

The Effect of *Zingiber Officinali* Roots Infusion On Some Physiological Parameters In Broiler Chickens

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Abstract:

This study is aimed to investigate the effect of *Zingiber Officinali* roots infusion on some physiological parameters in broilers. 40 birds at age one day were divided into two groups (each group has 20 birds) : 1. Control group administrated distal water. 2. The treatment group administrated the infusion of *Zingiber officinali* roots orally at dose 100 mg/kg.B.W. for 6 weeks . At the end of experiment , blood samples were taken from brachial vein from ten birds of each groups for hematological and biochemical tests. The following physiological parameters were studied: Hemoglobin concentration , packed cell volume , glucose concentration, cholesterol concentration , body weight and food intake. The results showed significant increase ($P < 0.05$) in hemoglobin concentration and packed cell volume in treatment group that compared with control , and there was significant decrease ($P < 0.05$) in cholesterol and glucose concentration in serum of treatment group that compared with control , however . There was no significant effect of *Zingiber officinali* roots infusion on body weight and food intake.

دراسة تأثير نقيع جذور نبات الزنجبيل على بعض المعايير الفسلجية في فروج اللحم

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الخلاصة:

استهدف البحث دراسة تأثير نقيع جذور الزنجبيل على بعض الصفات الفسلجية في فروج اللحم، حيث استخدم (40) طيراً بعمر يوم واحد قسمت إلى مجموعتين (كل مجموعة تحوي (20) طيراً (1) مجموعة السيطرة تم تجريعها الماء المقطر عن طريق الفم (2) . مجموعة المعاملة أعطيت نقيع جذور الزنجبيل عن طريق الفم بجرعة 100 ملغم / كلغم من وزن الجسم لمدة 6 أسابيع . عند نهاية فترة التجربة تم سحب الدم من الوريد العضدي من عشرة طيور من كل مجموعة لغرض إجراء الفحوصات الدموية والكيموحيوية. تمت دراسة الصفات الفسلجية التالية :- تركيز الهيموكلوبين وحجم خلايا الدم المرصوص وتركيز الكلوكونز والكولسترول الكلي في مصل الدم واستهلاك العلف ووزن الجسم الأسبوعي . أظهرت النتائج وجود زيادة معنوية ($P < 0.05$) في تركيز الهيموكلوبين وحجم خلايا الدم المرصوص في مجموعة المعاملة مقارنة بمجموعة السيطرة. وقلة معنوية ($P < 0.05$) في تركيز الكولسترول و الكلوكونز في مصل الدم في مجموعة المعاملة مقارنة بمجموعة السيطرة. لكن ليس هنالك تأثير معنوي لنقيع جذور الزنجبيل على وزن الجسم واستهلاك العلف.

Introduction:

Ginger, the rhizomes of *Zingiber officinale*, one of the most widely used species of ginger family (1). Ginger, consists of the fresh or dried roots of *Zingiber officinale*.

The English botanist William Roscoe gave the plant the name *Zingiber officinal* in 1807 publication. The genus *Zingiber* includes about 85 species of aromatic herbs from East Asia and Topical Australia (2). The term ginger is also used to describe the edible part of the plant which is commonly used as spice in cooking through the world (3).

Ginger contains up to 3% of an essential oil (it contains zingiberene, beta-phellandrene, beta-bisabolene, arcurcumene, d-camphor, arylalkalene and pungent substance) that causes the fragrance of the spice and also contains phenolic compounds such as shogaols and gingerols (4). The dried rhizomes of ginger are implicated in the treatment of cardiac disease, asthma, colic, atherosclerosis and it is reported to possess antioxidant and antiobesity activity and anti-inflammatory activity (5). Ginger has also traditionally been used as a remedy for nausea, vomiting and motion sickness (6). Ginger is also used for atherosclerosis and high cholesterol levels (7). A new study in Japan

shows that zingerone, the major pungent component of ginger, prevents fat storage (8). Ginger has been reported to increase glutathione, reduce lipid peroxidation *in vivo* and scavenging of various free radicals *in vitro* (9).

