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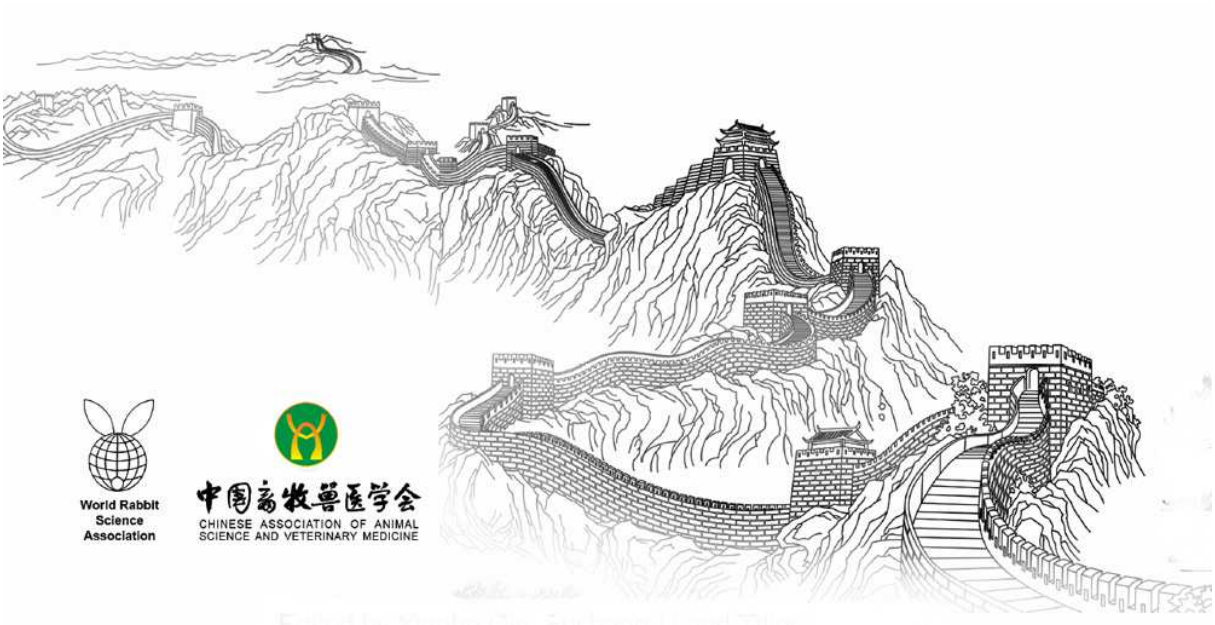

THE EFFECTS OF DIFFERENT COARSE FODDERS IN DIET TO TISSUE MORPHOLOGY OF DIGESTIVE TRACT IN REX RABBIT

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ABSTRACT

In order to evaluate the influence of 4 different coarse fodders*: Caragana microphylla*, clover, bean stalk and peanut shell to tissue morphology of digestive tract in Rex Rabbit, we selected 96 Rex Rabbits of 45 days, randomly distributed into 4 groups with the same male parent ratio. The fodder contained different coarse feed raw materials, Group I: 30% *Caragana microphylla* + 10% clover, group II: 40% clover, Group III: 40% bean stalk, Control: 15% peanut shell + 25% clover. Preliminary trail period was 11 days, trail period was 60 days. The results showed that: Except crypt depth of duodenum and jejunum were significantly deeper than other parts after using different coarse fodders ($P<0.05$), other indexes i.e.villus height and V/C value won't be affected by the source of coarse fodders ($P>0.05$). This indicated that *Caragana microphylla* could increase the depth of duodenum and jejunum, and affected the secretion function of small intestine.

Key words: coarse fodder, Rex Rabbit, tissue morphology of digestive tract.

INTRODUCTON

Rex rabbit is a kind of small plant-eating animal. Energy, protein, vitamins and other nutrients are very important, but fiber not only provided nutrients, but also had multiple physical-functions (Gu *et al.* 2002). Recent feeding practices show that the development and application of coarse fodders is one of the important factors that restrict sustainable development of Rex Rabbit besides energy feeds and protein feeds Therefore, we designed this experiment, and discussed the effects of different coarse fodders to tissue morphology of digestive tract of Rex Rabbits.

