The Effect Of Adding Different Levels Of Water Extract Of Cloves (Syzigium Aromaticum) To Drinking Water On Productive Traits Of Broiler Chickens

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Abstract
This study aimed to determine the effect of adding different level of cloves (*Syzigium aromaticum*) aqueous extract to drinking water on productive traits of broiler chickens. A total of 180 broiler chicks, Ross 308, one day age, 40 gm average weight were used. The treatments were as follows: T1: the control treatment (without addition), while T2, T3 and T4 were added to the aqueous extract of clove flowers at a concentrate of 200, 300 and 400 ml/ L of drinking water, respectively. The results showed that there was a significant increase ($P \leq 0.05$) on some production traits (final body weight, total weight gain, feed intake, consumed water, feed conversion, dressing and production index), with a significant decrease ($P \leq 0.05$) on mortality for cloves aqueous extract treatments compared to the control treatment. The addition of the aqueous extract of clove flowers at a concentration of 400 ml / L of drinking water (T4) gave the best results.

Keywords: Broiler chickens, Cloves (*Syzigium aromaticum*), Productive traits.

Introduction

The modern poultry industry depends on a large extent on breeding, nutrition, management, and health, guarantees the ability to compete in the global meat market, as a result of development, it was necessary to find ways to support health, protect birds and improvement of immunity (Agostini, 2012 ; Ismail *et al*.,2021). Antibiotics have been used for a long time in the poultry industry, as feed additives to improve growth performance, inhibit some specific pathogenic microorganisms and increase of some microflora in the small intestine over a period of years (Soltan *et al*., 2008).

Antibiotics have created resistant strains, by transferring resistance to other species, especially in the common races between humans and animals, led to serious public health problems. In 2006 the European Union approved a resolution to ban the use of antibiotics as growth promoters for animals (Gerson *et al*., 2009 ; Mudalal *et al*.,2021). Many studies focus on alternatives to antibiotics, it can be antimicrobial, promotes growth without causing bacterial resistance, no side effects on, such as organic acids (De Lange *et al*., 2010), enzymes (Bedford and Cowieson, 2012), probiotics (Musa *et al*., 2009; Gibson *et al*., 2004), antimicrobial peptide (Choi *et al*., 2013), herbal plant (Windisch *et al*., 2008; Gong *et al*., 2014).

Medicinal plant oils and extracts have received great attention in poultry feeding, as feed additives to improve and increase production, it has very beneficial effects being antioxidants and antimicrobials, it contains natural chemicals, great interest and importance in its therapeutic activity, its physiological effect on animals and humans, in addition to being available, inexpensive and non-polluting to the environment, it can be obtained simply and cheaply (Yadav *et al*., 2006 ; Roisbel *et al*., 2018).

Plant extracts have several advantages over commercial antibiotics, it is free from residues and can be used in the food industry, one of the medicinal plants, have been widely used is cloves (Syzigium aromaticum), it is an evergreen tree with a pyramidal shape, 15 meters high, it has a strong aromatic scent that belongs to Myrtaceae family, the original home of cloves is the Molucca Islands in Indonesia and the southern Philippines. Clove flowers contain eugenol, act as a natural antioxidant, it also contains Vitamin C (a natural antioxidant in the body), reduces free radicals. Cloves also have the antiseptic property of some viral infections, it is also a strong antibacterial and eliminates parasites (Abad *et al*., 2007; Al-Ameeri and Aljashami, 2017), Therefore to the importance of using medicinal plants and improving the body's immunity, this study aimed at the effect of using different levels of aqueous extract of clove flowers on the productive performance of broiler chickens.

Materials and Methods:

This experiment was conducted at the private poultry field, in Thi-Qar Governorate, from 15/9/2020 to 19/10/2020. A total of 180 broiler chicks, Ross 308, one day old, 40 gm weight, were reared in a hall measuring 70×10 m, in batteries with three floors, each floor contains a cage with dimensions of 1.5×1 m. The chicks were distributed randomly to four experimental treatment groups, 45 chicks per treatment, with three replicates per treatment (15 chicks/ replicate). The treatments were as follows:

T1: (Control treatment).
T2: Added to the aqueous extract of clove flowers at a concentrate of 200 ml / liter of drinking water.
T3: Added to the aqueous extract of clove flowers at a concentrate of 300 ml / liter of drinking water.
T4: Added to the aqueous extract of clove flowers at a concentrate of 400 ml / liter of drinking water.

