Kafrelsheikh Vet. Med. J. Vol. 6 No. 2 (2008) (368-387)

ROLE OF GINGER AS ANTIBACTERIAL AND IMMUNOMODULANT IN CHICKENS

Hegazy, A.M [1], Nasra, Awadin [2], Soliman, A. H [1].

Animal Health Research Institute Kafr Elsheikh Regional Lab. [1].

Animal Production Research Institute Kafr Elsheikh [2]

ABSTRACT

This study was carried out to evaluate the effect of adding ginger to poultry feed as anti salmonella and its effect on performance. So, 110, nineteen- days-old local breed chicks were allotted into 4 groups by ranking methods as 25 bird per group and the rest was sacrificed for bacteriological examination. Group1 (G1) negative control, group2 (G2) salmonella control, group3 (G3) ginger control and group4 (G4) was challenged at 21-day-old with 1 ml over night broth culture, both G3&G4 receive diet containing ginger at a rate of 1% from 19th day old. Performance (body weight and feed conversion), colonization of salmonella in different organs, some blood biochemical parameters and heamagglutination inhibition titre (HI for ND vaccine) were measured and statistically analyzed.

INTRODUCTION

The use of herbs is a time-honoured approach to strengthening the body and treating disease. However, herbs contain active substances that can trigger side effects and interact with other herbs, supplements, or medications. For these reasons, herbs should be taken with care, under the supervision of a specialist in the field of botanical medicine.

Fresh ginger contains 80.9% moisture, 2.3% protein, 0.9% fat, 1.2% minerals, 2.4% fibres and 12.3% carbohydrates. The minerals present in ginger are iron, calcium and phosphorous. It also contains vitamins such as thiamine, riboflavin, niacin and vitamin C, ***Govindarajan, (1982)***.

Ginger has strong antibacterial and to some extent antifungal properties. In vitro studies have shown that active constituents of ginger inhibit multiplication of colon bacteria. It inhibits the growth of E.coli, Proteus Spp., Staphylococci, Streptococci and Salmonella ***James, et al., (1999) and Gugnani and Ezenwanze (1985)***.

Gastroenteritis due to salmonellosis and E.coli is continues threat to the poultry industry, causing huge economic losses. Antibiotics have been usually incorporated in feeds to control these cases, but the disadvantages are the high cost of these drugs that means less profit, and the emergence of resistant strains to the commonly used antibiotics poses a health risk to livestock in the near future ***(New Scientist, 1996).***

The antibacterial activity of the ethanolic extracts of ginger against S.typhi was positive. Though the growth inhibitory response varied with the type of bacterial species tested and the type of extract, ethanolic extract of ginger inhibited S.typhi with10 mm diameter. While the aqueous extract of ginger inhibited S.typhi showing 8mm diameter ***(Ekwenye and Elegalam, 2005).*** The extracts of ginger exhibited antibacterial activity against the pathogens S. aureus, S. pyogenes, S. pneumoniae and H. influenza. The minimum inhibition concentration (MIC) of extracts ranged from 0.0003 µg /ml to 0.7 µg /ml for ginger. Results indicated that the extracts of ginger roots may contain compounds with therapeutic activity ***(Akoachere et al., 2002).*** The essential oils of

Z.officinale showed antimicrobial activity against gram-positive and gram-negative bacteria using the agar diffusion method **(Martins et al., 2001).**

Microbial drug resistance is a difficult problem. As medicinal chemists advance in their search for new bacterial targets to attack bacterial evolve; as a result, a large number of bacterial species have become resistant to antibacterial drugs ***(Garau, 1994., Gould, 1994., and Sanders and Sanders 1992).*** Thus there is a need to develop an alternate strategies, for this reason, this paper was designed to evaluate the effect of ginger therapeutically (in vitro or in vivo) and on poultry performance.

MATERIAL & METHODS

1- Extraction of ginger:

As described by ***Nelson and Reginald (2007);*** the ginger rhizomes were washed with clean sterile distilled water and allowed to air-dry for one hour. Then the outer covering of the ginger were manually peeled off and the ginger was washed again and extracted using the following procedures:

Exactly 200g of fresh ginger were blended and soaked in 100 ml of 95% ethanol for 24 hrs, the extract was obtained, and filtered using a sterile muslin cloth after which the extract was air-dried and stored at 4C for further investigations.

2- Bacterial species: S.enteritidis were supplied by **A. M. Hegazy.; Animal Health:**

Research Institute (Kafr Elsheikh Branch).

