Kafrelsheikh Vet. Med. J. Vol. 9 No. 1 (2011) (401-420)

IMPACT OF ORGANIC ACIDS SUPPLEMENTATION ON FIBER LEVEL AND OCCURANCE OF INTESTINAL DISTURBANCES IN RABBITS

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ABSTRACT

Acidifiers have been assayed for intensive rabbit production diets, either as organic acids (blends of several acids) or their salts, with research being focused mainly on both health and productive performances. The impact of organic acids fortification for grower New Zealand x Californian rabbit diets having different levels of fiber (18 & 14 % ADF) on growth performance, carcass traits as well as nutrients digestibility and energy nutritive value (TDN and DE) were demonstrated in this study.

Results obtained revealed that the body weight gain, feed conversion values showed no significant differences between the rabbits fed the control diet and those fed organic acids fortified diets and have the same nutrients content while the groups fed low fiber diets were significantly (P<0.05) lower than groups fed normal fiber diet and this may be attributed to the observed diarrhea due to low fiber level in their diet. However, feed intake for all groups fed organic acid supplemented diets were significantly (P<0.05) lower than the control group. Carcass traits and dressing percentage values of rabbits fed the experimental diets and slaughtered at 11 weeks old revealed that there was no significant difference in the rabbits fed the control diet and those fed organic acids fortified diets. The digestibility of nutrients of organic acids fortified diets revealed that *there was no significant difference between all groups and the control except for group with 0.15% organic acids and fed low fiber diet showed a significant decrease in the digestion coefficient of crude fiber fractions (NDF, ADF, Cellulose and hemi-cellulose%).*

In Conclusion, the used blend of the dietary organic acids in this study have no significant effect on growth performance of the rabbit and no major positive response over the control was observed on the diet digestibility and nutritive value of the experimental diets.

Keywords: rabbit diet - organic acids- fiber – digestibility.

INTRODUCTION

Antibiotics have been used in animal production as an economical means of increasing production and preventing disease ***(Dinber and Richard, 2005).*** The emergence of antibiotics resistance in pathogenic bacteria has led to concern over their use in animal production and has resulted in worldwide consideration of preventing or limiting their use in animal production. To prevent the risk of developing such pathogens and also to satisfy demand for a food chain free of drugs, the use of in-feed antibiotics in the European community were totally banned in ***(Council regulation 98/2821/CEE, 1998).***

Among the candidate replacements for antibiotics are organic acids both individual acids and blends of several acids ***(Dinber and Buttin, 2002).*** The action mechanisms of organic acids are mainly involved in balancing the microbial population in the small intestine and / or to stimulating the activity of digestive enzymes ***(Knarreborg, et al., 2002).*** Acidifiers have also been assayed for intensive rabbit production diets, either as organic acids ***(Scapinello, et al., 2001)*** or their salts ***(Hullar, et al., 1996),*** with research being focused mainly on both health and productive performances.

The antibacterial effect of non-dissociated VFA, observed at caecal pH of about 6.0. It has been hypothesized that a high cecal turnover rate combined with a high supply fermentable fiber would improve and stabilize the microbial activity ***(Prohaszka, 1980).***

Provision of adequate fiber is important to balance diet for rabbits. Although forage is the major source for fiber, their energy content is low, especially for low quality forages. As genetic potential of rabbit increases for meat production providing sufficient energy and fiber becomes more difficult. Thus, the objective of this work was to investigate to what extent the impact of dietary organic acids supplementation, included at two levels (0.15% and 0.3%) on growth performance, cecal environment, and nutrients digestibility for growing rabbits fed different fiber levels diet.

MATERIALS AND METHODS

This work was designed to test the impact of organic acids supplementation on growth performance as well as nutrients digestibility and nutritive value for (TDN and DE). Also to evaluate the cecal fermentation of rabbit groups fed diets contain different levels of fiber.

A total fifty-four New Zealand x Californian rabbits of both sex, weaned at 5 weeks old were provided from a private farm for rabbit's production to conduct the present work. All rabbits were vaccinated against snuffles using Hemorrhagic Septicemia and protected against parasites using Ivermectin preparation. The rabbits were sexed, ear-tagged, weighed and allotted randomly to six groups, (9 rabbits for each) of nearly equal initial body weight. Each group was replicated three times, three rabbits for each, in battery cage. The rabbits were fed *ad libitum* on two basal diets formulated to meet the nutrient requirement of rabbits according to the feeding standards of the ***NRC (1977)***. The diets were differed mainly in their dietary fiber levels. The first diet was contained normal-fiber level (ADF 18%) corresponding to current recommendation ***(De Blas et al., 1999; Gidenne, 2000;)*** while the second diet was contained (ADF 14%). The composition of the basal diets was presented in Table (1) and (2). Both of the used diets were supplemented with blend Organic acids at a level 0, 0.15 and 0.3 %. (Feed grade Norel & Nature, Spain*).

