HISTOLOGICAL EFFECT OF INCLUSION DIFFERENT LEVELS OF CORIANDER OIL IN BROILER DIET ON SMALL INTESTINE

Hassan S.A. Al-Tememy F. K. Al-Jaff E.H. Al-Mashhadani Sunbul J. Hamodi

***Department of Animal Resource- College of Agriculture- University of Baghdad – Iraq.**

ABSTRACT

This study was conduced at the poultry farm, Animal Resource Department, Collage of Agriculture, University of Baghdad from 20-4-2010 to 4-6-2010, to investigate the potential effect of coriander oil on intestine histometrical traits in broiler . One hundred and thirty five Arbor acers day-old broiler chicks were randomly assigned in to three dietary treatments with three replicate pens per trearment (15 birds/pen). Birds were fed experimental diets containing 0%,0.5% and 1% coriander oil. Water and feed were provided *ad libitum* during the six weeks experimental period. Three experimental birds were taken randomly from each treatments at 42 day and anesthetized by using chloroform inhalation in closed chambers and then the necropsy were applied to removed the small intestine. Histological technique were applied on each samples and also the ocular micrometer were used to measured the thickness of the intestinal wall layers.

Results showed that feed conversion ratio were significantly ($p<0.05$) higher in the (T2 and T3) as compared with control treatment. Chicks in (T2 and T3) had significantly ($P<0.05$) higher thickness in duodenum wall than control (T1), but the mucosal layer thickness were more significantly ($P<0.05$) in (T3) . The jejunum wall and mucosal layer thickness were significantly ($P<0.05$) higher in (T2) group. While chicks in (T3) had significantly ($P<0.05$) higher wall and mucosal layer thickness in ileum compared with T1 and T2 .

In conclusion the results showed that the increase in the intestinal wall thickness indicate that the intestine is highly activated in digestion and absorption function that lead to increase of feed conversion ratio.

INTRODUCTION

The nutritional value of diet fed to chicken had traditionally been evaluated to growth performance and nutrient digestibility. In additional to nutritional physiological studies the research on intestinal structure was also important. As the intestine was the digestive and absorptive organ.

In macroscopic anatomy , the guts of poultry differ relative to body weight (Thoma,1984) . Fowls produced for meat purpose , such as broiler chickens and piking ducks , had intestines of greater length and area than those of egg laying fowl , such as the white leghorn chicken and wild duck (Yamauchi *et.al.*,1990)

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Herbs and spices are most important part of human diet. In addition to boosting flavor, herbs and spices are also known for their preservative and medicinal value (Saeed and Tariq,2006), which forms one of the oldest sciences. Coriandrum Sativum (Coriander) is considered both as an herb and a spice.

It has been referred to as antidiabitic (Gray and Flatt, 1999) and hypocholesterolenic (Chithra et.al.,1997; Dhanapakiam et.al.,2008) The seed of coriander sativum contain 0.5-1% essential oil which is rich in beneficial phytonnutrients including carvone, geraniol, limonene, borneol, camphor, elemol and linalool. Coriander's flavonoides include quercitin, kaempferol, rhamentin and apigenin. It also contains active phenolic acid compounds including caffeic and cholorogenic acid. (Isao e.al.,2004) suggested that the volatile oils have antimicrobial properties against food borne pathogen such as Salmonella species. Aromatic plants and essential oils extracted from these plants have become more important due to their potential antimicrobial and stimulating effects on digestive system (Lee et al., 2004). They have a stimulating effect on the digestive system of animals, Through the increasing production of digestive enzyme and by improving the utilization of digestive products through enhanced liver function (langhout, 2002; Williams and Losa, 2001 and Hermandez et. al., 2004). Limited research has suggested that some aromatic plants and their components could improve feed intake, feed conversion ratio and carcass yield (Ather, 2002; Basset, 2000; Herampt, 2001 and Tucker, 2002).

Small intestine include the duodenum , jejunum and ileum , there were no distinguishable on gross observation between duodenum and jejunum , while the Mickel diverticulum is often used as a landmark to separate the jejunum and ileum (Chikilian and Speroni,1996; Duke,1994).