3- **In vitro sensitivity test**: The sensitivity of S.enteritidis strain used in challenge was tested against a set of chemotherapeutic agents were carried out using the cup-plate diffusion method as described by ***Cruickshank, et al., (1975),*** 0.4g of ginger extract residue is diluted up to 1ml with sterile distal water in test tube, about 0.3g per ml of each of erythromycin, doxycycline and colistin were also prepared along side, which served as a positive control. Exactly 0.02ml of each concentration was introduced into each hole on the medium and was allowed to stand on the bench for about one hour for proper diffusion. Then inoculated with tested organism from over night broth culture by sterile cotton swab. It was there after incubated at 37°C for 24hrs, the sensitive bacteria grew everywhere except in areas around the holes in the medium. Then, the resulting inhibition zones obtained were measured in mm and recorded against the corresponding concentrations ***(Nelson and Reginald 2007).***

4- **Experimental design**: 110 one-day-old local breed chicks were allotted into 4 groups, 25 each. Ten birds were sacrificed for detection of salmonella, as well as 25 fecal swabs to prove salmonella free chicks.

*G1, serve as negative control receives plain diet.

*G2, infected with 1 ml S.enteritidis over night broth culture at 21-days -old via oral route.

*G3, serve as ginger control (plain diet +ginger 1 % starting at 19 days old).

* G4 (plain diet + ginger at a rate of 1 % starting at 19-days-old and infected with 1 ml S.enteritidis over night broth culture at 21-day-old,. via oral route).

5- Samples collection:

a- Samples for salmonella colonization of the organs, 5 bird from challenged groups were sacrificed at the end of each of 2^{nd}, 4^{th}, 6^{th} and 8^{th} weeks post infection (WPI).

b- Fecal swabs to study the shedding of salmonella (30 fecal swabs / group).

c- Five serum samples were collected at the end of each of 2^{nd}, 4^{th}, 6^{th} and 8^{th} WPI/group.

6- Growth performance: Body gain and feed conversion **were** recorded bi-weekly.

7- Vaccination: All groups were vaccinated against Newcastle disease, at seven day of age with Hitchener B1 and at 21 and 35-day-old with Lasota strain vaccine.IBD vaccine at fourteen days of age.

8- Immune response against Newcastle disease (ND): HI titre against ND as described by ***king and Seal (1998)***. The ND virus and positive control serum was kindly provided by **Dr.A.Y.Tahoon,** Senior Researcher Animal Health Research Institute (Kafr Elsheikh Branch).

9- Measurment of blood chemistry: Biochemical parameters were assayed calorimetrically by using of commercial diagnostic kits of total protein ***(Weichselbaum, 1946)***, albumin ***(Doumas, 1971)***, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) ***(Retiman and Francle, 1957).*** Creatinine ***(Husdan and Rapaport, 1968)***, uric acid ***(Arliss and Entvistle, 1981).***

10- Statistical analysis: using the General Linear Model for analysis of variance ***(SAS, 1990).*** Duncan's multiple range test ***(Duncan, 1955)*** was used for test the significance ($p<0.05$) of differences among means.

RESULTS AND DISCUSSION

Symptoms appeared 5 day PI as depression, low feed intake and whitish diarrhea in salmonella infected groups with no marked difference between them.

Mortality was 4 % in both salmonella control and ginger + salmonella groups' ,deaths are restricted to 1st week post infection, the mortality rate was lower than that recorded by other workers and this may be attributed to older birds are considerably less susceptible to the lethal effects of paratyphoid salmonellae and may experiences intestinal colonization and even systemic dissemination without significant morbidity or mortality. The development of resistance to salmonellae in young birds has often been attributed to the acquisition of protective microflora that either competes with salmonellae for intestinal receptor sites or produce antagonistic factors that inhibit Salmonella growth, ***(Stavric et al., 1987)***. Invasion beyond the gastrointestinal tract can lead to Salmonella multiplication in the macrophage-phagocyte system (MPS) of the liver and spleen ***(Barrow et al., 1987)***. Colonization of salmonella in different organs was evident (Table 1) in both salmonella control group and salmonella challenged ginger group ***(Abd El-Wanis, Sohad 1995 and Hegazy,2002)***, liver showed high colonization rate 45 % , followed by spleen 40% and gallbladder 25 % in salmonella control group. There were a reduction 20 % in liver, 15% in spleen and 10 % in gallbladder in colonization rate in ginger –salmonella treated group, these reductions may be attributed to the use of ginger, which has antibacterial properties. In vitro studies have shown that active

constituents of ginger inhibit multiplication of colon bacteria and these bacteria ferment undigested carbohydrates causing flatulence. This can be counteracted with ginger. It inhibits the growth of E. coli, Proteus Spp., Staphylococci, Strepto cocci and Salmonella ***(James et al., 1999 and Gugnani and Ezenwanze 1985).***

