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Original Research

Effect of dietary supplementation of *Curcuma* and ginger on the microflora of leghorn hens

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ABSTRACT:

This study was conducted to determine the effect of adding 0.0, 0.05 , 0.1% of ginger powder or 0.4 and 0.6% of curcuma powder on microflora of white leghorn hens. Total of 100 white leghorn birds were used with 34 weeks old which were randomly distributed to five treatments (20 birds for each treatment). Results indicated that adding of either 0.05 and 0.1% of ginger powder or 0.4 and 0.6% of curcuma powder has reduced the bacterial total count, coliforms, *Staphylococcus aureus* and yeast in different parts of gut tract (intestine, pad and caecum), as the absence of coliforms bacteria and yeast in both pad and caecum where indicated when using 0.1% of ginger powder, while there was no *S. aureus* bacteria of this concentration in the three tested parts of the gut tract. The use of 0.6% of curcuma powder resulted in the absence of *S. aureus* bacteria in the intestine and reduction in the pad and caecum. As a conclusion, the results obtained were encouraging and different in their effect on the inhibition of bacteria and yeast and can play an important role when used in chicken feed.

Keywords:

White leghorn, *Curcuma*, ginger, chicken feed.

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INTRODUCTION

Medicinal plants contain substances with natural chemical properties used for treating many pathological injuries and increasing body immunity. Turmeric is one of the most important spices, colored and medicinal plants. The medicinal part of this plant is rhizome while its active substances are curcumin and volatile oil. Turmeric has a significant role in inhibition of microorganism (Donatella *et al*., 2015; Daniells, 2017), because its substances such as, sesquiterpene lactone in addition to the well known curcminoids compounds which consisting of curcumin, demethoxycurcumin, bisdem methoxy curcumin. Turmeric has been safe pharmacological consumed as a food supplement for several centuries (Omer, 2014). It has inhibitory effectiveness against many pathogenic bacteria, for instance, *Bacillus cereus, B. subtilis, B. coagulans, Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa* (Negi *et al*., 1999). It reduces the aflatoxin produced by *Aspergillus parasiticus* (Soni *et al*., 1992). Ginger (*Zingiber officinale*) is among the medicinal plants which is characterized by a bitter taste (Alani *et al*., 2007), yellowish white colour. It is anti-pathogenic microorganism due to its active substances as, saponin, glycosides and volatile oils (El-Astal, 2005) as glycosides of saponin and antimicrobial compounds are released throw degrading of the non-surgery part (saponin) while some of antimicrobial glycosides compounds are released by glucosidase enzyme forming iridoid as intermediate compound which is breaking down into dialdehyde (Kubo *et al*., 1995). Several studies were conducted on ginger plant which gave higher inhibitory effectiveness against many microorganisms, like *E. coli, Staphylococcus aureus, P. aeruginosa* and *Candida albicans*. Ginger extract gave antifungal action against some molds for example, *Fusarium oxysporum, Alternaria alternata, Aspergillus niger, A. flavus* and *Penicillium notatum* (Al-Ani 2007; Mohammed, 2012).

MATERIALS AND METHODS

This study was carried out at the poultry field of Agriculture College, Baghdad University for the period from 30.9.2014 to 25.11.2014. A total of 100 white leghorn birds were used with 34 weeks age. Birds were divided into five cases as duplicate for each treatment and ten birds for each duplicate (20 birds for each treatment). Ginger and curcuma powders were added separately to the bird's diet at different percentages, the additions included five treatments as follows:

T_1: Control diet (without any additions).

T_2: Addition of 0.05% ginger powder to diet.

T_3: Addition of 0.1% ginger powder to diet.

T_4: Addition of 0.4% turmeric powder to diet.

T_5: Addition of 0.6% turmeric powder to diet.