Intestinal wall histologicaly consist of four layers : mucosa , sub mucosa , muscularis and serosa , the mucosa of small intestine forms villi which project into the lumen and greatly increase the overall absorption surface area of the organ . The surface epithelium of the villi is small columnar epithelium with numerous goblet cells . Intestinal absorptive cells have extensive microvilli on its apical surface . Goblet cells are scattered between the absorptive cells and produce the mucous . Intestinal glands (Crypts of lieberkuhn) extend from the base of the villi into the underlying lamina properia . Undifferentiated epithelial cells located in the glands divide and migrate up to renew the glandular and surface epithelium every 24-48 hr . Acidophilic granular cells (paneth cells) are present in the epithelium at the base of the gland , these cells produce peptidase and lysozyme and may be phagocytic . Enteroendocrine cells are also present in the epithelium of the intestinal gland . Tunica sub mucosa is very thin in chicken with absent of bronner gland , tunica muscularis is characterized by two layers of smooth muscle , the inner layer of circular muscle fibers are surrounded by an outer of longitudinal folds . Myentrice plexi are often present between muscle layers . Atypical tunica serosa lies outside the tunica muscularis

as the outermost layer of the organ (Ann, 2004; Elizabeth and Fredric,2001; Ziswiler and Farner,1979) .

In comparative of small intestinal villi between white layer and broiler chicken , the broiler have large villi and more matured ultrastructure in the epithelial cells than those in white layer (Yamauchi, 2002,2001; Yamauchi and Tarachai,2000) . The villi from both types of chickens form zig-zag arrangement which is thought to slow ingesta flow (Yamauchi and Isshiki, 1991; Altken, 1960; Gebella,1985).

MATERIAL AND METHODS

This study was conduced at the poultry farm, Animal Resource Department, Collage of Agriculture, University of Baghdad from 20-4-2010 to 4-6-2010, during summer months to study the effect of inclusion different levels of coriander oil as diet ingredient on histological structure of small intestinal wall of broiler chickens . A total of 135 Arbor acers day-old broiler chicks were assigned randomly to three dietary treatments form 1-6 weeks of age, with three replicate pens (15 birds/pen). The experimental diets were control (T1), 0.5% coriander oil (T2), and 1% coriander oil (T3). The experimental diets formulated to isocaloric and isonitrogenic according to NRC (1994).

Feed and water were provided *ad libitum* through out the experimental period, Birds were vaccinated against Newcastle and Gumboro disease according to their age. Histological criteria at the end of the study, which include intestinal wall layers thickness (mucosa, sub mucosa, muscularis and sesrosa). Three experimental birds were isolated randomly from each treatments at 42 day and anesthetized by using chloroform inhalation in closed champers and then the necropsy were applied to removed the small intestine. The samples were immediately fixed by formalin (10%) for 24 hours. After dehydration with ethyl alcohol in increasing concentration (70-100%) and passed in two content of xylol the samples were embedded in paraffin , sectioned by the rotary microtome at 5µm. After slides samples were passed through the decreasing concentration (100-70%) of ethylic alcohol and in xylol. The histological slides were stained by Hematoxylin and Eosin stain (Luna, 1968). An ocular micrometer were used to measured the thickness of the intestinal wall layers (Bancroft and Cook, 1984; Crossmon,1937).

Data were subjected to analysis of variance (SAS, 2001) and significant treatment means were separated by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

The effect of coriander oil on feed conversion ratio (g. feed/ g. gain) are presented in table1. The inclusion of treatment T2 and T3 were resulted in significant ($p<0.05$) higher feed conversion ratio as compared with control group. While, there were not significantly ($p<0.05$) different in the average of feed conversion ratio between treatments T2 and T3. Table 2 show the

comparative of duodenum wall thickness between all treatment . Chicks in T2 and T3 had significantly (P<0.05) higher thickness in total duodenum wall than T1 . The same result was appeared in jejunum and that showed in table 3. Table 4 show that the T3 had significantly (P<0.05) higher wall thickness in ileum compared with T1 and T2 .

The effect of adding different levels of coriander oil on mucosal layer thickness of small intestinal wall in duodenum , jejunum and ileum were shown in tables 5,6 and 7 respectively . Chicks in T3 had significantly (P<0.05) higher thickness of duodenal mucosal layer than the other treatment groups that shown in table 5 . Table 6 show that there were higher significantly (P<0.05) for T2 in jejunum mucosal layer thickness compared with the treatments . While T3 had significantly (P<0.05) more thickness in ileum mucosal layer from T1 and T2 and that shown in table 7 .