(*) Organic acids composition, 10.5% formic acid, 11.5% propionic acid, 13% sodium butyrate, 12% orthophosphoric acid, 4% lactic acid , 5% fumaric acid and 44% colloidal silica (NOREL-MISR).

Experimental parameters:

Growth trial:

The growth trial was lasted for six weeks. Body weight, feed intake, feed conversion ratio (FCR) ***(Ensminger, 1980)***, Relative growth rate (RGR) ***(Brody, 1968)*** in the different groups were recorded weekly.

Digestibility trial:

Digestibility trial was conducted at the end of the growth trial and lasted for 5 consecutive days where feces were collected from each cage according to the method of ***Perez et al. (1995)***.

The Chemical analysis of diet nutrients and feces were conducted for CP, NDF, ash, crude fat ***(AOAC, 1995)***, ADF, cellulose ***(Van Soest et*** *al.,1991)* and lignin *(Hintz and Mertens,1996)* to evaluate the dietary nutritive value and digestibility.

The values of TDN and DE were calculated according to ***NRC, 2001*** based on nutrient analyses (CP, NDF, ADF, NFC, EE, Lignin, NDICP, and ADICP according to the following equations.

- **TDN%=D.C.P%+D.NDF%+D.NFC %+(D.FAT% X 2.25)**
- **TDN%= D.C.P%+D.C.F%+D.NFE %+(D.FAT% X 2.25)**
- **DE= 0.004409 X TDN%**

At end of the digestibility trial 3 rabbits were taken randomly from each group, slaughtered and ceci were taken and tied from both ends and put in the ice box to be frozen at -20 ^{o} C until chemical analysis for pH, NDF and CP in the cecal contents in order to measure the cecal environment.

Table (1): Physical composition of the experimental diets on as fed basis.

Ingredients	18 % ADF	14 % ADF
Dried Alfalfa	10%	10%
Egyptian clover hay	9%	6%
Bagass	0%	16%
corn	17%	18.7%
Soybean meal	10%	17%
Wheat bran	26%	7%
Rice polishing	15%	13%
Molasses	2%	2%
fennel	3.1%	3.1%
Dill	4.7%	4%
Basil	2%	2%
Limestone	0.5%	0.5%
Sodium carbonate	0.1%	0.1%
Sodium dibasic phosphate	0.2%	0.2%
Sodium chloride	0.4%	0.4%

Table (2): Chemical composition of the experimental diets on as fed basis.

Nutrients (%)	18 % ADF	14% ADF
Dry Matter	88.6103%	89.852
Crude Protein	17.31%	15.71%
NDF	31.55%	24.7253%
ADF	17.85%	14.03. %
Cellulose	14.91%	11.58%
Hemicelluloses	13.7%	10.70%
Lignin	2.92%	2.44%
NDICP	2.22%	1.29%
ADICP	0.89%	0.52%
Crude Fat	1.97%	2.77%
Ash	7.665%	7.19%
NFC*	30.12%	39.46%
TDN %**	60.43%	65.62%

* NFC= DM- (CP +NDF + EE +Ash) Calculated **

Table (3): Impact of dietary organic acids supplementation on cumulative growth parameters of growing rabbits fed different levels fiber diets.

Group / Item	Diets					
	ADF 18%			ADF 14%		
	Organic Acids%			Organic Acids%		
	0%	0.15%	0.3%	0%	0.15%	0.3%
Initial body weight	875.56± 51.91[a]	726.67± 46.46[b]	716.67± 34.76[b]	872.22± 53.67[a]	903.33± 46.31[a]	865.56± 49.89[a]
Final body weight	2112.11± 77.82[a]	1932.22± 52.73[b]	1848.33± 47.99[b]	1882.22± 69.62[b]	1843.33± 49.69[b]	1847.78± 55.22[b]
Overall body gain	1236.56± 32.56[a]	1205.56± 40.04[a]	1151.67± 46.86[a]	1010± 32.32[b]	940± 42.49[b]	982.22± 34.63[b]
Overall Feed intake	3761.10± 18.98[a]	3576.68± 30.87[b]	3558.33± 35.06[b]	3424.44± 5.88[c]	3103.90± 43.19[d]	3081.67± 38.75[d]
Cumulative feed conversion ratio	3.06± 0.08[bc]	2.99± 0.09[c]	3.11± 0.12[abc]	3.42± 0.11[a]	3.35± 0.14[ab]	3.16± 0.08[abc]

1) Values are means ± standard errors. 2) Means without a common letter differ significantly ($P \leq 0.05$).