The role of ginger extract in vitro was evident as antibacterial as it show an inhibition zone of 13 mm diameter (blank control 0.02 ml sterile saline show no inhibition). Further more, antibiotics, doxycycline, erythromycin and colistin showed inhibition zone of 18 mm, 15 mm and 12 mm, respectively. This is similar to the findings of Nelson and ***Reginald (2007)*** where they reported that each of raw ginger extract , cold water, hot water and ethanolic extracts of ginger show reasonable degree of inhibition against S. typhi and E.coli. In the same order, the result of ***Ekwenye and Elegalam (2005)*** showed that S.typhi was sensitive to either aqueous or ethanolic extracts of ginger. On the other hand ***Renata and Juliette (2002)*** reported that ginger show only little bacteriostatic activity against S.enteritidis and E.coli. Also ginger showed only moderate levels of inhibitory effect ***(Thiruppathi et al., 2004)*** .Completely absence of chemotherapeutic effect was recorded by ***Onyeagba et al. (2004).***

Although there is no evident of direct effect of ginger on salmonella in vivo, yet the improvement of weight and other parameters may be attributed to the effect of ginger on anaerobes, other biological processes and antioxidant effect ***(Kikuzaki and Nakatani, 1993;. Jayakumar et al., 1999; and Mahdy et al., 2003).***

The result of performance (Table 2) showed that there was a significant difference of weight of ginger – salmonella group vs. salmonella control group, in the same time, there was a significant difference between Salmonella infected groups vs. negative control group. Although there were a differences between control groups which of no significance. The same significance pattern was observed in body gain (Table 3).

The active components of ginger are reported to stimulate digestion, absorption, relieve constipation and flatulence by increasing muscular activity in the digestive tract ***(ICMR bulletin, 2003)***. This appear to be concise as ginger improve FCR (Table, 4) than that of control group, although the significance appear only between salmonella infected group and non-infected groups.

Serum protein of avian blood ranges between 3 and 6 gm/dl. Albumin is considered the large fraction of the total protein, so a reading less than 3gm/dl indicates hypo- albuminemia. Chronic renal or hepatic diseases, malnutrition and malabsorption cause hypoprotenemia ***(Embert, 1986)***. The changes in liver metabolism caused by endotoxins treatment or live bacterial challenge have been observed in both mammals and birds ***(Curtis et al., 1980)***. Liver is affected greatly due to infection or sepsis which in turn affects its function, ***(Kokosharov, et al., 1997)***, who reported degenerative changes in the liver to which attribute the decreased protein synthesis. Also, ***Kokosharov (2007)***, reported significant decrease in either serum total protein or albumin due to S.gallinarium infection, also he added that, the acute S.gallinarium infection caused reduction in albumin whereas globulin fractions increased.

Serum albumin levels in S.gallinarium infection were lower in susceptible birds five days post-inoculation as compared to healthy birds, also, there was an increase in the activity of aspartate-aminotransferase (AST) in birds five days post-inoculation as compared to the mean value in birds of the same group ***(Freitas et al., 2007)*** these changes are correlated with the liver lesion at five-days post-inoculation, (multifocal necrosis), higher AST levels, and lower albumin levels. This may be interpreted as inability of the liver to synthesize protein due to the lesion intensity, macroscopically evidenced by hepatomegaly and measurable loss of protein in the affected kidney. Therefore, the damage in the glomerular filtration barrier may result in the presence of plasma proteins in the urine; in addition, inflammation of the renal parenchyma or epithelial damage of the tubules may cause loss of protein to the urine, ***Relford and Lees (1996)***.

