg diet had a significant effect on broiler BWG, as well similar report was published by Ahmed., (2015) that the 3% fennel seed powder has a significant effect (P<0.05) on broiler feed intake, FCR, and BWG.

In this study T3 and T4 had better FCR than control, T2 and T5, so the difference was significant according to (P<0.05). Similar result was reported from Mohammed et al. (2009) that 1, 2, and 3 gr fennel seed powder per

kg diet has a significant effect (P<0.05) on FCR and BWG, also in the experimental study by AL-Sagan et al., (2019) and presented that 3.2% fennel seed powder had a significant effect (P<0.05) on FCR and BWG.

There was significant difference among the all groups due to use of fennel, feed intake was significantly decrease in T3 and T4, BWG was significantly increased in T3 and T4 and the FCR was also better in T3 and T4 (which were fed 2 and 3 gr fennel per kg diet, respectively). Similar findings were reported by (Fatima et al., 2022) that overall feed intake and weight gain were considerably greater.

In this study there was no significant difference among the all groups by used of furazolidone. Similar finding was obtained from the research of Wekhe and Nyeche, (2002) which used furazolidone as feed additives and reported that the groups which have fed with furazolidone did not significantly effect on the feed intake, FCR, and BWG with the control group. As well Ahmed et al. (2012) reported that use of different level (0, 100, 200, 300 mg) of furazolidone and reported that they did not have significant effect among all groups.

CONCLUSION

Uses of fennel have positive effect on growth performance of broiler and also it has heat stress removal traits, it must be used in hot regions. Furazolidone did not have significant effect, it is better to use fennel instead of furazolidone.

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Conflict of interest

All authors express no conflict of interest in any part of research, manuscript and submission to the journal.

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