The conditions of rearing were the same for all chicks, the temperature was 34-35 °C during the first week, was gradually reduced 2 °C weekly, as for the lighting system, it was 23 hours lighting+ an hour of darkness. The birds were fed two types of diets, starter diet from 1-21 days, the second diet was a grower diet from 22-35 days, were calculated according to NRC (1994) recommendations (Table 1).

The productive trait were body weight (gm / bird), weight gain (gm/ bird/ week), feed intake (gm/ bird/ week), feed conversion factor (gm feed consumed / gm weight gain), and the production index according to Naji (2006):

$$\text{Production index} = \frac{\text{Body weight} \times \text{Viability}}{\text{Rearing periods (day)} \times \text{Feedconversion} \times 10}$$

Viability= 100- Mortality

At the end of the fifth week, 12 birds were slaughtered each treatment, after cleaning, the carcass weight was taken after slaughter. The dressing percentage was calculated according to Al-Fayyadh *et al.* (2011):

$$\text{Dressing percentage} = \frac{\text{Carcass weight without internal vicera(gm)}}{\text{Body weight (gm)}} \times 100$$

Table (1): Diets nutritional and chemical compositions.

Ingredient %	Starter (1-21 days)	Grower (22-35 days)
Yellow corn	42.50	46.50
Wheat	18.00	18.00
Soybean meal	32.00	27.50
***Protein concentration**	4.00	4.00
** **Premix**	1.00	1.00
Limestone	2.00	1.50
Plant oil	0.50	1.50
Total	100.00	100.00
Calculated chemical composition		
Crude protein (%)	23.10	21.30
Metabolize energy (kilo calorie/ kg diet)	2954	3072
Calorie: protein ratio	127.87	144.22
Crude fiber (%)	3.82	3.85
Calcium (%)	0.92	0.86
Phosphorus (%)	0.48	0.45
Methionine (%)	0.55	0.51
Lysine (%)	1.32	1.24
Methionine + Cystine (%)	0.90	0.84

*The protein concentrate for broiler feeding produced by the company (WafiB.V. Holland). Chemical composition: 40% crude protein, 5% crude fat, 2.20% crude fiber, 7.10% Moisture, 28.30% crude ash, 4.20% Calcium, 4.65% Phosphorus, 2107 Met. energy(kcal.g-1).

**Premixes, chemical composition: 10% crude protein, 2.1% crude fat, 0.34% crude fiber, 2.66% Moisture, 51.02% crude ash, 20.08% Calcium, 10.83% Phosphorus, 753.82 kcal kg Met. Energy.

Table (2): Preventive measures for chicks.

Age (day)	Preventive measures
1-5	An antibiotic (enrofioxacine) by drinking water
7	Newcastle vaccine by drinking water
12	Gumboro vaccine by drinking water
17	Newcastle vaccine (Lasota) by drinking water

Extract preparation

The cloves used in the experiment were brought from the local market, the aqueous extract of clove flowers was prepared according to the modified method of Hernandez *et al*. (2004), includes mixing a clove flowers dry powder with distilled water at a ratio of 1 gm: 2 ml distilled water, by an electric mixer, leave the solution for 24 hours at room temperature, filter the resulting mixture using several layers of sterile gauze, ading the aqueous extract that we obtained to the drinking water at the three levels (200, 300, 400 ml extract / liter of drinking water). Provide water to the treatments, each treatment according to the level of addition, until the end of the experiment.

Table (3): Chemical composition of clove flower powder.