Screening of some blood biochemical parameters (table 5) showing that total serum protein; hypoproteinemia was evident due to S.enteritidis infection, as there is a significant decrease in the average level of total protein (3.2g /dl) if compared by the control group (4.9 g/dl), this effect may be attributed to the pathological effect of salmonella on liver tissues as judged by isolation of the organism from the liver tissue ***(Freitas et al., 2007)***, As the liver consider the precursor of most serum protein. Although there was significant difference between salm-ginger (SG) treated group (3.91g/dl) and control (4.9g/dl); yet the effect of ginger on total serum protein was clear, as it protect the liver and in turn sharp decrease in the level of serum total protein 3.2 g/dl in salmonella control group, vs. 3.91 g/dl in ginger salmonella group this could be explained

by ***Saber (2007)***, where he reported that ginger aqueous extract diminish the histopathological changes in the liver of albino rates. Unexpected effect in total serum protein values is that there is no significant decrease in ginger control group 4.49 than that of control negative 4.9g /dl, and according to the available literature there is no explanation.

Albumin, is synthesized by the liver and has a half life about 2 weeks, so decrease in albumin level may be due to decrease production by the liver or albumin loss either from the kidney (nephropathy) or loss from intestine (enteropathy). In the present work , the albumin follow the same pattern of total protein, due to close relationship between them (Table, 5), in different groups, where significant differences were traced between control groups and infected groups and between salmonella control and ginger salmonella group, where the ginger protect sharp decrease of albumin 1.7g/dl vs. 2.03g/dl, respectively ***(Saber, 2007)***.

Alanine amino transferase (ALT) formally termed serum gultamic pyruvic transferase (SGPT), present mostly inside hepatocyte so it is specific for the liver of human and other animal but not in birds ***(Lohr, 1975)***. Meanwhile in this work, salmonella infection increase ALT significantly, 26 u/l vs. 10 u/l in control negative one (Table, 5). Also, ginger increase ALT significantly, 16u/l vs. 10u/l in control. The addition of ginger in salmonella –ginger group was expected to be summation i.e. greater than 26u/l (salmonella –infected group), but ginger control the salmonella and the values recorded was significantly less than salmonella-infected group. These findings could be supported by findings of ***Saber (2007)***, who found that ginger alone increase either AST or ALT, but it control higher elevation due to liver damage.

On the other hand aspertate transferase (AST) formally termed serum gultamic oxaloacetic transferase (SGOT), present in liver cell, intestine and muscles, in acute infection it proceed ALT, a significant increase in the levels of aspartate aminotransferase and creatine kinase,were detected 96 hrs after S.typhimurium inoculation in chicken, ***(Itoh et al,. 1996).*** Although serum AST is not liver specific in birds, increased activity has been associated with hepatocellular damage in chicken and turkeys ***(Rivtez et al., 1977 and Pearson et al., 1979)***.

Transient impairment of kidney function that has been noted during acute phase-infection ***(First, 1996)***. Uric acid is the primary catabolic product of protein, the avian kidney excrete uric acid primarily by tubular excretion, the normal serum uric acid of the most bird is 2-15 mg/dl ***(Embert, 1986)***. Hyper uricemia in birds is associated with starvation, gout, tissue destruction and renal disease ***(Chandra,et al., 1983;Osbaldiston, 1968 and Rivtez, et al., 1977)***.

Under the circumstances of the present work we can stated that any group revealed hyper uricemia, according to the findings of ***(Embert, 1986)***, but salmonella infection significantly increase uric acid level 6.75 mg /dl vs. 4.36 mg/dl in control negative group (Table, 5). Also, it is evident that ginger decrease uric acid level either in infected or control groups, 5.58mg/dl, 2.45 mg/dl, respectively, vs. 6.75 mg/dl in salmonella infected group and 4.36mg/dl in control negative group.

Furthermore creatinine is a product of protein metabolism, so its serum level increase indicates a defective excretion from the kidney. Creatinine is not a major non protein nitrogenous component of avian blood, the normal serum creatinine of the most birds ranges from 0.5- 1.5 mg/dl ***(Rivtez et al., 1977)***.

In the present work, salmonella infection, significantly increase serum creatinine level \ 1.38mg/dl in salmonella infected group, vs. 0.79mg/dl in control negative group. In the same time the addition of ginger in SG group did not relief the salmonella effect on creatinine level 1.36mg/dl and still significantly high in comparison to the control. While ginger alone significantly increase creatinine as compared with negative control, 0.93 vs. 0.79mg/dl respectively, (Table, 5).

Immune response against ND vaccination as evaluated by HI titre which reveals a difference in $\log_2$ of GM. This difference was significant in 2nd WPI between salmonella infected control group and other group 3.4 vs. 5.2, 5, and 3.8 (Table, 6). In 4th W. PI significance appeared between salmonella control and ginger control groups 4.6 vs. 6.6 respectively. Generally, addition of ginger in both salmonella treated group and control group increase $\log_2$ GM. HI titre but non significant.