The birds were fed by the standard diet (Ahmaed *et al*., 2018) which composed of the following: protein, soybean cake, corn, wheat, limestone and sodium chloride at the percentages of 10, 19.5, 30, 39.5, 0.7 and 0.3% respectively. Ginger rhizomes and turmeric were obtained from local markets, dried and grinded gently and then added to the diet using the previous proportions. After three months of feeding, the birds were slaughtered, the carcasses cleaned and the internal viscera were removed according to the method men-

Table 1. Effect of adding ginger to bird's diet on total count of bacterial in different parts of gut tract

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	2.105×10^7	4.34×10^7	1.305×10^7
2	T_2	2.3×10^2	3.95×10^3	2.5×10^3
3	T_3	-	-	-

Table 2. Effect of adding ginger to bird's diet on counts of coliform bacteria in different parts of gut

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	3.55×10^6	6.9×10^6	2.7×10^6
2	T_2	5×10^1	1.5×10^1	9×10^1
3	T_3	1×10^1	-	-

Table 3. Effect of adding ginger to bird's diet on bacterial count of *S. aureus* on different parts of birds gut

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	2.6×10^2	5.1×10^3	4.76×10^4
2	T_2	2.9×10^1	1.5×10^2	1.7×10^1
3	T_3	-	-	-

Table 4. Effect of adding ginger powder to bird's diet on yeast count in different parts of gut

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	9.25×10^4	9.0×10^3	2.85×10^6
2	T_2	6.2×10^3	4.0×10^2	10×10^2
3	T_3	4.05×10^2	-	-

tioned by Alfaid and Nagi (1989).

Counts of total bacteria in different regions of chicken gut were determined by pour plate method mentioned by Harrigan and McConce (1976) which involved the intestines, pad and caecum by using nutrient ager medium. Counts of coliform bacteria, *Staphylococcus aureus* and yeasts were determined using Eosin Methylene Blue Agar (EMBA), mannitol salt agar and Potato Dextrose Ager (PDA) media respectively in the gut too.

RESULTS AND DISCUSSION

Results of Table 1 clarified the influence of ginger on the total bacteria in the intestines, pad and caecum parts of the gastrointestinal tract as it decreased for each from 2.105×10^7, 4.34×10^7 and 1.305×10^7 to 2.3×10^2, 3.95×10^3 and 2.5×10^3 CFU/g respectively when adding 0.05% ginger powder to the birds diet, while no growth was observed at the concentration of 0.1% for the three tested parts. The previous results might be due to the active existing materials in ginger and its inhibitory microbial action. Previous results showed that the laboratory concentrations could be used in bird feeding and no need to use higher levels obtained.

The effect of adding ginger powder to bird's diet on the counts of coliforms was shown in Table 2. The count of colon bacteria decreased to 5×10^1, 1.5×10^1 and 9×10^1 CFU/g compared with the control treatments (3.55×10^6, 6.9×10^6 and $2.7\times10^{6)}$ CFU/g for the intestine, pad and caecum lntestine, fter the control treatment 3.55 Table 2 the count of respectively, no growth was observed at concentration 0.1% for the pad and caecum while the count decreased to 1×10^1 CFU/g for intestine at the same concentration.

Studies indicated that the active components of ginger which are gingerly, shogaol and paradol inhibit the growth of coliform while ginger inhibits other bacterial genera such as, *Salmonella*, *E. coli, Staphylococcus*, *Enterococci*, *Listeria* and *Clostridium* (Sediek *et al*., 2012; Poeloengan, 2011). Yassen and Ibrahim (2016) found that the raw extracts of ginger plant have an inhibitory action against *E. coli* and *Staphylococcus aureus*. Bacterial counts of gram positive *S. aureus* were affected when ginger was added to birds diet as their counts decreased by adding of 0.05% on control treatment while bacterial colonies disappeared when added 0.1% for three parts of gut Table 3.