Table1. *The effect of adding coriander oil to the diet on feed conversion ratio (g feed/g gain) of broiler chicks from 1-6 weeks of age.*

Week	Control T1	Coriander oil (% in diet) 0.5 T2	1 T3	Levels of significance
1	1.94±0.12b	2.08±0.10a	1.90±0.02b	*
2	2.11±0.01a	2.11±0.01a	1.95±0.02b	*
3	1.96±0.11a	1.63±0.03b	1.60±0.02c	*
4	1.80±0.02b	1.45±0.22c	1.93±0.02a	*
5	1.83±0.01a	1.81±0.11b	1.74±0.02c	*
6	2.42±0.11b	2.65±0.22a	2.56±0.01c	*
1-6	2.01±0.03a	1.96±0.01b	1.94±0.03b	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil

Table 2. *The effect of adding coriander oil to the diet on duodenum wall layers thickness (mm) of broiler chicks at 6 weeks of age.*

Wall layers	Control T1	Coriander oil (% in diet) 0.5 T2	1 T3	Levels of significance
Mucosa	125.29±1.59c	255.85±1.03b	261.41±0.69a	*
Sub mucosa	0.455±0.005	0.455±0.005	0.455±0.005	**N.S.**
Muscularis	23.26±0.06a	18.225±1.48b	19.40±0.92ab	*
Serosa	3.47±0.26	2.89±0.10	2.95±0.16	**N.S.**
Total wall thickness	152.475±1.91b	277.925±3.11a	284.215±1.76a	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil
N.S.: not significant

Table 3. *The effect of adding coriander oil to the diet on jejunum wall layers thickness (mm) of broiler chicks at 6 weeks of age.*

Wall layers	Control T1	Coriander oil (% in diet)		Levels of significance
		0.5 T2	1 T3	
Mucosa	102.84±1.64c	160.35±1.32a	113.50±0.97b	*
Sub mucosa	0.46±0.005	0.46±0.005	0.46±0.005	**N.S.**
Muscularis	11.03±0.16b	14.43±0.45a	10.66±0.43b	*
Serosa	0.92±0.01b	1.85±0.005a	1.02±0.09b	*
Total wall thickness	115.255±1.80b	172.61±5.36a	125.655±1.50b	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil
N.S.: not significant

Table 4. *The effect of adding coriander oil to the diet on ileum wall layers thickness (mm) of broiler chicks at 6 weeks of age.*

Wall layers	Control T1	Coriander oil (% in diet)		Levels of significance
		0.5 T2	1 T3	
Mucosa	68.97±0.98c	90.48±0,27b	114.57±1.11	*
Sub mucosa	0.94±0.01	0.94±0.01	0.94±0.01	**N.S.**
Muscularis	13.00±0.05c	22.06±0.13a	17.84±0.17b	*
Serosa	3.33±1.32	2.04±0.18	2.33±0.47	**N.S.**
Total wall thickness	86.25±2.35c	115.53±0.6b	135.69±1.77a	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil
N.S.: not significant

Table 5. *The effect of adding coriander oil to th diet on duodenum mucosal layers thickness (mm) of broiler chicks at 6 weeks of age.*

Mucosal layer parts	Control T1	Coriander oil (% in diet)		Levels of significance
		0.5 T2	1 T3	
Villi length	108.03±1.12b	226.03±0.97a	229.58±0.43a	*
Crypts of lieberkuhn	15.42±0.43c	27.04±0.07b	29.04±0.24a	*
Muscularis mucosa	1.83±0.03b	2.77±0.02a	2.78±0.005a	*
Total mucosa thickness	125.29±1.59c	255.85±1.03b	261.41±0.69a	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil

Table 6. *The effect of adding coriander oil to the diet on jejunum mucosal layers thickness (mm) of broiler chicks at 6 weeks of age*.

Mucosal layer parts	Control T1	Coriander oil (% in diet) 0.5 T2	Coriander oil (% in diet) 1 T3	Levels of significance
Villi length	84.86±0.96c	130.64±0.44a	89.79±0.51b	*
Crypts of lieberkuhn	16.14±0.64c	27.84±0.87a	22.72±0.40b	*
Muscularis mucosa	1.83±0.03a	1.87±0.01a	0.99±0.06b	*
Total mucosa thickness	102.84±1.64c	160.35±1.32a	113.50±0.97b	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil

Table 7. *The effect of adding coriander oil to the diet on ileum mucosal layers thickness (mm) of broiler chicks at 6 weeks of age.*

