EFFECT OF INCLUDING DIFFERENT LEVELS OF CORIANDER SEED IN BROILER DIET ON THE MEASURMENTS OF SMALL INTESTINE HISTOLOGY.

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SUMMARY

This study was Carried out to determine the potential effect of coriander seed as growth promoting substance in broiler chicks raised under summer condition in Iraq. One hundred and eighty day-old Arbor Acer broiler chick were randomly assigned to four dietary treatments with three replicate pens (15 birds/pen). Birds were fed experimental diets containing 0% (T1),1% (T2), 2% (T3) and 3% (T4) coriander seed. Water and feed were provided ad libitum during the experiment. 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. Histological technique were applied on each sample and also the ocular micrometer were used to measured the thickness of the intestinal wall layers. Result showed that feed conversion ratio were significantly ($p<0.05$) higher in the 2% (T3) coriander Supplemented diet as compared with other treatments. Chicks in (T2) had significantly ($P<0.05$) higher thickness in duodenum wall and mucosal layer than other treatments. The jejunum wall and mucosal layer thickness were significantly ($P<0.05$) higher in (T4) group. While chicks in (T2) and (T4) had significantly ($P<0.05$) higher wall and mucosal layer thickness in ileum compared with T1 and T3. In conclusion, using coriander seeds in broiler chicks diet improved the overall function and efficiency of small intestine.

Keywords: *coriander seed, broiler, small intestine wall layers.*

INTRUDUCTION

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 Pekin ducks, have 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) .

Coriander (*Coriandrum sativum* L.) is culinary and medicinal plant from the umbeliferae family. This plant is widely distributed and mainly cultivated for seed. The seed contain an essential oil up to 1% and the the monoteroid, Linalool in the mean component. Coriander the active ingredients are a potential antibacterial (Burtm, 2004; Cantore et al., 2004; Kubo et al., 2004), antioxidant (Wangensteen et.al., 2004) antidiabetic (Gallagher et al., 2003) and stimulatory effects in the digestion process (Cabuk et al., 2003). However, few reports are available concerning the effect of coriander seed on poultry performance (Saeid and Al-Nasry, 2010).

Small segments include the duodenum, jejunum and ileum, show no demarcation 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 histological structure 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) .

In comparative of small intestinal villi between white layer and broiler chicken , the broiler have larger 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 and Altken, 1960).

The early comparative studies on the intestine of birds have showed the arrangement of the mucosa, the smooth musculature and intramural nerves is not substantially different from that found in the mammalian intestine (Gebella, 1985). Astrong correlation between the anatomy of gut with feeding habits of the bird species, (Ziswiler and Farner, 1972) show that length of small and large intestine were correlated with fiber content in the diet. The aim of the present trial was to study the effect of different level of coriander seed on the wall thickness of duodenum, jejunum and ileum.

MATERIAL AND MEHODS

This study was carried out at the poultry farm, Animal Resource Department, University of Baghdad, Collage of Agriculture, during summer months to study the effect of inclusion different levels of coriander seed (*Coriandrum sativum* L.) as diet supplementation on histological structure of small intestinal wall of broiler chickens .

Treatments : A total of 180 day-old broiler were allocated randomly (utilizing a complete randomize design (CRD) to four dietary treatment from 1-42 days of age, with three replicate pens (15 birds/pen). The experimental diets were control (T1), 1% coriander seed (T2), 2% Coriander seed (T3) and 3% coriander seed (T4). The experimental diets were formulated to be isocaloric and isonitrogenous 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 different levels of coriander seed on feed conversion ratio (g. feed/ g. gain) are presented in Table (1). The inclusion of 2% coriander seed resulted in significant ($p<0.05$) better feed conversion ratio as compared with other groups. While, feed conversion ratio on average for the control treatment 0% (T1) and 1% (T2) coriander seed were significantly lower ($p<0.05$) as compared to 2% (T3) and 3% (T4) coriander supplemented diet. Table (2) show comparative of duodenum wall thickness between all treatment . Chicks in T2 had significantly ($P<0.05$) higher thickness in duodenum wall than other treatments . While T4 had significantly ($P<0.05$) higher thickness in jejunum wall than the treatments as

shown in Table (3). Data in Table (4) show that the T2 and T4 had significantly (P<0.05) higher wall thickness in ileum compared with T1 and T3 .

Table (1). The effect of different levels of coriander seed on feed conversion ratio (g. feed/g. gain) in broiler at 42 day-old.