Materials and methods:**Materials and instruments :**

Ginger root powder, distilled water, Ordinary balance and Electronic sensitive balance (sartorius balance Gc16033-0CE), thermometer and heater, flasks and capillary tubes and syringe, water bath, microcentrifuge, Whitman no.1 filter paper, Spectrophotometer, cholesterol kit and glucose kit (SPINREACT laboratories).

Method of extraction:

Infusion usually prepared by using Hand method for extraction by diluting one volume of the plant (well grinded) to ten volumes of distilled water at 80 °C in stopper flask, shaking well and then it is allowed to stand for ten minutes, cooled and filtered. Infusion should be used within 12 hours of its preparation (10) and the dose which was used 100 mg / kg-B.W.P.O.

Procedure:

40 birds at age one day, the average weight 55g are housed in two cages and divided into two groups, each group has 20 birds.

1-treatment group:- administered the infusion of *Zingiber officinale* orally at dose 100 mg / kg body weight for 6 weeks.

2-control group: administered distilled water orally.

Composition of ration in broilers

Substances	Starter ration percentage	Finisher ration percentage
Corn	18	20
Wheat	48	49.2
Soyben meal	19	17.8
Concentrated protein	12	10
Calcium and phosphorus	1	1
Limestone	0.7	0.7
Methionin	1	1
Salt	0.3	0.3

Chemical analysis	Starter ration percentage	Finisher ration percentage
Metabolic energy	2931	2821
Crude protein	22.04	20.07
Phosphorus	0.5	1.30
Calcium	1.3	0.44
Crude fiber	3.59	3.74
Lysin	1.21	1.08
Methionine	0.31	0.31

Body weight: the bird weigh at one day of age, weekly body weight was taken for each bird.

Food intake: weekly food intake was taken to each group as follow.

Food intake (g) = quantity of daily given food – quantity of remained food.

Hematological test: blood samples were taken from ten birds of each group from brachial vein at the end of experiment .some of blood samples were put in test tubes containing EDTA and the others put in test tubes without anticoagulant for preparing of serum.

-Hemoglobin concentration: are measured as in Varley method (11).

-packed cell volume: are measured as in Coles method (12).

-cholesterol and glucose concentration: are measured as in Kaplan method (13, 14).

Statistical analysis:

Students t - test was used to analyze the significance of differences between treatment group and control group. (15).

Results :

1-Hemoglobin concentration:-

Results showed significant effect of *Z. Officinale* roots infusion on Hemoglobin concentration ,there is

significant increase($P < 0.05$) in hemoglobin concentration in treatment group compared with the control table(1).

Table -1- Effect of *Z. officinale* roots infusion on Hb concentration in broiler chickens

Hb Concentration g /dl	Treatment group	Control group
	13.95 $\pm$ 0.02a	11.56 $\pm$ 0.3b

- Values are mean $\pm$ SEM

- the small letters indicate there is significant difference ($P < 0.05$) between two groups.

2-Packed cell volume:

results showed significant effect of *Z. Officinale* roots infusion on packed

cell volume ,there is significant increase($P < 0.05$)in packed cell volume in the treatment group compared with the control table(2).

Table -2- Effect of *Z. officinale* roots infusion on packed cell volume in broiler chickens

	Treatment group	Control group
Packed cell volume %	35.4 $\pm$ 2.04 a	25.8 $\pm$ 2.18 b

-values are mean $\pm$ SEM

-small letters indicate there is significant difference ($P < 0.05$) between groups.

3-glucose concentration:

Results showed effect of *Z.officinale* roots infusion on glucose concentration, there is significant

decrease ($P < 0.05$) in glucose concentration in the treatment group compared with the control as in table (3).

Table -3- Effect of *Z. officinale* roots infusion on glucose concentration in broiler chickens

groups	Glucose concentration mg / dl of blood
treatment	103.95±1.3 a
control	173.89±2.8 b

-values are mean ± SEM

-small letters reveals to significant differences ($P < 0.05$) between groups.