Mucosal layer parts	Control T1	Coriander oil (% in diet) 0.5 T2	Coriander oil (% in diet) 1 T3	Levels of significance
Villi length	54.01±0.10c	65.94±0.09b	87.39±0.90a	*
Crypts of lieberkuhn	13.08±0.90c	22.66±0.34b	25.30±0.19a	*
Muscularis mucosa	1.88±0.02a	1.88±0.02a	1.88±0.02a	*
Total mucosa thickness	68.97±0.98c	90.48±0.27b	114.57±1.11a	*

a,b,c : Means in the same raw with different superscript are significantly different.
*(P<0.05).
Mean±Std. Error
T1: control; T2:0.5% coriander oil; T3:1% coriander oil

The results of the present study were in agreement with (Mass,1974;Miller,1975;Langhout et.al.,1999;Yasar and Forbes,1999) whom showed that the poultry innards are affected by diet . So the result of present study proved the effect of adding the different levels of coriander oil in diet on the histological structure of the wall of small intestinal parts . (Yamouchi and Zou,1988) believes that the feeding habits rather than individual body weight difference account for gross anatomical difference in the intestine, these report suggest the nutritional value of diet may produce microscopic alteration in the intestinal mucosa although the general histological feature of the intestine are well known .

The results show the increase in the intestinal wall thickness indicate that the intestine is highly activation in digestion and absorption function and that lead to increase of feed conversion ratio. Also the study proved that the

duodenum was the mainly part of small intestine in digestive and absorptive function because the duodenum had more wall thickness compared with other parts of small intestine and it fallowed by jejunum then ileum in this respect . These results were agree with (Yamauchi et.al.,1995) who suggest that the duodenum had highest villi length followed by lower length in jejunum and lowest length in ileum, these results were suggest that the vigorous absorptive part would be mainly the duodenum and then extend to the jejunum and ileum .

Differentiation of the intestinal wall thickness were result mainly from different in thickness of mucosal layer because this layer have the villi and intestinal glands (Crypts of lieberkuhn) , the increase of villi length cause increase the absorptive area , while the increase in crypts depth which is responsible for degeneration of absorptive epithelial cells of the villi and release the digestive enzymes, lead to more activity in degeneration of absorptive epithelial cells which covered the villi, and more active in releasing the digestive enzymes . The villus morphological feature correspond with increase feed intake and rapid growth rate of broiler suggesting a possibility of intestinal villus histological alterations related with intestinal function (Yamauchi and Isshiki,1991;Ziswiler and Farner,1972) . The study agree with (William and Linda ,2000) they suggested that the villus were larges in duodenum but gradually shorten and thicken caudally . The ileal villi are shorter (Yamuchi and Isshiki,1991;Yamuchi et.al.,1993) and lower (Yamuchi et.al.,1995,1996) than those of the duodenum and this indicate that the absorptive function of ileal villi were less active than that of intestinal proximal parts, this may be due to fact that nutrient have already been absorbed by the time intestinal contents reach the intestinal proximal parts (Yamuchi,2002) .

The present study show that the sub mucosal layer in the wall of small intestine were hadn't any activity in birds due to absence of Brunner glands compared with mammals . That agree with (William and Linda ,2000) who suggest that the wall of intestine of the chicken was similar to that of the mammals but the absence of duodenal glands and the an extremely thin sub mucosa in the chicken are notable difference . The results of this study indicated that the inclusion of different levels of coriander oil in broiler diet, resulted in increase of duodenum wall thickness in T2 group, ferther more, jejunum wall was thicker in T4 group, while ileal wall thickness was higher in T2,T4 than the control and T3.

REFERENSES

Ann, Jo. 2004. Veterinary histology. Chapter 32. University of Illinois.

Altken, R.N.C. 1960. A histological study of the stomach and intestine of the chicken. J. Anat. Vol.22, part 3. 457-460.

Ather, M. A. M. 2000. Polyherbal additives proves effective against vertical transmission of IBD. World poultry-Elsevier 16:50-52.

Bassett, R. 2000. Oreganos positive impact on poultry production. World Poultry-Elsevier. 16:31-34.

Bancroft, J. D. and Cook, H.C. 1984: Manual of Histological Techniques; Churchill Livingstone. Edinburgh.

Crossmon, G. 1937. A Modification of malloys Connective Tissue Stain with a Discussion of the principles involved. Anat. Rec. 69: 33-38.

