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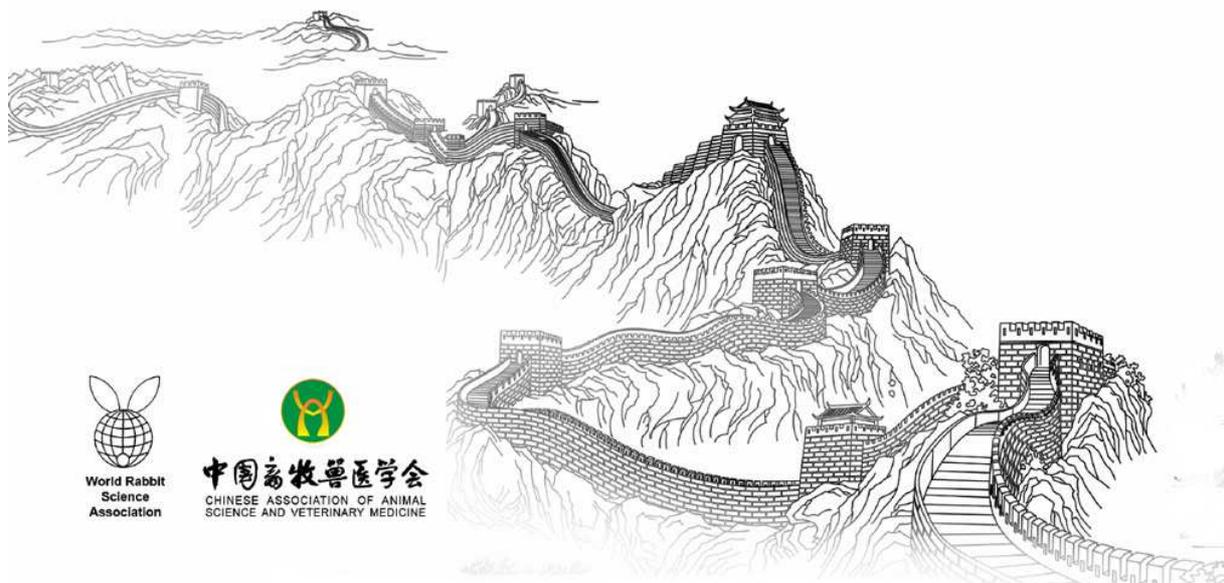
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RESEARCH ON NUTRION EVALUATION OF CITRUS PULP IN MEAT RABBIT

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ABSTRACT

This study was conducted to assess the chemical composition of citrus pulp as well as its feeding values on meat rabbit. Six New Zealand White Rabbits (body weight 2.0 ± 0.2 kg, half male and half female) were selected in digestion tests; A total of 150 New Zealand White rabbits weaned contemporarily were selected for the feeding trials, they were randomly allotted into 5 groups with 5 replicates per groups and 6 rabbits per replicate (half male and half female). The 5 groups were separately fed diets with citrus pulp 0% (control group), 5%, 10%, 15% and 20%. Performance was measured in each group. The results were shown as follows: the content of GE, DM, CP, CF, NDF, ADF, ADL, EE, Ash, Ca, P, NFE and AA in citrus pulp was 15.20MJ/kg, 90.06%, 6.82%, 14.04%, 19.85%, 15.83%, 2.04%, 3.55%, 2.67%, 0.89%, 0.12%, 62.98% and 5.495%. Digestible energy of citrus pulp for Rabbit was 11.02 MJ/kg. The digestibility of GE, DM, CP, NFE, CF, NDF and ADF in citrus pulp was 72.5%, 76.3%, 70.7%, 83.3%, 38.9%, 42.2% and 33.4% separately. The supplement of citrus pulp had no significant effect on dietary intake, daily gain and feed conversion ratio for rabbit if it don't exceed 15% of the feed ($P < 0.05$). In conclusion, Citrus pulp is a high value feed with high digestibility. It is recommend that the addition ratio in rabbit diets should be no more than 15%

Key words: Citrus Pulp, Meat Rabbits, Nutritional value, Feeding Value.

INTRODUCTION

China is one of the major citrus producing countries in the world. Citrus production of China was the highest in the world with 26.45 million tons in 2010, and about 20-30 million tons Citrus pulp were produced annually. At present, the utilization of citrus pulp in China is poor, large amount of citrus pulp are discarded. It causes great waste of resources, and induces pollution of the environment. The experiment aimed to determine citrus pulp chemical composition by measuring its conventional nutrition, amino acid composition and its digestibility for meat rabbits. It provided a scientific basis for application promotion of adding the citrus pulp in the diet of Meat Rabbits

MATERIALS AND METHODS

Experimental Materials

Citrus pulp was collected from Camry Juice Co (Nanchong City, Sichuan Province) for experiment.

Experimental Design

Six New Zealand Rabbits (weight 2.0 ± 0.2 kg, half male and half female) were selected for digestion tests. The digestible energy and conventional nutrients digestion parameters of citrus pulp were determined by collection full excrements analysis method. A total of 150 New Zealand rabbits weaned synchronously were randomly allotted into 5 groups with 5 replicates per groups and 6 rabbits per replicate (half male and half female) in feeding test. The 5 groups were separately fed diets with citrus pulp 0% (control group), 5%, 10%, 15% and 20%. Production Performance was measured in each group.