Table (4): Impact of dietary organic acids supplementation on nutrients digestibility percentage of the experimental diets.

Group / Item	Diets					
	ADF 18%			ADF 14%		
	Organic Acids%			Organic Acids%		
	0%	0.15%	0.3%	0%	0.15%	0.3%
Nutrients Digestibility						
DM	69.25±0.64 ^{ab}	66.51±2.17 ^{b}	65.14±1.8 ^{b}	72.45±1.27 ^{a}	65.95±0.3 ^{b}	68.46±0.78 ^{ab}
CP	81.12±0.59 ^{a}	80.04±0.85 ^{a}	78.03±2.15 ^{a}	77.20±2.38 ^{a}	72.01±1.5 ^{b}	72.13±0.59 ^{b}
EE	72.82±1.27 ^{ab}	61.5±4.53 ^{c}	67.18±2.35 ^{bc}	76.94±2.95 ^{a}	73.2±1.35 ^{ab}	73.48±1.43 ^{ab}
NFE	78.17±0.56 ^{bc}	77.49±1.58 ^{c}	77.53±0.79 ^{c}	83.22±1.16 ^{a}	80.28±0.32 ^{abc}	80.89±0.6 ^{ab}
CF	36.70±0.60 ^{a}	29.6±5.55 ^{abc}	23.40±4.26 ^{bc}	32.86±4.97 ^{ab}	19.73±1.28 ^{c}	28.96±1.21 ^{abc}
Nutritive value (Energy Availability)						
TDN (%)	64.31±0.55 ^{bc}	62±1.94 ^{c}	60.88±1.48 ^{c}	69.51±1.92 ^{a}	64.91±0.21 ^{bc}	66.58±0.57 ^{ab}
DE(Kcal/Kg)	2835±24.02 ^{bc}	2733.33±85.77 ^{c}	2684.33±65.36 ^{c}	3064.67±84.67 ^{a}	2862±9.24 ^{bc}	2936.33±25.37 ^{ab}

Data presented as means ± standard error.

Columns with different superscript within the same row are significantly different at P<0.05.

Table (5): Impact of dietary organic acids supplementation on digestion coefficient of crude fiber fractions of the experimental diet.

Group / Item	Diets					
	ADF 18%			ADF 14%		
	Organic Acids%			Organic Acids%		
	0%	0.15%	0.3%	0%	0.15%	0.3%
Nutrients Digestibility						
NDF	37.97±1.34 ^{a}	32.99±4.48 ^{a}	28.62±3.91 ^{a}	29.07±5.29 ^{a}	17.06±1.17 ^{b}	26.82±1.76 ^{ab}
ADF	33.06±1.98 ^{a}	25.77±5.78 ^{a}	20.10±4.67 ^{ab}	24.97±5.83 ^{a}	11.10±1.81 ^{b}	21.67±1.88 ^{ab}
Cellulose	36.70±0.60 ^{a}	29.60±5.55 ^{abc}	23.40±4.26 ^{bc}	32.86±4.97 ^{ab}	19.73±1.28 ^{c}	28.96±1.21 ^{abc}
Hemicellulose	44.32±2.64 ^{a}	42.39±2.88 ^{ab}	39.71±2.88 ^{ab}	34.46±4.71 ^{ab}	24.82±0.57 ^{b}	45.29±11.4 ^{a}
NFC	93.56±1.37 ^{a}	93.44±1.02 ^{a}	94.70±1.15 ^{a}	96.46±0.42 ^{a}	95.05±0.2 ^{a}	93.77±0.81 ^{a}
Nutritive value (Energy Availability)						
TDN (%)	64.80±0.82 ^{abc}	62.20±2.16 ^{bc}	60.98±1.71 ^{c}	69.17±2.18 ^{a}	64.1±0.27 ^{bc}	66.27±0.69 ^{ab}
DE(Kcal/Kg)	2857±36.37 ^{abc}	2742.33±95.28 ^{bc}	2688.67±75.18 ^{c}	3049.67±96.51 ^{a}	2826±12.01 ^{bc}	2922±30.79 ^{ab}

Data presented as means ± standard error.