4- Cholesterol concentration :

The results showed significant effect of *Z. officinale* roots infusion on cholesterol concentration , there is

significant decrease ($P < 0.05$) in cholesterol concentration in treatment group compared with the control as in Table(4) .

Table (4) Effect of *Z. officinale* roots infusion on cholesterol levels in broiler chickens

groups	Cholesterol level mg /dl of blood
treatment	104.5±1.7 a
control	212.57±3.6 b

-values are mean ± SEM

-small letters indicate to significant difference ($P < 0.05$) between groups.

5-Food intake:-

Results showed no significant effect of *Z. officinale* roots infusion on food intake , there is no significant

differences ($p < 0.05$) in food intake between treatment group and control. (Table 5).

Table (5) Effect of *Z. officinale* roots infusion on food intake in broiler chickens

Age weeks	in	Food intake of treatment group (g)	Food intake of control group (g)
1		267.83 $\pm$ 4.9 a	249.5 $\pm$ 5.3 a
2		317.8 $\pm$ 1.6 a	278 $\pm$ 2.9 a
3		419 $\pm$ 3.4 a	427 $\pm$ 5 a
4		557.42 $\pm$ 3.8 a	558.14 $\pm$ 2.8 a
5		605 $\pm$ 5 a	639 $\pm$ 6.2 a
6		914 $\pm$ 1.8 a	902.16 $\pm$ 2.2 a

-values are mean $\pm$ SEM

-small letters reveals that there is no significant difference between groups.

6-Body weight:

Results showed no significant effect of *Z. officinale* roots infusion there

is no significant differences ($p < 0.05$) in body weight between treatment group and control table (6).

Table (6) Effect of *Z. officinale* roots infusion on body weight in broiler chickens.

Age week	in	Body weight(g) of control group	Body weight(g) of treatment group
1		175.6 $\pm$ 4a	156 $\pm$ 3.4a
2		195.8 $\pm$ 2.7a	189.4 $\pm$ 2.1a
3		308.6 $\pm$ 1.7a	296.4 $\pm$ 3.8a
4		524.2 $\pm$ 3.7a	443.2 $\pm$ 3.2a
5		842 $\pm$ 4.7a	734.6 $\pm$ 3.8a
6		1382 $\pm$ 3.9a	1255 $\pm$ 3.8a

- values are mean $\pm$ SEM

- small letters indicate no significant difference ($P < 0.05$) between groups.

Discussion:

1-Hemoglobin concentration :- the significant effect of *Z. officinale* roots infusion on hemoglobin concentration due to the effect of

ginger on blood circulation and increase circulating red blood cells, or the effect of gingerol and shagoals on erythropoietin, this accepted with

recent studies on *Z. officinale*, researcher found that *Z. officinale* aqueous extract increased significantly ($p < 0.05$) the lowered levels of red blood cells and hemoglobin concentration in rats.(3,16)

2-Packed cell volume:-the significant effect of *Z. officinale* roots infusion on packed cell volume due to increase circulating red blood cells, this is accepted with new study on *Z. officinale* roots extract, researchers found that *Z. officinale* roots aqueous extract increased significantly ($p < 0.05$) the lowered levels of packed cell volume in rats (3,16).

3- Glucose concentration :- the significant effect of *Zingiber officinale* roots infusion on glucose concentration is by increasing insulin levels, this is accepted with a study on *Zingiber officinale* roots extract, the researchers found that the treatment of diabetic rats with *Zingiber officinale* aqueous extract produce significant increase ($P < 0.05$) in insulin levels and decrease in fasting glucose levels. This study suggest potential antidiabetic activity of the Juice of *Zingiber officinale* in type 1 diabetic rats possibly involving 5-HT receptor (17) second study found that gingerol-treated cells increase insulin- sensitive glucose uptake, thus ginger may enhance the insulin sensitivity and improve chronic disease such as diabetes (18). In another study, researchers found that the ethanolic extract of *Zingiber*

officinale in rats and mice useful in treatment or control type 2 diabetes mellitus (19). Another study showed that ginger(*Zingiber officinali*) was effective in lowering serum glucose(20).