It is concluded that ginger as feed additives has an either positive or negative insignificantly effect on the measured parameters. But it decreased significantly the drastic effect of the infection on growth, feed conversion, and liver and kidney functions and on immunity performance in most occasions.

Table (1): Colonization of salmonella in different organs and rate of shedding as judged by intestinal colonization.

Groups / Organs	Control		Ginger control		Salmonella(S)		Ginger+(S)	
	+/tot	%	+/tot	%	+/tot	%	+/tot	%
Liver	0	0	0	0	9/20	45	5/20	25
Spleen	0	0	0	0	8/20	40	5/20	25
G.bladder	0	0	0	0	5/20	25	3/20	15
intestine	0	0	0	0	14/30	46.6	8/30	26.6
Total	**0**	**0**	**0**	**0**	**36/90**	**40**	**21/90**	**23.33**

Tot = total S = salmonella

Table (2): Average body weight in gm in different groups

Groups	Control neg.		Salmonella control.		Ginger control.		Ginger +S	
Period	mean	S.E	mean	S.E	mean	S.E	mean	S.E
21st day	247^{a}	4.5	241^{a}	4.7	242^{a}	4.54	240^{a}	4.3
2nd Wk. P.I	418^{c}	8.1	339^{a}	6.29	437^{c}	6.58	378^{b}	6.9
4th Wk. P.I	584^{c}	11.8	447^{a}	10.4	613^{c}	5.73	493^{b}	9.6
6th Wk. P.I	731^{c}	12.5	543^{a}	13.5	765^{c}	14.95	635^{b}	10.9
8th Wk. P.I	876^{c}	22.1	655^{a}	22	927^{dc}	6.12	771^{b}	8
R.A.B.W 100 %	100		74.8		105.82		88.0	

There is a significant difference between items carrying different letter in the same raw at $P \leq 0.05$

R.A.B.W= Relative average body gain

Table (3): Average body gain in gm in different groups.

Groups	Control-	Salmonella (S)	Ging. cont.	Ging+S
Period pi.	B.G	B.G	B.G	B.G
2weeks	171^{a}	98^{c}	173^{a}	138^{b}
4 weeks	161^{a}	106^{c}	168^{a}	123^{b}
6 weeks	150^{b}	116^{d}	163^{a}	128^{c}
8 weeks	156^{b}	115^{d}	168^{a}	129^{c}
Total	638^{b}	435^{d}	672^{a}	518^{c}
Mean ± S.E	$159.5^{a} \pm 4.4$	$108.8^{c} \pm 4.2$	$168^{a} \pm 2.4$	$129.5^{b} \pm 3.1$
R.A.B.G100%	100	68.2	105.3	81.2

There is a significant difference between items carrying different letter in the same raw at $P \leq 0.05$.

R.A.B.G=Relative average body gain.

Table (4): Average feed conversion rate in different groups.

Groups	Control-	Salmonella(S)	Ging. cont.	Ging+(S)
Period pi .	F.C	F.C	F.C	F.C
2weeks	2.46	3.29	2.15	3.11
4 weeks	2.95	4.28	2.33	3.95
6 weeks	3.29	5.33	3.06	4.37
8 weeks	3.83	5.31	3.71	4.9
Mean ± S.E	$3.13^{ab} \pm 0.29$	$4.6^{c} \pm 0.49$	$2.81^{a} \pm 0.36$	$4.08^{bc} \pm 0.38$

There is a significant difference between items carrying different letter in the same raw at $P \leq 0.05$

Table (5): Average values of some biochemical parameters of the blood of different group.

Groups / Item	Control neg.		Salmonella(S)		Ginger control.		Ginger+(S)	
	mean	S.E	mean	S.E	mean	S.E	mean	S.E
Serum T.protein g /dl	4.9^{c}	0.2	3.2^{a}	0.1	4.49^{c}	0.18	3.91^{b}	0.17
Albumin g /dl	2.79^{c}	0.04	1.7^{a}	0.03	2.62^{c}	0.06	2.03^{b}	0.09
SGOT (AST) U/l	41^{a}	1.1	65^{c}	3.9	37.3^{a}	1.5	49^{b}	2.4
SGPT (ALT) U/l	10^{a}	0.4	26^{d}	0.9	16^{b}	0.9	20.6^{b}	0.8
Uric acid mg/dl	4.36^{b}	0.05	6.75^{d}	0.23	2.45^{a}	0.08	5.58^{c}	0.06
Creatinine mg/dl	0.79^{a}	0.02	1.38^{c}	0.04	0.93^{b}	0.02	1.36^{c}	0.08

There is a significant difference between items carrying different letter in the same raw at P≤ 0.05

Table (6): Geometric mean±SEM of heamoagglutination inhibition titre against Newcastle disease virus vaccine expressed as log 2 in different groups.