Columns with different superscript within the same row are significantly different at P<0.05

Table (6): Impact of dietary organic acids supplementation on NDF, CP, DM and pH of the cecal contents.

Group / Item	Diets					
	ADF 18%			ADF 14%		
	Organic Acids%			Organic Acids%		
	0%	0.15%	0.3%	0%	0.15%	0.3%
Cecal Content(g)	83.02 ±6.85 [a]	76.06 ± 6.5 [a]	94.76 ± 8.85 [a]	84.74 ± 7.71 [a]	86.08 ± 5.71 [a]	80.44 ±3.23 [a]
Cecal Content (%) of BW	4.04 ± 0.21 [a]	4.12 ± 0.24 [a]	5.24 ±0.5 [a]	4.63 ± 0.47 [a]	4.72 ± 0.5 [a]	4.6 ± 0.15 [a]
Cecal DM	20.98 ± 0.54 [a]	19.14 ± 3.2 [a]	20.3±1.17 [a]	21.26 ± 1.37 [a]	20.3±1.9 [a]	20.69±1.38 [a]
CP DM	31.87±2.25 [a]	30.75 ±4.40 [a]	26.29± 0.44 [a]	32.72± 4.28 [a]	30.94±6.2 [a]	31.45± 7.8 [a]
NDF DM	34.34±6.2 [a]	37.03±10.49 [a]	34.5±6.24 [a]	34.34± 5.37 [a]	37.08±5.7 [a]	44.64 ± 1.89 [a]
PH	7.18 ± .06 [a]	7.37 ± 0.55 [a]	7.16 ± 0.12 [a]	7.0 ± 0.1 [a]	7.0 ± 0.1 [a]	7.15 ± 0.1 [a]

Data presented as means ± standard error.

Columns with different superscript within the same row are significantly different at $P<0.05$.

RESULTS AND DISCUSSIONS

Regarding the impact of dietary organic acids supplementation on growth performance of growing rabbits fed different fiber levels, although, many of these organic acids are fed to livestock, information are not readily available on their feeding value, therefore evaluation of the performance of growing rabbits fed diets containing different levels of organic acids under this investigation is the main objective of this study. Body weight growth and body weight gain and relative growth rate of rabbits (5-11 weeks old) fed the experimental diets is shown in Table (3). The results revealed that the inclusion of organic acids did not affect the body weight of the animals during the first 4 weeks of experimental period. Between 35 to 64 days of age, the body weight was high and not statistically different in all experimental groups fed both levels of fiber and supplemented with the low level of organic acids blend (0.15). In the second fattening period (64 to 77days of age), the body weight of all groups supplemented with both organic acids levels were significantly ($P<0.05$) lower than the control group. These results are in accordance with those reported by ***Harris and Johnston (1980)*** who found that the average 9-week weight of rabbits fed organic acids supplemented diets had significant lower body weight as compared with the control group. Also, no acidifier effects on body weight and feed conversion during the starter phase were mentioned by ***Daskiran, et al., (2004)*** , Moreover, these results showed that at 7 and 9 weeks of age, the groups fed low fiber diets were significantly ($P<0.05$) lower than groups fed normal fiber diet and this sharp decrease in the daily gain was because the diarrhea incidence which observed in the rabbits fed these diets. ***Carabano et al (1988)*** attributed this to the decrease in the cecal turnover rate when the dietary fiber decreased below 14% CF. As the fiber deficiency greatly affects the cecal fermentation pattern and impairs the caecal microbial activity ***(Gidenne.,2000)*** and the level of cellulolytic flora ***(Boulahrouf., et al 1991).*** Mortality by diarrhea is always increased only for the lowest level of fiber ***(Perez et al. 1996).*** This confirmed the important role of low-digested fiber fractions in preventing digestive troubles in the young rabbit ***(Blas et al.,1994).*** Generally, body weight gain values showed that there were no significant differences between the rabbits fed the control diet and those fed organic acids supplemented diets. ***Hernandez, et al., (2006)*** failed to observe any effect on the performance of chickens when formic acid was added to the feeds.