Chikilian, M. and N. B. de Speroni .1996. Comparative study of the digestive system of three species of tinamou. I. *Crypturellus tataupa, Nothoprocta cinerascens*, and *Nothura maculosa* (Aves: Tinamidae). J. Morph. 228: 77-88.

Chithra, V. and S. Leelamma. 1997. Hypolipidermic effect of coriander seeds (Coriandrum sativum). Antioxidant enzyme in experimental animals. Ind. J. Biochem. Biophys, 36: 59-61.

Duke, G.E. 1994. Anatomy and physiology of the digestive system in fowl. Pages 46-49 *in* Proc. 21st Annual Carolina Poultry Nutrition Conference, Dec. 7-8, Charlotte, N.C.

Duncan's, D. B. 1955. Multiple range and multiple F tests. Biometrics. 11: 1-42.

Dhanapakiam, P., J. Mini Joseph, U. K. Ramaswamy, M. Moorthy and A. Senthilkumar. 2008. The Cholesterol lowering property of coriander seeds (coriandrum sativum): Mechanism of action. J. Evni. Biol. 29(1): 53-56.

Elizabeth and Fredric . 2001. Comparative veterinary histology with clinical correlates, First edition, Manson publishing / the veterinary press.

Gebella, G. 1985. Structure of the musculature of chickens small intestine. Anat. and Embr. 171:139-149. London.

Gray, A. M. and P. R. 1999. Insulin- releasing and insulin-like activity of the traditional anti-diabetic plant coriandrum sativum (coriander). Br. J. Nutr. 81: 203-209.

Hertrampt, J. W. 2001. Alternative antibacterial performance promoters. Poult. Int. 40: 50-52.

Hernandez, F., J. Madrid, V. Garcia, J. Orengo and M. D. Megias. 2004. Influence of tow plant extract on broiler performance, digestibility, and digestive organ size. Poult. Sci., 83: 169-174.

Longhout D. J., J. B. Schutte, P. Vanleerwen, J. Wiebenga and S. Tamminga.1999. Effect of dietary high and low methyllated citrus pectin on the activity of the ileal microflora and morphology of the small intestinal wall of broiler chickens. Br. Poult. Sci.. 340-347.

Luna, L. G. 1968. Manual of histologic staining methods of 5th armed forces institute of pathology. 3rd McGraw-Hill book Company-New York.

Langhout, P. 2000. New additives for broiler chickens. World Poultry. Elsevier. 16: 22-27.

Lee, K. W., H. Everts and A. C. Beynen. 2004. Essential oils in broiler nutrition. Int. J. Poult. Sci. 3:738-752.

Isao, K., F. Ken-Ichi, K. Aya, N. Ken-Ichi and A. Tetsuya . 2004. Antimicrobial activity of coriander volatile compound against Salmonella Choleraesuits. J. Agric. Food Chem. 52(11): 3329-3332.

Moss, R. 1974.Winter diets, gut lenghs and interspecific competition in Alaska ptarmigan .Auk. 91:737-746.

Miller, M.R. 1975. Gut morphology of mallards in relation to diat quality. J. of Wildlife Management. 39:1168-1173.

SAS. 2001. SAS user's guide: Statistics, Version 9th Ed. SAS instituse Inc., Cary N.C. USA.

Saeed, S. and P. Tariq. 2006. Effect of some seasonal vegetables and fruits on the growth of bacteria. Pak. J. Bio. Sci. 9(8): 1547-1551.

Thomas, V.G. 1984. Winter diet and intestinal proportions of rock and willow ptarmigan and sharp tailed grouse in Ontario. Can. J of Zoo., 62:2258-2263.

Tucker, L. 2002. Botanical broilers: Plant extracts to maintain poultry performance. Feed Int. 23, 26-29.

William J. and M. Linda .2000. Color atlas of veterinary histology, second edition, Awolter Klumer company.

Williams, P. and R. losa. 2001. The use of essential oils and their compounds in poultry nutrition. World Poult. Elsevier, 17:14-15.

Yasar, S. and J. M. Forbes. 1999. Performance and gastro-intestinal response of broiler chickens fed on cereal grain-based foods soaked in water. Br. Poult. Sci. 40:65-76.

Yamauchi K. and Z. X. Zhou . 1988. Comparative anatomical observations on small intestine of chickens and waterfowls. Worlds Poult. Congress, Nagoya Japan. 1059-1060.

Yamuachi K., K. Yamamoto and Y. Isshiki. 1995. Morphological alterations of the intestinal villi and absorptive epithelial cells in each intestinal part in fasted chickens. Japanese Poult. Sci. 32:241-251.