Experimental diets and feeding management

According to nutritional needs of meat rabbits recommended by de Blas (2010), local feed resources and digestion test results, almost the same dietary nutrition level of diet were designed and supplied in each group. The rabbits were fed ad libitum. Experimental diets had already been fed for five days before test started. The test started at the age of 30 days and lasted for eight weeks.

Statistical analysis

Data were processed by Excel2003 software, then analyzed by the one-way analysis of variance and Duncan's method. Probability levels of 0.05 were used to determine the significance in all treatments. And the result expressed in "mean + / - standard deviation". All statistical analysis of data was performed using SPSS14.0.

RESULTS AND DISCUSSION

Nutritional composition of citrus pulp

The content of CP, CF of citrus pulp was 6.82%,14.04%.(Table 1). Citrus pulp is an high energy feed according to International Feed Ingredients Classification Standard and Cereal By-products according to Chinese feed ingredients Classification Standard, category II. The content of NFE in citrus pulp was 59.98%, while the content of ADL was only 2.04% (Table 1). The amino acid compositions of citrus pulp were imbalanced and the contents of amino acid were as follows: AA: 5.495%, Lys:0.48%, Met:0.06%. Taken together, citrus pulp was a high energy feed (Table 2).

Table 1: Conventional nutrient composition of citrus pulp (%)

GE	DM	CP	EE	NFE	Ash	Ca	P	CF	NDF	ADF	ADL
15.20	90.06	6.82	3.55	59.98	5.67	0.49	0.12	14.04	19.85	15.83	2.04

Table 2: Amino acid composition of citrus pulp (%)

Items	Content	Items	Content
Asp	0.44±0.06	Ile	0.15±0.03
Thr	0.31±0.04	Leu	0.32±0.14
Ser	0.40±0.05	Tyr	0.44±0.02
Glu	0.55±0.11	Phe	0.33±0.04
Gly	0.33±0.08	Lys	0.48±0.12
Ala	0.25±0.06	His	0.35±0.07
Cyc	0.09±0.02	Arg	0.23±0.05
Val	0.26±0.02	Pro	0.35±0.06
Met	0.06±0.03	AA	5.495±0.13

Nutrient digestibility of Citrus pulp

GE in citrus pulp was 15.2MJ/kg and the energy digestibility was 72.5%, while DE was 11.02 MJ/kg and energy digestibility is high. The digestibility of DM, CP, NFE in citrus pulp were higher than 70%, and the digestibility of CF, NDF and ADF were also higher than 30%, especially De in citrus pulp is higher than Oat, which was an excellent energy feedstuff resources for rabbit with DE of 10.9 MJ/kg. Thus it is one of potential high quality energy feed resources for rabbit.

Table 3: Nutrient digestibility of Citrus pulp (%)

GE	DM	CP	NFE	CF	NDF	ADF
72.5±0.6	76.3±5.7	70.7±4.3	83.3±2.0	38.9±6.1	42.2±6.6	33.4±5.9

Feeding effect of citrus pulp

With the increasing amount of citrus pulp in diet, rabbit feed intake showed a tendency of downward gradually. There was no significant difference between the test groups (no more than 15% citrus pulp added) and control group. Yao yanchu et al. (2011) reported that there were mainly two types of bitter substances in citrus pulp, one is the limonoids (represent substance were Limonin and Nomilin hormone), the other was flavonoids (represent substance was naringin). With the increasing amount of citrus pulp, Rabbit ADG showed a gradual downward trend. There was no significant difference on ADG between the test groups (no more than 15% citrus pulp added) and control group. FCR of experimental groups was not significantly different ($P > 0.05$) and the difference of deaths between test groups was not large. Taken together, no more than 15% of addition ratio in rabbit diets is appropriate

Table 4: Effects of dietary citrus pulp proportion on meat rabbit performance

Items	0%	5%	10%	15%	20%	P
ADFI/(g/d)	96.44±4.68 ^a	96.30±3.11 ^a	96.58±5.02 ^a	94.92±4.67 ^{ab}	89.89±4.32 ^b	0.041
ADG/(g/d)	30.73±1.07 ^a	30.37±0.53 ^a	30.29±1.22 ^{ab}	30.13±0.81 ^{ab}	28.86±0.7 ^b	0.022
F/G/(g/g)	3.05±0.07	3.08±0.09	3.09±0.12	3.05±0.12	3.01±0.10	0.830
Number of deaths	2	3	2	2	3	-

In the same row, values with different small letter superscripts mean significant difference ($P < 0.05$), while with the same or no letter superscripts mean no significant difference ($P > 0.05$).

CONCLUSION

Citrus pulp was an excellent potential energy feed resource for meat rabbit, and the recommended proportion in rabbit diets was no more than 15%.

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REFERENCES

- de Blas C., Wiseman J 2010. Nutrition of the Rabbit. *2nd Edition CAB Insertional*.
 Yao Y.C., Liu Z.H., Yang F.Y. 2011. Study on nutrients and bitter compounds of citrus pulp in Three Gorges Reservoir Region of Chongqing. *China feed*, 21, 19-21.

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