Concerning feed Intake and feed conversion ratio the results presented in Table (3) displayed that feed intake for all groups fed organic acids supplemented diets were significantly (P<0.05) lower than the control group, especially groups fed 0.3% organic acids supplemented diets at 7 weeks old. This may be attributed to the changes in the retention time of liquids. Thus, the rate of passage of Particles also seemed linked to the dietary fiber level, as already observed by ***Bellier& Gidenne (1996).*** Also, average of feed intake values showed that groups fed low-ADF diets were significantly (P<0.05) lower than groups fed normal fiber diet (control) and this could be explained by a longer retention time of the digesta in the gut. as observed by ***Fraga et al (1991)*** and ***Gidenne et al.(2004b).***

Results concerning average feed conversion values presented in Table (3) showed that there were no significant differences between the rabbits fed the control diet and those fed organic acid supplemented diets. However, it revealed that the feed conversion ratio was more efficient for rabbits fed normal fiber diet (2.86, 2.61, and 2.98) compared to those fed low fiber diet (3.76, 3.86, and 3.94). This improvement in the FCR results could be due to presence of Egyptian clover hay in the diet to avoid an excessive retention time of digesta in the cecum and an impairment of growth performance improved cecal fermentation and increased the supply of high-quality microbial protein through cecotrophy ***(GarcI' et al., 1999).***

Regarding nutrients digestibility and nutritive value of the experimental diets, The achieved results Table (4) showed that there is no significant difference between all groups and that the experimental diets have digestion coefficient of the DM (ranged from 72.45-69.25). This indicated that inclusion of organic acids did not affect the nutrient digestibility of the feed ingredients used in formulation of the diets. Near values have been reported by ***Alicata et al. (1988).*** The groups fed low fiber diet and supplemented with 0.15% or 0.3% organic acids were significantly ($P<0.05$) lower than control group in the protein digestibility. ***Keys et al. (1996)*** found a non significant decrease in protein digestibility when rabbits were fed organic acids supplemented hay diets containing 7.7%, 13.4%, and 20.7% ADF. ***Hoover and Heitmann (1972)*** found no difference in protein digestibility when diets containing15 % or 30 % ADF were fed to rat. ***Partanen and Mroz (1999)*** reviewed that the improvements in diet digestibility are variable and often not significant, rarely exceeding 0.003% .They concluded that the effects on digestibility and productive performances of the inclusion of organic acids in rabbit nutrition were not clear. The increase in the digestion of nutrients could be attributed to decrease CF level in the diet which led to increase the cecal microbial activity by reducing the rate of passage and increasing the retention time ***(Amber, 2007).*** The relatively low fiber digestibility might be related to its slow degradation rate through microbial fermentation ***(De Smet et al, 1995),*** combined with its low proportion of fine particles and then with a short cecal fermentation time. ***Keys et al. (1996)*** found that not only did fiber content affect fiber digestibility, but also the source of the fiber was important. Average NDF digestibility was ranged from (26.82-37.97%) which are closer to the values obtained by ***De Blas et al. (1995)*** for similar diets at 50 days of age (30.9%) or in adult animals (36.9%).

Impact of dietary organic acids supplementation on digestion coefficient of crude fiber fractions presented in Table (5). The results indicated that there is no significant difference between all groups and the control one. It is clearly established that a reduction of the dietary fiber level results in an increase in the digestible energy (DE) content. This is associated with a reduction in voluntary feed intake ***(Gidenne et al. 1991)*** and with a greater reduction in fiber intake or fecal output. Here it explained, also, the increase in ADF digestibility for a low ADF intake, whereas the quantity of NDF degraded remained higher for control animals. This apparently contradicts previous results obtained in adult ***(Gidenne, 1992)*** or growing rabbits ***(Gidenne et al. 1991)*** where a lower NDF content induced a lower fiber digestibility.

Regarding characteristics of the cecal contents and cecal fermentation traits, in rabbits, the content of the cecum was affected quadratically by the dietary fiber level. This effect would be related to the positive effect of fiber on the ileo-caecal motility, since a decrease in dietary fiber concentration (from 39.6 to 21.7% NDF, on DM basis) increased the mean cecal retention time (from 16.6 to 28.6 h) ***(Gidenne., 1994).*** Fiber chemical composition did not affect either weight of cecal contents, which agrees with its lack of influence on cecal mean retention time ***(Garcı´a et al., 1999).***

The results of Impact of dietary organic acids supplementation on NDF, CP, DM and of the cecal contents, cecal content weight per gram or as percent of total body weight which presented in Table (6) revealed that there is no significant difference between all groups and the control one .This agree the results of ***Gidenne et al (2002)*** which was indicating that the cecal microbial activity of the young rabbit is controlled by the fiber level and by the feed intake level. On the other hand, the groups fed low fiber diet and supplemented with 0.15%, 0.3% organic acids both are significantly (P<0.05) lower than control group in the NDF digestibility. This reduction may be due to lower fiber level in this diet which leads to decrease in both the cecal weight and volatile fatty acids concentration ***(Gidenne et al., 2004a and Tao and Li, 2006).***