Week	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	Levels of significance
1	1.93±0.56	2.22±0.32	1.85±0.56	1.85±0.61	N.S.
2	2.10±0.10b	2.40±0.12a	1.84±0.02c	1.88±0.02c	*
3	1.94±1.02b	1.98±0.08a	1.73±0.11c	1.71±0.02c	*
4	1.80±0.03b	1.72±0.25c	2.09±0.01a	1.74±0.12d	*
5	1.81±0.02a	1.79±0.20a	1.79±0.23a	1.77±0.32a	N.S.
6	2.41±0.02a	2.30±0.02b	2.28±0.01c	2.53±0.21a	*
1-6	1.99±0.11a	2.06±0.31a	1.93±0.10b	1.91±0.11b	*

a,b,c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
N.S.: not significant

Table (2). The comparative of duodenum wall layers thickness of broiler chicks at 42 day-old .

Wall layers	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	Levels of significance
Mucosa	125.290±1.59d	222.630±1.52a	167.935±0.86c	189.770±2.84b	*
Sub mucosa	0.455±0.005a	0.455±0.005a	0.455±0.005a	0.455±0.005a	N.S.
Muscularis	23.26±0.06a	23.15±0.17a	23.27±0.05a	19.405±0.805b	*
Serosa	3.47±0.26	3.48±0.25a	3.42±0.30a	2.94±0.15a	N.S.
Total wall thickness	152.475±1.91	249.715±1.09a	195.265±0.68	212.575±3.79b	*

a,b,c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control; T2:1% coriander seed; T3:2% coriander seed; T4:3% coriander seed
N.S.: not significant

Table (3). The comparative of jejunum wall layers thickness of broiler chicks at 42 day-old.

Wall layers	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	Levels of significance
Mucosa	102.84±1.64d	155.39±0.53b	117.60±0.99c	196.52±0.29a	*
Sub mucosa	0.46±0.005	0.46±0.005	1.46±0.005	0.46±0.005	N.S.
Muscularis	11.03±0.16b	18.44±0.21a	11.95±1.69b	21.13±0.67a	*
Serosa	0.92±0.01b	1.88±0.02a	0.96±0.03b	1.88±0.02a	*
Total wall thickness	115.255±1.80d	176.185±0.34b	130.985±2.72c	220.005±0.99a	*

a,b,c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
N.S.: not significant

Table (4). The comparative of ileum wall layers thickness of broiler chicks at 42 day- old.

Wall layers	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	Levels of significance
Mucosa	68.97±0.98b	82.11±1.89a	72.48±0.27b	86.13±0.57a	*
Sub mucosa	0.94±0.01	0.94±0.01	0.94±0.01	0.94±0.01	N.S.
Muscularis	13.0±0.05c	15.01±0.09b	13.48±0.42c	17.80±0.13a	*
Serosa	3.33±1.32	2.38±0.52	2.06±0.20	1.44±0.51	N.S.
Total wall thickness	86.25±2.355b	100.45±2.52a	88.96±0.35b	106.315±1.22a	*

a,b,c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
N.S.: not significant

The effect of adding different levels of coriander seed on mucosal layer thickness in duodenum , jejunum and ileum were shown in Tables (5,6 and 7) respectively. Chicks in T2 had significantly (P<0.05) higher thickness of duodenal mucosal layer than the other treatment groups (Table 5) . Table (6) show that there were higher significantly (P<0.05) for T4 in jejunum mucosal layer thickness compared with the treatments . While T2 and T4 had significantly (P<0.05) more thickness in ileum mucosal layer from T1 and T3 (Table 7) .

Table (5). The effect of adding different levels of coriander seed on duodenum mucosal layers thickness of broiler chicks at 42 day- old.

Mucosal layer parts	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	P
Villi length	108.03±1.12d	194.23±1.10a	134.29±0.88c	56.32±2.87b	*
Crypts of lieberkuhn	15.42±0.43c	25.55±0.35b	30.84±0.02a	30.59±0.09a	*
Muscularis mucosa	1.83±0.03b	2.85±0.06a	2.79±0.005a	2.85±0.06a	*
Total mucosa thickness	125.29±1.59d	222.63±1.52a	167.93±0.86c	189.77±2.84b	*

a,b,c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
P: Levels of significance

Obtained results are 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 proved the effect of adding the different levels of coriander seed 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, Furthermore, these report suggest That 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 indicating that the intestine is highly activate in digestion and absorption function and may 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 the highest villi length followed by jejunum then ileum, the results were suggest that the vigorous absorptive part would be mainly the duodenum and then extend to the jejunum and ileum .