Contents	Dry weight basis (%)
Moisture	30.18
Crude protein	6.17
Crude fat	5.22
Soluble sugars	31.47
Crude fiber	14.08
Ash	4.93

Statistical analysis

Data were analyzed by a Completely Randomized Design (CRD), significance of the differences between the means was tested using Duncan's multiple range test (Duncan, 1955) with a significance level of 0.05 and 0.01, using the ready-made statistical software (SAS, 2001).

Results and discussion

Table (4) shows the effect of using an aqueous extract of clove flowers on the productive performance of broiler chickens, adding the extract to the birds' drinking water led to a significant improvement ($P<0.05$) on final body weight, feed conversion efficiency, feed intake during the experimental period (35 days), and carcass weight, the dressing percentage and production index compared to the control treatment. T4 has outperformed compare with T3 and T4. The addition of the aqueous extract of clove flowers led to a significant decrease ($P<0.05$) on mortality compared to the control treatment.

Table (4): The effect of using aqueous extract of clove flowers on broiler production performance (mean ± standard error).

Treatments / Traits	T1	T2	T3	T4	Sig.
Final body weight (gm)	43.2 ±1683.21d	48.3 ±1881.23c	55.8 ±1931.06b	35.4 ±2001.12a	*
Total Feed intake (gm)	30.5 ±2915.72d	31.5 ±3119.22c	30.3 ±3160.16b	28.3 ±3188.08a	*
Cumulative Weight gain (gm)	17.3 ±1643.21d	16.0 ±1841.23c	17.7 ±1891.06b	16.8 ±1961.12a	*
Feed conversion (gm feed intake/ gm weight gain)	0.78 ± 1.77c	0.70 ± 1.69b	0.73 ± 1.67b	0.69 ± 1.63a	*
Mortality (%)	0.32 ± 6.22a	0.25 ± 4.32b	0.21 ± 3.77c	0.19 ± 1.89d	*
Production index	2.33 ± 254.80d	2.41 ± 304.30c	2.53 ± 317.92b	2.76 ± 344.41a	*
Dressing percentage	0.55 ± 76.14d	0.50 ± 79.04c	0.48 ± 80.07b	0.51 ± 81.26a	*

T1: (control transaction without addition), **T2:** add the aqueous extract of clove flowers at a rate of 200 ml / liter of drinking water. **T3:** add the aqueous extract of clove flowers at a rate of 300 ml / liter of drinking water. **T4:** add the aqueous extract of clove flowers at a rate of 400 ml / liter of drinking water. * The different letters within one column indicate the presence of significant differences between the groups at a probability level of 0.05.

The positive results obtained in this experiment from the use of aqueous extract of clove flowers in the productive performance of the birds (final body weight, weight gain, feed conversion efficiency, feed intake, dressing percentage and production index), for all addition treatments compared with the control treatment, it can be attributed to the fact that the use of plant extracts in feeding domestic birds improves productive performance, improves digestion, and has no harmful effects on the health of birds. Akyildiz and Muzaffer (2016) indicated that the extract improves the appetite of

birds, feed intake increased, reflects positively on the overall performance, a tonic and stimulant for the digestive system, the aqueous extract of clove flowers, it can have an effect by supporting beneficial microorganisms (microflora) in the intestine and eliminating pathogenic microorganisms, thereby increasing nutrient utilization and digestibility of feed and improving the assimitable energy of the addition treatments (Hashemi and Davoodi, 2010; Gandomani *et al*., 2014).

The best results in productive traits are due to biologically active substances in clove flowers, the most important of which are flavonoids and phenols, improved productive performance of birds (Nassar *et al*., 2007). Flavonoids are compounds that activate thyroid hormones, these hormones accelerate the processes of demolition and construction within cells, improve the productive performance of broilers, in addition to its work as anti-fungal and microbial in the digestive system, it supports the normal microflora in the gut (Cheng *et al*., 2014). The most important phenolic compound found in clove flowers is eugenol, which is considered a stimulating substance for the digestive system, influential and beneficial, increases feed digestibility and increased utilization, reflects positively on body weight and general health (Celekil and Kavas, 2008).