Yamauchi K. and Isshiki .1991. Scanning electron microscopic observation on the intestinal villi in growing White leghorn and Broiler chickens from 1 to 30 days of age . Br. Poult. Sci. 32:67-78.

Yamauchi K, E. Nakomura and Y. Isshiki. 1993. Development of the intestinal villi associated with the increased epithelial cell mitosis in chickens. Ani. Sci. and Tech. 64:340-350.

Yamauchi K, H. Kamisoyama and Y. Isshiki .1996. Effect of fasting and refeeding on structures of the intestinal villi and epithelial cell White leghorn hens. Br. Poult. Sci. 37:909-921.

Yamauchi, K. 2002. Review on chicken intestinal villus histological alterations related with intestinal function. J. Poul. Sci. 39:229-242.

Yamauchi K, Z-X. Zhou, E.I. Ibardolaza , Y. Isshiki and Nakahiro .1990. Comparative anatomical observations on each intestinal segment in chickens and waterfowls. Technical Bulletin of Faculty of Agriculture, Kagawa University. 42:7-13.

Yamauchi, K. 2002. Digestive / absorptive function and intestinal villus histology. Function and Information of Nutrients. Pp: 16-28. In Japanes.

Yamauchi, K. 2001. Digestive organ. Veterinary Histology. Second ed. Pp: 265-273. In Japanise.

Yamauchi K. and P. Tarachai . 2000. Changes in intestinal villi cell area and intracellular autophagic vacuoles related to intestinal function in chickens. Br. Poult. Sci. 41:416-423.

Ziswiler V. and D.S. Farner.1972. Digestion and digestive system. Avian Bio. Vol 2. pp:343-430. Academic press. London.

التأثير النسيجي لإضافة مستويات مختلفة من زيت الكزبرة في عليقة فروج اللحم على الأمعاء الدقيقة .

التميمي، حسن سعد عبد الحسين فرح خالد الجاف عيسى حسين المشهداني سنبل جاسم حمودي

*** قسم الثروة الحيوانية- كلية الزراعة- جامعة بغداد- العراق.**

الخلاصة

أجريت الدراسة في حقل الدواجن التابع إلى قسم الثروة الحيوانية في كلية الزراعة – جامعة بغداد من تاريخ 20-4-2010 إلى 4-6-2010 ، للتعرف على تأثير زيت الكزبرة على القياسات النسيجية لأمعاء فروج اللحم. تم توزيع 135 فرخا بعمر يوم واحد عشوائيا على ثلاث معاملات تغذوية باستخدام ثلاثة مكررات لكل معاملة (15 طير/قفص). تمت تغذية الطيور على علائق تحتوي 0% ، 0.5% و 1% زيت الكزبرة. قدم العلف والماء بشكل حر خلال مدة التجربة (6 أسابيع). اخذ ثلاثة طيور عشوائيا من كل معاملة بعمر 42 يوم، خدرت الطيور عن طريق استنشاق الكلوروفورم في حاوية مغلقة ثم أجريت الصفة التشريحية لغرض الحصول على الأمعاء الدقيقة. طبقت التقانة النسيجية على جميع العينات ثم تم قياس سمك طبقات جدار الأمعاء بواسطة استخدام المايكروميتر العيني.

أظهرت النتائج بان كفاءة التحويل الغذائي كانت أعلى معنويا ($P<0.05$) لمعاملة T3,T2 مقارنة بالمعاملات الأخرى . سمك جدار الاثنى عشري للمعاملات T2 و T3 كانت أعلى معنويا ($P<0.05$) مقارنة بمعاملة السيطرة، ولكن سمك الطبقة المخاطية كان أعلى معنويا في المعاملة T3 مقارنة بباقي المعاملات. سمك جدار الصائم والطبقة المخاطية لمعاملة T2 كانت أعلى معنويا ($P<0.05$) مقارنة بالمعاملات T1 و T3. بينما كان سمك الطبقة المخاطية وجدار اللفائفي للمعاملة T3 أعلى معنويا ($P<0.05$) مقارنة بباقي المعاملات.

نتائج الدراسة الحالية استنتجت بان الزيادة في سمك جدارالامعاء يعتبر مؤشرا على زيادة فاعلية الأمعاء في أداء وظيفتها في الهضم والامتصاص ويؤدي ذلك إلى زيادة معامل التحويل الغذائي.