Age / Groups	Control negative	Salmonella control	Ginger control	Ginger+ salmonella
2^{nd} weeks Pi	5 ± 0.45^{a}	3.4 ± 0.24^{b}	5.2 ± 0.37^{a}	3.8 ± 0.36^{ab}
4^{th} weeks Pi	6.2 ± 0.37^{a}	4.6 ± 0.4^{b}	6.6 ± 0.4^{a}	5.2 ± 0.37^{ab}
6^{th} weeks Pi	7.2 ± 0.2^{a}	5.2 ± 0.37^{b}	7.6 ± 0.24^{a}	5.6 ± 0.24^{b}
8^{th} weeks Pi	7.6 ± 0.24^{a}	5.4 ± 0.24^{b}	7.8 ± 0.2^{a}	5.8 ± 0.28^{b}
Average of log_2GM±SEM	$6.5^{bc}\pm0.52$	$4.65^{a}\pm0.45$	$6.8^{c}\pm0.59$	$5.1^{ab}\pm0.45$

There is a significant difference between items carrying different letter in the same raw at P≤ 0.05

REFERENCE

- ***Abd-El-Wanis, Sohad. (1995):*** Refinement of a common antigen for detection of fowl paratyphoid carriers .Ph. D. Thesis. Fac. Vet. Med., Cairo, Univ., Egy.

- ***Akoachere J. F.; Ndip, R. N.; Chenwi ,E. B.; Ndip, L. M.; Njock, T. E. and Anong, D. N. (2002):*** Antibacterial effect of Zingiber officinale and Garcinia kola on respiratory tract pathogens. East Afr. Med. J. 79:588-592.

- ***Arliss, J. O. and Entvistle, W.M. (1981):*** Enzymatic determination of uric acid. Clin. Chemst. Acta, 118:301-309

- ***Barrow,A.;Huggins, M.B.; Lovell, M. A.and Simpson, J. M. (1987):*** Observations on the Pathogenesis of experimental S.typhimurium infection in chickens.Res.V.Sci. 42:194-199.

- ***Chandra , M.; Singh, B.; Soni, G.L. and Ahuja , S.P(1983):*** Renal and biochemical changes produced in broilers by high-protein, high-calcium, urea - containing and vitamin A- deficient diets. Avian Dis, 28:1,

- ***Cruickshank,J. P.;Duguld, P.; Marmoin, R .H .; Swain HA. (1975):*** Tests for sensitivity to Antimicrobial agents. In: Medical Microbiology, 12th edition. Churchill Livingstone, Edinburgh, 190-204.

- ***Curtis, M. J.; Jenkins, H. G. and Butler, E. J. (1980):*** The effect of E.coli endotoxins and adrenocortical hormone on plasma enzyme activities in the domestic fowl. Res. Vet. Sci. 28:44–50.

- ***Doumas,B.(1971):*** Colorimetric determination of serum albumin.Clin. Chem. Acta.31: 400-403

- ***Duncan, D. B. (1955):*** Multiple range and multiple F. test. Biometric. 11: 1-42. Edrington,

- ***Ekwenye U.N and Elegalam N.N. (2005):*** Antibacterial Activity of Ginger (Zingiber Officinale Roscoe and Garlic (Allium Sativum L.) Extracts on E.Coli and S.typhi. International J. of Molecular Med. & Advance Science 1 (4): 411-416.

- ***Embert, H.C. (1986):*** Avian clinical pathology In: Vet. Clinical Pathology, 4th Ed. by W.B. Saunders company.Ch.16 pp.279-301.

- ***Fernandez, A.Lara, C.Loste, A.Calvo, S. and Marca, M.C(2001):*** Control of S.enteritidis Pt4 experimental infection by Fosfomycin in newly hatched chicks.Comp. Immunol.Microbiol.and infect.Dis. V. 24, Issue 4, Pp. 207-216

- ***First, R. M. (1996):*** Renal function. Pages 484–504 in: Clinical Chemistry: Theory, Analysis, Correlation.3rd ed. L.A.Kaplan and A. J. Pesce, ed.Mosby-Year Book, Inc.,St.Louis, MO.