METERAILS AND METHODS

Experimental animals and design

We selected 96 normally developed healthy Rex Rabbits all aged 1.5 months and randomly distributed (according to their weights) into 4 diet treatment groups (same parent ratio).We randomly decided group I (30% *Caragana microphylla* + 10% clover), group II (40% clover), group III and control group (40% bean stalk).
This experiment used single factor completely randomized design, and performed in Experimental Rex rabbit farm of Institute of Animal Husbandry and Veterinary.

Rabbit house and rabbit hutch

The experiment used single caged feeding indoor, metal mesh cage. The size of the cage was 53 * 37 * 35 cm, forced ventilation. The trial period was 60 days.

Experimental diet and formula

Diet preparation consulted the standard recommended by Lebas.F (1999) and Ren (2002, 2006), the formula of diet see Table 1.

Table 1: Diet formula (%)

Item	Group I	Group II	Group III	Control
Raw material composition（%）				
Caragana microphylla	30	-	-	-
Clover	10	40	-	25
Bean stalk	-	-	40	-
Peanut shell	-	-	-	15
Bean pulp	15.8	15.8	15.8	15.8
Bran	29.0	29.0	29.0	29.0
Wheat floor	8	8	8	8
Fat	2.0	2.0	2.0	2.0
Sugar	1.5	1.5	1.5	1.5
$CaCO_3$	0.5	0.5	0.5	0.5
$Ca(HCO_3)_2$	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5
Choline chloride	0.04	0.04	0.04	0.04
Methionine	0.2	0.2	0.2	0.2
Lysine	0.26	0.26	0.26	0.26
Threonin	0.2	0.2	0.2	0.2
Vitamin premix	0.5	0.5	0.5	0.5
Mineral premix	1.0	1.0	1.0	1.0
Nutrient Level：				
DE	10.90	10.02	11.41	11.50
CP	16.18	16.85	15.85	16.28
Coarse fiber	16.23	15.63	17.23	15.06
Ca	0.96	1.17	1.59	0.67
P	0.50	0.54	0.59	0.51

Feeding method

Using progressive reloading method, the reloading period was 11 days. All the experimental rabbits drank freely, and feed with fixed time and quantity, feeding time was 8:00 AM and 6:00 PM.

Collection and fixation of internal organs and digestive tract samples

At the end of experiment, we selected 8 rabbits in every group with similar body weight. and were slaughtered through breaking their neck. The pre-slaughter weight, carcass weight were recorded. The length of small intestine, caecum, colon, rectum were measured.

All the experimental data was calculated and analyzed using EXCEL2003 and SPSS 17.0 software. We performed variance analysis between groups using ANOVA processes, and performed multiple comparisons with Duncan's method.

RESULTS AND DISCUSSION

From Table 2, we can get that the group I had the highest pre-slaughter weight, and was higher than group II, group III and control group; the carcass weight in group I was higher than other 3 groups(P>0.05). The small intestine length was the lowest in group I

All the indexes above had no significant differences between all the groups (P>0.05).

Table 2: The effect to length of small intestine

Item Group Item	No.	Group I	Group II	Group III	Control
Pre-slaughter weight(g)	8	1896.25±292.4^{Aa}	1696.25±290.77^{Aa}	1804.38±95.75^{Aa}	1702.50±159.51^{Aa}
Carcass weight(g)	8	863.75±170.81^{Aa}	713.12±153.30^{Aa}	811.25±66.86^{Aa}	733.13±104.02^{Aa}
Small intestine length(cm) length(cm)	8	249.88±33.62^{Aa}	295.94±25.51^{Aa}	260.38±19.32^{Aa}	260.88±15.52^{Aa}
Caecum length(cm)	8	45.33±4.84^{Aa}	44.88±2.36^{Aa}	45.75±3.02^{Aa}	46.21±1.07^{Aa}
Colon length(cm)	8	103.31±4.65^{Aa}	105.56±12.87^{Aa}	100.13±8.22^{Aa}	107.88±9.43^{Aa}

NOTE: On one line, with the same letter means are not different at P=0.05, the different capital letters mean extremely significant difference (P <0.01), the different lowercase letters mean significant difference (P<0.05).