4- Cholesterol levels :- the significant effect of (*Zingiber officinale*) roots infusion on cholesterol concentration was due to antioxidant action of (*Zingiber officinale*) extract results from gingerols and shagaols, active components in ginger, gingerol inhibit lipid peroxidation (2,21,22), and can scavenge superoxide anion and hydroxyl radicals(23,24,25,26).

In a study researchers found that consumption of ginger extract significantly ($P < 0.05$) reduced level of triglycerides, VLDL and LDL in plasma (27).

In another study researchers found that cellular cholesterol synthesis rate was reduced significantly ($P < 0.05$) in macrophage derived from mice consumed ginger extract compared to those from control (1) another study found that treatment with *Zingiber officinale* extract cause significant decrease in serum cholesterol, serum triglyceride and blood pressure in diabetic rats(28,29).

Second study found that supplementation of ginger extract to broiler chickens improved antioxidant status and reduce cholesterol levels (30).

5- Food intake:- the (*Zingiber officinale*) roots infusion has no

significant effect on food intake. There is no study explains this effect but may be due to less effect of infusion on appetite(4).

6- **Body weight** :- the (*Zingiber officinale*) roots infusion has no significant effect on body weight due to zingerone , the major pungent component of ginger prevent fat storage and reduce the absorption of fat from the small intestine (8,31).

References:

- 1- Mccann, J. (2003). Herbal Medicine Hand Book. 2nd ed. Philadelphia; Lippincott.
- 2- Foster S. (2003). Ginger (*Zingiber officinale*): Your food is your medicine. Steven Foster Group pp: 1 – 5 (online).
- 3- Ody, P. (2000) Complete Guide to Medicinal Herbs 2nd ed . London : Dorling –Kinderesly ;
- 4- Wichti , M. (2004) . Herbal Drugs and phytopharmaceutical 3rd ed . Boca Raton , FL : CRC Press . PP. : 653 – 656.
- 5- Joshi, H. and parle, M. (2006). (*Zingiber officinale*) Evaluation of its notropic effect in mice. Afr. J. Traditional Complementary and Alternative Medicine. 3(1): 64 – 74.
- 6- Borrelli, F. (2005). Effectiveness and safety of ginger in the treatment of pregnancy Induced nausea and vomiting. Obstet. Gynecol. 19(1): 54 – 7.
- 7- Fuhrman, B.; Rosenblat, M.; Hayek, T.; Coleman, R. and Avirma, M. (2000). Ginger extract consumption reduces development of atherosclerotic, apolipoprotein E-deficient mice. J. Nutr. Bio: 1124 – 1131.
- 8- Han , L. K.; Morimoto , C.; Zheng , y. N.; Li , w.; Asami , E.; Okuda , H. and Saito , M . (2008). Effect of zingerone on fat storage in overictomized rats. Yakuga kuzashi. 128 (8): 1195 – 2011.
- 9- Jagetia G. C.; Baliga M. S.; Venkatesh P. and Ulloor J. N. (2003). Influence of ginger rhizome (*Zingiber officinal* Rosco) on survival, glutathione and lipid peroxidation in mice after whole – body exposure to gamma radiation. Radiat Res. 160: 584 – 592. (Pub–Med)
- 10- Hand, S. S; Mundkinajeddu, D. and joseph, Q. R. (1998). Method for extraction of medicinal plants. Indian Herbal Pharmacopia. Tanushree Enter prises – worli Naka. Mubia India. (1): 46 – 98.
- 11- Varley, H. A.; Growenlock, K. and Bell, M. (1980) . Practical Clinical Biochemistry. 5thed . London ; William Heinemann medical book.
- 12- Coles. H. E. (1986) . Veterinary Clinical Pathology . 4thed .W .B. Saunders. London.