Table (6). The effect of adding different levels of coriander seed on jejunum mucosal layers thickness of broiler chicks at 42 day- old.

Mucosal layer parts	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	P
Villi length	84.86±0.96d	110.55±0.46b	95.63±0.47c	158.56±0.46a	*
Crypts of lieberkuhn	16.14±0.64d	41.99±0.01a	19.81±0.22c	34.16±0.25b	*
Muscularis mucosa	1.83±0.03c	2.84±0.05b	1.89±0.03c	3.80±0.08a	*
Total mucosa thickness	102.84±1,64d	155.39±0.53b	117.06±0.99c	196.52±0.29a	*

a.b.c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
P: Levels of significance

Table (7). The effect of adding different levels of coriander seed on ileum mucosal layers thickness of broiler chicks at 42 day- old.

Mucosal layer parts	Control T1	Coriander seed (% in diet) 1 T2	2 T3	3 T4	P
Villi length	54.01±0.10c	67.22±0.98a	57.52±0.31b	67.48±0.52a	*
Crypts of lieberkuhn	13.08±0.90b	13.01±0.89b	13.08±0.02b	16.77±0.03a	*
Muscularis mucosa	1.88±0.02a	1.88±0.02a	1.88±0.02a	1.88±0.02a	*
Total mucosa thickness	68.97±0.98b	82.11±1.89a	72.48±0.27b	86.13±0.57a	*

a.b.c,d : Means in the same raw with different superscript are significantly different.
**(P<0.05).*
Mean±Std. Error
T1: control(0%); T2:(1%); T3:(2%) and T4:(3%) coriander seed
P: Levels of significance

Differentiation of the intestinal wall thickness resulted mainly from different in thickness of mucosal layer because presence of villi and intestinal glands (Crypts of lieberkuhn) . Increasing of villi length increased the absorptive area . While the increasing in crypts depth 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) who suggested that the villus were larger 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 lack 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 thin sub mucosa in the chicken are noticeable . The results of this study indicated that the inclusion of different levels of coriander seed in broiler diet, resulted in increase of duodenum wall thickness in T2 group, farther more, jejunum wall was thicker in T4 group, while ileal wall thickness was higher in T2,T4 than the control and T3.

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التأثير النسيجي لإضافة مستويات مختلفة من بذور الكزبرة في عليقة فروج اللحم على الامعاء الدقيقة.

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قسم الثروة الحيوانية/ كلية الزراعة/ جامعة بغداد- العراق

اجريت الدراسة لمعرفة تأثير بذور الكزبرة على القياسات النسيجية لأمعاء فروج اللحم . تم توزيع 180 فرخ بعمر يوم واحد عشوائيا على ثلاث معاملات تغذوية بأستخدام ثلاث مكررات لكل معاملة (15 طير/قفص) . تمت تغذية الطيور على علائق 1% ، 2% و 3% بذور الكزبرة . قدم العلف والماء حتى الشبع خلال مدة التجربة (6 اسابيع) . اخذ ثلاث طيور عشوائيا من كل معاملة بعمر 42 يوم، خدرت الطيور عن طريق استنشاق الكلوروفورم في حاوية مغلقة ثم اجريت الصفة التشريحية لغرض الحصول على الامعاء الدقيقة. طبقت التقانة النسيجية على جميع العينات ثم تم قياس سمك طبقات جدار الامعاء بواسطة استخدام المايكروميتر العيني.

اظهرت النتائج بان كفائة التحويل الغذائي كانت اعلى معنويا ($P<0.05$) لمعاملة T3 مقارنة بالمعاملات الاخرى . سمك جدار الاثنى عشري للمعاملة T2 كانت اعلى معنويا ($P<0.05$) مقارنة بمعاملة السيطرة، ولكن سمك الطبقة المخاطية كان اعلى معنويا في المعاملة T2 مقارنة بباقي المعاملات. سمك جدار الصائم والطبقة المخاطية لمعاملة T4 كانت اعلى معنويا($P<0.05$) مقارنة بالمعاملات T1. بينما كان سمك الطبقة المخاطية وجدار اللفافي للمعاملات T2 و T4 اعلى معنويا ($P<0.05$) مقارنة بباقي المعاملات.

نتائج الدراسة الحالية استنتجت بان الزيادة في سمك جدارالامعاء يعتبر مؤشر على زيادة فاعلية الامعاء في اداء وظيفتها في الهضم والامتصاص ويؤدي ذلك الى زيادة معامل التحويل الغذائي كنتيجه للمعاملات الغذائيه باستخدام الكسبرة فى علائق كتاكيت اللحم.