From Table 3 we see that the influence of 5 different coarse fodders to the morphology of small intestine in Rex Rabbit. In group I, the crypt depth of duodenum is significant deep than group II, group III and control group ($P<0.05$). The crypt depth of jejunum of group I is significant deep than group II, group III and control group ($P<0.05$). Other indexes of small intestine have no significant differences between all the groups ($P>0.05$).

Table 3: The effect to the small intestine morphology of Rex Rabbits

Parts	Index	Group I	Group II	Group III	Control
Duodenum	Villi hight(um)	729.06±100.32^{Aa}	728.09±33.46^{Aa}	669.75±42.10^{Aa}	710.08±74.54^{Aa}
	Crypt depth(um)	129.94±27.39^{Aa}	100.03±8.76^{Ab}	101.30±6.16^{Ab}	103.11±19.28^{Ab}
	V/C	5.61 ^{Aa}	7.28 ^{Aa}	6.61 ^{Aa}	6.89 ^{Aa}
Jejunum	Villi hight(um)	485.96±50.09 ^{Aa}	573.41±46.40 ^{Aa}	442.43±51.83 ^{Aa}	487.63±64.27 ^{Aa}
	Crypt depth(um)	113.64±37.23^{Aa}	89.25±11.20^{Ab}	98.39±13.91^{Ab}	91.46±25.00^{Ab}
	V/C	4.28 ^{Aa}	6.42 ^{Aa}	4.50 ^{Aa}	5.33 ^{Aa}
Ileum	Villi hight(um)	321.50±117.94 ^{Aa}	343.25±23.95 ^{Aa}	364.50±29.01 ^{Aa}	316.74±36.90 ^{Aa}
	Crypt depth(um)	79.31±14.22 ^{Aa}	75.16±8.04 ^{Aa}	70.57±8.41 ^{Aa}	72.24±11.32 ^{Aa}
	V/C	4.05 ^{Aa}	4.57 ^{Aa}	5.17 ^{Aa}	4.38 ^{Aa}

In Table 4, all those results show that different coarse fodders have no significant pathological influences on the morphology of all the organs.

Table 4: The histology pathological changes observed results of digestive tract under microscope

Organ	Group I	Group II	Group III	Control
Jejunum	Normal villis, lamina hyperplasia	No lesions, inherent layer of lymphocyte	No lesions	No lesions

Note: The sections of duodenum, ileum, appendix, rotundus and colon have no lesions.

Small intestine is the main part of nutrients absorption, and the absorption is mainly depend on intestinal villi. Glandulae intestinales have the function of secreting digestive juice, so the good conditions of small intestine mucous membrane is the basis of the digestion of nutrient and the normal growth of animals (Yao *et al*. 2003). The villi length and crypt depth reflect the function of intestine. When villus are long, digestive absorptive function is strong. The crypt depth reflects cell production rate, the cell maturation rate and the secretive function increased while the crypt became shallow. The V/C value reflects the functional status of small intestine: the large value means strong digestive absorptive function (Hu *et al*. 1999). The results of this experiment show that different coarse fodders have no significant influence on the villi length of small intestine of all parts, but have significant influence on crypt depth. The crypt depth of duodenum and jejunum is significantly deep than other 3 groups, and V/C value is the lowest in group I, which indicated that adding 30% caragana microphylla would influence the renewal and metabolism of intestinal epithelial cells.

CONCLUSIONS

1) Coarse fodders made of *Caragana microphylla*, clover, bean stalk, peanut shell had no significant influence on internal organs weights and morphology of digestive tract.
2) As a source of coarse fodders in Rex rabbits' feed, *Caragana microphylla* can increase the crypt depth of duodenum and jejunum.

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