The average weight of cecal contents in 35-d weaned animals (8.4% BW) was higher than that obtained in 35-d suckling animals (4.65% BW), which indicates an adaptation of the size of the fermentative area to weaning and suggests that it was not the first limiting factor of cell wall digestion. An inverse relationship between weight of cecal contents and feed intake has also been observed in previous work ***(Garcı´a et al., 1993, 2000).***

Moreover, there were no significant differences between groups in the PH as shown in Table (6). Although the cecal pH tended to decrease during the feed intake period (evening and night), when a higher amount of substrate for the microorganisms was entering into the cecum ***(Bellier., and Gidenne., 1996).***

In Conclusion, the used blend of the dietary organic acids in this study have no significant effect on growth performance of the rabbit and no major positive response over the control was observed on the diet digestibility and nutritive value of the experimental diets. Also, the characteristics of the cecal contents and cecal fermentation traits showed no significant response. Moreover, the low fiber dietary content altered the growth, digestion and cecal performances of growing rabbits.

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تأثير إضافة الأحماض العضوية على مستوى الألياف وحدوث الاضطرابات المعوية بالأرانب

من ضمن أسباب المناعة البكتيرية للمضادات الحيوية هو استخدام المضادات الحيوية في العليقة بالنسب تحت العلاجية لذلك تم منع استخدامها في العليقة في أوربا منذ شهر يناير 2006 فكان من الضروري البحث عن بدائل لهذة المضادات الحيوية منها استخدام الأ... اض العضوية لتسريع عملية النمو وتحقيق التوازن بين ال... الإنزيمات الهضمية.

أجريت هذه الدراسة على 54 أرنب نيوزيلاندي ابيض مفطوم عمر 5 أسابيع لتقييم أثر إضافة مزيج من الأحماض العضوية (يتكون من 10.5٪ حمض الفورميك، 11.5٪ حمض البروبيونيك، 13٪ بيوتيرات الصوديوم، 12٪ حمض اورثوفوسفوريك، 4٪ حمض اللاكتيك، 5٪ حمض الفيوماريك و44٪ من غروانى السيليكا) إلى علائق الأرانب ... ض فى نسبة الألياف وتأثيره على معد... الاضطرابات المعوية بالأرانب مقارنة بالعلائق الضابطة.

... ل نوعين من العليقة الاولى كنترول تحتوى على نسبة ألياف 18٪ ADF والثانية منخفضة في نسبة الألياف ADF 14% وقد اعتبروا كمجموعة ضابطة أي بدون أحماض عضوية ثم تم إضافة مزيج الأحماض العضوية على كل من العليقتين بنسبة 0.15% و0.3% على الترتيب؛ تم تسجيل وزن الجسم الحي والعلف المستهلك أسبوعيا، كما تم حساب معدلات التحويل الغذائي ومعدلات النمو النسبى بشكل فردى حتى عمر 11اسبوع. كما تم تحليل محتويات الأعور لقياس معاملات الهضم و قياس مستوى NDF وCP وDM والpH. كما تم إجراء 6 تجارب هضم لقياس معاملات الهضم و القيمة الغذائية للعلائق التجريبية بعد إضافة مزيج الأحماض العضوية ومقارنتها بمعاملات الهضم و القيمة الغذائية للعلائق الضابطة.

أظهرت نتائج هذه التجربة أن إضافة مزيج الأحماض العضوية في عليقة الأرانب ليس لها تأثير معنوي إحصائيا على كل من معدلات النمو أو كمية العلف المستهلك أو معدل التحويل الغذائي ومعدلات النمو النسبي.

وأظهرت نتائج قياس معاملات الهضم والقيمة الغذائية للعلائق التجريبية المضاف لها مزيج الأحماض العضوية ومقارنتها بمعاملات الهضم و القيمة الغذائية لعلائق الكنترول أن إضافة مزيج الأحماض العضوية في عليقة الأرانب ليس لها تأثير معنوي إحصائيا على معاملات الهضم و القيمة الغذائية للعلائق 0 كما اظهر قياس معاملات الهضم لمحتويات الأعور DMو NDF وCP و قياس الـ pH ، انه بشكل عام لم تكن هناك فروق ذات دلالة إحصائية بين المجموعات باستثناء هضم الـ NDF0