These results were agreed with the study of Awad and Najeeb (2016) that ginger has a clear effect

Table 5. Effect of adding turmeric powder to bird's diet on bacteria counts

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	2.105×10^7	4.34×10^7	1.305×10^7
2	T_4	2.05×10^6	2.43×10^6	1.96×10^6
3	T_5	3.5×10^5	2.03×10^5	2.5×10^5

Table 6. Effect of adding turmeric powder to diet on coliform bacterial count in different parts of gut

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	3.55×10^6	6.9×10^6	3.55×10^6
2	T_4	3.04×10^4	2.5×10^4	5.45×10^5
3	T_5	2×10^2	1.31×10^2	4.8×10^4

Table 7. Effect of adding turmeric powder to bird's diet on *S. aureus* bacterial count

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	2.6×10^2	5.1×10^3	4.76×10^4
2	T_4	1×10^1	1.05×10^2	1.25×10^3
3	T_5	-	6.05×10^1	6.4×10^2

Table 8. Effect of adding turmeric powder on yeast preparation

S. No	Treatment	Intestine (CFU/g)	Pad (CFU/g)	Caecum (CFU/g)
1	T_1	9.25×10^4	4.0×10^4	2.85×10^6
2	T_4	1.21×10^3	7.65×10^3	8.45×10^5
3	T_5	4.81×10^1	3.15×10^2	6.1×10^4

against some types of bacteria especially, *E. coli* and *S. aureus*. Yeast showed sensitivity toward ginger powder, as there was no growth by adding of a portion of 0.1% for the pad and caecum while the count of yeast in the intestine was 4.05×10^2 CFU/g at the same addition compared with the numbers of control treatment (9.25×10^4 CFU/g) of same part and decreased to 6.2×10^3 CFU/g by adding of 0.05%.

Ginger powder is highly effective against fungi; it's containing approximately 400 of different active compounds. It is a mixture of volatile and non- volatile components, for instance, shogaols, gingerols and sesquiterpenoids. Gingerol is a mixture of crystals of ginger one which is the main cause of ginger activity; it plays an important role in inhibiting microorganisms (Melvin *et al.*, 2009). Table 5 results showed the effect of adding turmeric powder to bird's diet at different concentration (0.4% and 0.6%) on total bacterial count, the treatment of 0.4% recorded a decrease in the total count of the three tested parts (intestine, pad and caecum) as the number reached 2.05×10^6, 2.43×10^6 and 1.96×10^6 and to get the values of 3.5×10^5, 2.03×10^5 and 2.5×10^5 at concentration of 0.6% for three parts respectively. The decrease in the count of total bacteria accompanied by increase in the addition of turmeric powder and this is confirmed by many studies (Niamsa and Sittiwet, 2009; Chattopadhyay *et al*., 2004; Naz *et al*., 2010). Turmeric is effective against many microorganisms; especially, the pathogenic ones found in the digestive system, it was also found that turmeric powder has disincentive effect against *Bacillus subtilis, B. macerans, B. licheniformis* and *Azotobacter*.

Decreased counts of coliform bacteria were also observed with the increase in the percentage of turmeric powder added to the diet as the decrease of two logarithms of the intestine and pad and one logarithmic cycle for caecum. Results from Table 6 and Table 7 showed that there was a decrease at one logarithmic cycle when turmeric used at 0.4%, while there was no bacterial growth in the intestine at 0.6% for *S. aureus* bacteria. Results of Table 8 indicated that all turmeric ratios added have contributed to the reduction of the count of yeasts. This effect differed according to the concentration used. It was found that using of 0.6% was more efficient in reducing the count of yeasts in the three parts of the digestive tract from values of 9.25×10^4 9×10^4 and2.85×10^6 CFU/g as the decline continued with the increase of the added rates until it reached 4.81×10^1, 3.15×10^2, 6.1×10^4 respectively.

CONCLUSION

Poultry is an important part which can develop the quantity and quality of meal and improve the specific qualities of it eggs by adding such plants to the animal feed. In this study, different concentration of curcuma and ginger were used. We found that they (both plants) were inhibitive to certain pathogens in different parts of the digestive system of white leghorn birds.

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