- 13- Kaplan, L. A. (1984) Glucose Kaplan A. Clin. Chem. Mosby CO. St. Louis. Toronto .1032 – 1036.
- 14- Naito, H. K. (1984) . Cholesterol Kaphlan A. Clin. The C.V. Mosby CO. St Louis. Toronto. 1194 –1206.
- 15- AL - Rawi, K, M. and Khalaf – AL A, A. (1980). Design and analysis of agriculture experiment. College of Agriculture, Mosul University.
- 16- Olayaki , L. A.; AJlbacdle , K. S. Gesua , S. S. and Soladoye , A. O. (2007) Effect of (*Zingiber officinale*) on some hematological values in Alloxan – induced diabetic rats . Pharmaceutical Biology. 45(7) :55 – 559.
- 17- Heimes, K.; Feistel, B. and verpohi, E. J. (2009). Impact of the 5-HT3 receptor channel system for insulin secretion and interaction of ginger extracts. Eur. J. pharmacol . 10(1 – 3): 58 – 65 (pub – med).
- 18- Sekiya K , Othani A. and Kusano S.(2004) Enhancement of insulin sensitivity in adipocytes by ginger . Biofactors . 22(1 – 4) : 153 – 6.
- 19- Nammi, S.; Sreemantula, S. and Roufogalis, B. D. (2009). Protective effect of ethanolic extract of (*Zingiber officinale rhizome*) on the development of metabolic.
- 20- AL-Amin , Z.M.; Thomson , M .; AL-Qatan , K.K .; Peltonen-Shalaby , R and Ali , M.(2006). Anti-dibetic and hypolipidemic properties of ginger (*Zingiber officinale*) in streptozotocin–induced diabetic rats.Br.J.Nutr.96(4):660 – 6.
- 21- Shukla, Y. and Singh, M. (2007) . Cancer preventive properties of ginger. food . Chem . Toxicol . 45(5) : 683 – 90.
- 22- Verma , S , K.; Singh , M.; Jain , P. and Bordia , S. (2004) . Protective effect of ginger , (*Zingiber officinale Rosc*) , on experimental atherosclerosis in rabbits . Indian J.Exp. Biol. 42 : 736 – 738 (Medline).
- 23- Akhani, S.P.(2004).Antidiabetic activity of the juice of *Z. officinale* in type 1diabetic rats College of Pharmacy, India, J. Pharme Pharmacol. 56(1):101-.
- 24- Croft, K. D. (1999). Antioxidant effect of plant phenolic compunds. In : "Antioxants in Human Health and Disease "cited by Basu , T. K; Temple , N. J. and Garg , M. L. New York. CABI publishing . Pp: 109 – 121.
- 25- Jeyakumar, S.; Nalini, N. and Venugopal, M. (1999). Antioxidant activity of ginger in rats fed a high fat – diet. Med. Sci. Res. 27: 341 – 344.

- 26- Masuda Y, Kikuzaki H, Hisamoto M, Nakatani , N. (2004). Antioxidant properties of gingerol related compounds from ginger. *Biofactors*. 21 (1 – 4) : 293 – 66.
- 27- Rosanna Y. Y. Lam , Mphil , Anthoy Y. H. Woo , po – Sing Leung , (2007)Antioxidant Actions of phenolic Compounds found in dietary plants on Low – Density Lipoprotein and Erythrocytes in vitro . *Journal of the American College of Nutrition* . 26(3) :233 – 242.
- 28- Asnani, V. M. and Verma, R. J. (2009). Ameliorative effects of ginger extract on paraben induced lipid peroxidation in the liver of mice. *Acta. Pol. Pharm*. 66(3) : 225 8 (pub – med).
- 29- Liu, N.; Huo, G.; Zhang, L. and Zhang, X. (2003) Effect of (*Zingiber officinale Rosco*) on Lipid peroxidation in hyperlipidemia rats. *Wesheng yanJiu*. (32) :22 – 23 (Medline).
- 30- Zhang , G. F. ; Yang , Z. B; Wang , Y.; Yang , W. R. Jiang , Siz and Gai , G. S. (2009) .Effect of Ginger root (*Zingiber officinale*) processed to different particle size on growth performance , antioxidant status , and serum metabolites of boiler chickens . *J. Poult . Sci* 88 : 2159 – 2166.
- 31- Natural Medicine Comprehensive . Database . (2006) Retrieved June 2006 from <http://www.naturaldatabase.com>.