- ***Freitas, N.OC; Arroyave, W; Alessi, A.C; Fagliari, J.J; Berchieri, A. (2007):*** Infection of commercial laying hens with S. gallinarum: clinical, anatomopathological and hematological studies .Rev. Bras. Cienc. Avic. Vol. 9 No.2 Campinas Apr./June.

- ***Garau, J. (1994):*** ß-Lactamases: current situation and clinical importance. Intensive Care Med. 20 (Suppl.): 3: S5–S9.

- ***Gould I. M. (1994):*** Risk factors for acquisition of multi-drug-resistant gram-negative bacteria. Eur. J. Clin. Micrbiol. Infect. Dis. 13 (suppl.):S30-S38

- ***Govindarajan, V.S. (1982):*** Ginger: Chemistry, technology and quality evaluation (Part I). Crit. Rev. Food Sci. Nutr. 17: 1.

- ***Gugnani, H.C. and Ezenwanze, E.C. (1985):*** Antibacterial activity of extracts of ginger (Zingiber officinale) and African oil bean seed (Pentaclethora macrophylla). J.Commun.Dis 17: 233.

- ***Hegazy, A.M. (2002):*** Epidemiological studies on Salmonellosis in chicken with special reference to S.enteritidis .Ph. D. Thesis. Fac. Vet. Med., Alex. Univ., Egypt.

- ***Husdan, H. and Rapaport, A. (1968):*** Estimation of creatinine by the jaffe reaction: A comparison of three methods. Clin. Chem 14: 222-228.

- ***ICMR Bulletin(2003):***Ginger:Its role in xenobiotic metabolism. Vol.33, No.6 , Pp:58.

- ***Itoh, N. Kikuchi ,N. Hiramune, T. (1996):*** Biochemical changes in fowl serum during infection with S. typhimurium. J. Vet Med Sci. 58 (10):1021-3.

- ***James,M.E.;Nannapaneni,R.and Johnson, M.G. (1999):*** Identification and charact-erization of two bacteriocin producing bacteria isolated from garlic and ginger root. J.Food Prot. 62: 899.

- ***Jayakumar, S.M. Nalini et al. (1999):*** Antioxidant activity of ginger (Zingiber officinale Roscoe.) in rats fed a high fat diet. Med Sci. Res. 27: 341.

- ***Kikuzaki, H. and Nakatani, N. (1993):*** Antioxidant effect of some ginger constituents. J.Food Sci 58: 1407.

- ***King, D.J. and Seal, B.S. (1998):*** Biological and molecular character-ization of ND.virus field isolates with comparison to reference NDV strain and pathogenicity after chicken or embryo passage of selected isolates. Avian Dis. 42:507-516.

- ***Kokosharov,T.;Hristov,H. and Belchev, L.(1997):*** Clinical, bacterio-logical and Pathological studies on experimental fowl typhoid. Indian Vet., J., 74, 547-549.

- ***Kokosharov, T.(2007):*** Changes in the protein profile in birds with experimental acute fowl Typhoid. Bulg. j. Vet. Med.9.No.3,189-192.

- ***Lohr, J.E (1975):*** Fatty liver and kidney syndrome in New Zealand in chickens. N. Z. Vet. J., 23:167.

- ***Mahady, G. B.; Pendland, S. L.; Yun, G. S.; Lu, Z. Z. and Stoia, A. (2003):*** Ginger (Zingiberofficinale Roscoe) and the gingerols inhibit the growth of Cag A+ strains of Helicobacter pylori. Anticancer Res. 23:3699-3702.

- ***Martins, A. P.; Salgueiro, L.; Goncalves,M. J.; da Cunha, A. P.; Vila, R.; Canigueral, S.; Mazzoni, V.; Tomi , F. J. and A. Casanova. (2001):*** Essential oil composition and antimicrobial activity of three Zingiberaceae from S.Tome Principe. Planta Med. 67:580-

- ***Nelson, C. Azu., and Reginald A. O (2007):*** Antimicrobial Properties Of Extracts Of Allium cepa (Onions) And Zingiber officinale (Ginger) On E.coli, S. typhi And Bacillus subtilis. The Internet Journal of Tropical Medicine. V.3,No.2. New Scientist, July,25-August 7, 1996.

- ***Onyeagba R.A.; Ugbogu O.C.; Okeke C.U. and Iroakasi .O. (2004):*** Studies on the antimicrobial effects of garlic (Allium sativum), ginger (Z.officinale Roscoe) and lime (Citrus aurantifolia Linn). African J. of Biotechnology V. 3, No. 10, Pp. 552-554.