The improvement in productive performance and growth depends on gut biology like villi height and crypt depth (Mohammadi *et al*., 2014), agreed with Jamroz *et al.* (2006), Alloui *et al.* (2014). The improvement in productive performance occurred due to morphological changes, that occurred in the intestines, such as increasing the height of the villi and the depth of the crypts, which increases the surface area for absorption and thus increases the efficiency of absorption of nutrients inside the intestine.

The significant increase in the dressing percentage was due to the significant increase in body weight, as there was a positive correlation coefficient between the final body weight and the percentage of purification (Tang, 2012), all this improvement in the characteristics of productive performance was reflected positively on the productive index, as for the superiority of T4 significantly compare to the other treatments, it may be due to the higher concentration of the active substances compared to the rest of the treatments, the effect of which appeared cumulatively during the experiment period, it will have a better effect on the birds in all productive traits compared to less concentrated treatments, which in turn was significantly superior to the control treatment. The results of our study agreed with Dalkici and Guler (2009), they used the extract of clove flowers in feeding broilers at three levels: 100, 200 and 400 gm / kg feed, where the addition treatments were superior to the control treatment in feed intake, feed conversion efficiency and final body weight, the effect of the extract positively on the feed digestibility, the best addition was 400 gm / kg diet, as it was found that clove extract can support productive performance. It also agreed with Salman and Ibrahim (2012) in a study to test the effectiveness of clove flowers (powder, oil and water extract) on the productive performance of broiler chickens, they used three levels 0, 0.4 and 0.8% clove powder to the diet, 0.8% clove oil to the diet, 0.4% aqueous extract of cloves to the drinking water, there was an improvement in production traits of broiler chickens exposed to heat stress.

Conclusions

We conclude from our study that the aqueous extract of clove flower powder led to a significant improvement in the productive performance of broiler chickens, the high levels of aqueous extract of clove flowers powder (T4) gave the best results compared to the rest of the treatments.

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Authors contribution

Z.K.F. AL-Mhsenawi & **M.H.A. Al-Asadi**: Collected the data and wrote the paper.
H.A. Abokallal & **A.M. Al-Aboudi**: Wrote the pape rand performed the analysis.

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تأثير اضافة مستويات مختلفة من المستخلص المائي لأزهار القرنفل الى ماء الشرب في الصفات الانتاجية لفروج اللحم

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[4] مديرية زراعة ذي قار/ وزارة الزراعة/العراق

المستخلص

أجريت هذه الدراسة بهدف معرفة تأثير اضافة المستخلص المائي لأزهار القرنفل الى ماء الشرب في بعض الصفات الانتاجية لفروج اللحم، استخدم فيها 180 فرخاً من فروج اللحم سلالة Ross 308 بعمر يوم واحد وبمعدل وزن (40) غم، وزعت عشوائيا الى اربعة معاملات بواقع 45 فرخا لكل معاملة بثلاث مكررات للمعاملة الواحدة (15 فرخا لكل مكرر) وكانت معاملات الدراسة كالاتي: T1 معاملة السيطرة (بدون اضافة)، وكانت T2 و T3 و T4 معاملات الاضافة حيث تم اضافة المستخلص المائي لأزهار القرنفل بمعدل 200 و 300 و 400 مل/لتر من ماء الشرب على التوالي، بينت النتائج وجود زياده معنوية ($P\leq0.05$) في بعض الصفات الانتاجية المدروسة (معدل وزن الجسم النهائي ومعدل الزيادة الوزنية الكلية وكمية العلف والماء المستهلك ومعامل التحويل الغذائي ونسبة التصافي والدليل الانتاجي) مع انخفاض معنوي ($P\leq0.05$) للنسبة المئوية للهلاكات لمعاملات الاضافة مقارنة بمعاملة السيطرة، وكانت اضافة المستخلص المائي لأزهار القرنفل بتركيز 400 مل/لتر من ماء الشرب هي الافضل حيث اظهرت T4 تفوقا معنويا ($P\leq0.05$) في جميع الصفات الانتاجية المدروسة مقارنة بمعاملة السيطرة ومعاملات الاضافة الاخرى.