- ***Osbaldiston, G. (1968):*** Diuresis and uric acid excretion in the fowl. Vet. Clin. Path., 2:235.

- ***Pearson, A.W.; Butler, E.J., and Fenwick, G.R (1979):*** Rapeseed meal and liver damage effect on plasma enzyme activities in chick's. Vet.Rec. 105: 200-

- ***Relford, R.L and Lees, G.E. (1996):*** Nephrotic syndrome in dogs: Diagnosis and treatment Compendium Continuing Education Practice Veterinary; 18:279-292

- ***Renata G. K. L and Juliette Zamparini (2002):*** Effects of spices on growth and survival of E. coli 0157 and S.enteritidis in broth model systems and mayonnaise.Food Control V.13,Issues 6-7,Pages399-404.

- ***Retiman, S. and Francle, S. (1957):*** Colorimeteric method for determination of serum transaminase activity. American J. of Clinical Pathology. 28: 65-68.

- ***Rivetz, B.; Bogin, E.; Weisman, Y.; Avider, J., and Hadani, A. (1977):*** Changes in the biochemical composition of blood in chickens infected with B. anserinea. Avian path. 6: 343.

- ***Saber, A. Sakr (2007):*** Ameliorative effect of ginger (Z.officiale) on Mancozeb Fungicide induced liver injury in albino rats. Aust. J. of Basic and App. Sci., 1(4): 650-656.

- ***Sanders C. C. and Sanders W. E. Jr. (1992):*** ß-Lactam resistance in gram-negative bacteria: global trends and clinical impact. Clin. Infect. Dis.; 15:824-839.

- ***SAS Institute. (1990):*** SAS Users Guide, Statistics, SAS Institute, Inc.,Cary, NC,USA.

- ***Stavric, S.; Gleeson, T. M.; Blanchfield, B. and Pivnick, H.(1987):*** Role of adhering microflora in competitive exclusion of Salmonella from young chicks. J. Food Prot. 50:928-932.

- ***Thiruppathi, S., Abdulla, M.H., Dorairaj, S., Sangeetha ,S. and Perumalsamy L. (2004):*** Salmonella Cross-contamination in Retail Chicken Outlets and the Efficacy of Spice Extracts on S.enteritidis Growth Inhibition on Various Surfaces Microbes and Environments .Vol. 19, No. 4 pp.286-291.

- ***Weichselbaum, T. E. (1946):*** An accurate and rapid method for the determination of protein in small amount of blood serum. Amer. J. Clin. Path. 10:40-49.

دراسة عن دورلا الزنجبيل كمضاد بكتيرى ومنشط مناعى فى الدواجن

عبد الحليم محمد محمد حجازى ، نصره بدير عوضين** ، حمزه عبد المنعم على سليمان***

*معهد بحوث صحة الحيوان (معمل كفر الشيخ)

** معهد الإنتاج الحيواني (محطة بحوث الإنتاج الحيواني بسخا)

أجرى هذا البحث لدراسة تأثير الزنجبيل كمضاد بكتيرى ومنشط مناعى على سلالة دجاج محلية. تم توزيع الكتاكيت فى سن 18 يوم الى أربع مجاميع(25 طائر/ مج) مج 1: ضابطة ، مج : 2عدوى صناعية بالسالمونيلا انتريتيديس فى سن 21 يوم، مج 3: عدوى صناعية بالسالمونيلا فى سن 21 يوم + 1% زنجبيل فى العليقة، مج 4: 1% زنجبيل فى العليقة.

* تم تسجيل معدلات الأداء (الزيادة فى الوزن- معامل التحويل)

* تم تسجيل بعض قياسات وظائف الكبد و الكلى

* تقدير مستوى الأجسام المناعية فى السيرم بواسطة اختبار التلازن الدموى المانع.

* تم استخلاص الزنجبيل بواسطة الأيثانول ودراسة تأثيره على السالمونيلا انتريتيديس (أختبار الحساسية) مقارنة ب أريثرومايسين ، دوكسي سيكلين، كولستين

وقد أظهر التحليل الإحصائي وجود اختلافات بين المجموعات وهذه الاختلافات كانت غير معنوية بين المجموعة الضابطة و المجموعة الضابطة للزنجبيل ولكنها كانت معنوية في العموم بين مجموعات الضابطة و المجموعات المصابة و أيضاً ضمن المجموعات المصابة.