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The Role of Fibre in Rabbit Nutrition

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Abstract

One hundred Dutch rabbits were given a range of diets between 4 and 12 weeks of age, based on feed mixture and lucerne, containing from 12.0 to 19.14 % CF to clarify the level of CF of which deviation growth was retarded.

The five tested groups were assigned the following treatments at the age of 4 to 12 weeks: Group 1 fed only feed mixture without hay meal, Group 2 20 % hay meal, Group 3 40 % hay meal and Group 4 60 hay meal, Group 5 fed on 0, 20, 40 and 60 % hay meal during the fortnightly periods (4-6, 6-8, 8-10 and 10-12 weeks) experimental periods respectively. The rest of the feed in the treatment was feed mixture.

Highest growth rates were recorded by rabbits of group 2 (14.38 % CF) followed by group 5 (graduated hay levels) and the daily feed consumption was increased by increasing the hay level, but it decreased in group 5 (0, 20, 40 and 60 % hay).

Rabbits receiving the control feed mixture diet (CFM) and that of 20 % lucerne recorded the best feed conversion, while that of 60 % lucerne (19.4 % CF) recorded the worst, and group 5 recorded the intermediate value, being 16.3 % less than that of FM treatment (12.0 % CF).

Carcass percentages at 12 weeks of age were 66.05, 55.70, 58.89, 56.94 and 57.59 % showing that the FM of 12 % CF was the most superior to other diets. The pH values of rabbits' meat were not influenced by slaughter age, and the meat of older rabbits was darker than that of younger ones. Group 2 (14.38 % CF) had higher water holding capacity than other groups at 8, 10 and 12 weeks.

The previous results indicated that feeding Dutch growing rabbits on feed mixture, or mixtures of fibre source, such as lucerne meal, up to the extent of 20 % or graduated hay levels (20, 40 and 60 %) not only gave the best performance but also revealed marked improvement in meat characteristics, while rearing these rabbits on higher levels of lucerne is not sufficient for meat production.

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1 Introduction

Rabbits are herbivorous animals, consuming high roughage diet bases on alfalfa (lucerne) meal, grass meal or other forage products. The use of these fibrous feedstuffs in rabbit feeding might lead to the conclusion that rabbits utilise dietary fibre efficiency. A low fibre diet results in a reduced growth rate of weanling rabbits (CHAMPE and MAURICE, 1983). In the studies of Pote et al. (1980) it was found that with weanling rabbits, complete replacement of corn by alfalfa did not reduce growth performance. Rabbits prefer legume hay to grass hay, because it contains higher protein and calcium levels and is generally more palatable. Generally alfalfa hay is the roughage choice (N.R.C. 1966). The present study aimed at investigating growth performance, carcass characteristics and meat quality of Dutch rabbits as affected by alfalfa hay levels in diet.

The publication has been written to fill a need for information on the practical use of feeding different feedstuffs with high content of roughages in rabbit nutrition with regard to tropical and subtropical regions.

2 Materials and Methods

The present work was carried out on the farm and in the laboratories of the Department of International Animal Husbandry, Faculty of Agriculture, International Rural Development and Environmental Production, University of Kassel, Germany.

Fattening trials:

One hundred Dutch rabbits weaned at four weeks of age were used in this study and distributed in 5 groups to clarify the effect of feeding different levels of hay meal and roughage on the growth performance, carcass characteristics and meat quality of growing rabbits. Each group was subdivided into four replicates.

The five groups were assigned the following treatments

Gr. 1: Fed on feed mixture during the whole experimental period (4-12 weeks of age).

Gr. 2: Fed on hay meal providing 20 % of the daily requirement, the rest (80%) was supplied by feed mixture.

Gr. 3: Fed on 40 % hay meal + 60 % feed mixture.

Gr. 4: Fed on 60 % hay meal + 40 % feed mixture

Gr. 5: Fed on 0, 20, 40 and 60 % hay meal during the successive fortnightly periods (4-6, 6-8; 8-10 and 10-12 week experimental periods respectively as groups 1, 2, 3 and 4 respectively).

The percentage rations of the experimental diets and their chemical compositions are shown in Table 1.

Rabbits were housed during the experimental period in wire hutches. The experimental feeds were offered ad libitum twice daily at 8 a.m. and 3 p.m. Fresh water was available ad libitum for all groups. The average body weight, body weight gain, feed consumption and feed conversion were recorded and calculated weekly up to 12 weeks of age.

Table 1: The percentage rations of the experimental diets and their chemical compositions

Dietary treatment					
Ingredient	1	2	3	4	5
Feed mixture	100	80	60	40	as Tr. 1 (2 weeks 0)
Hay	0	20	40	60	as Tr. 2 (2 weeks 20)
					as Tr. 3 (2 weeks 40)
					as Tr. 4 (2 weeks 60)
Chemical Composition (calculated):					
DE Kcal/kg feeds	2480.00	2454.00	2428.00	2332.00	
CP %	16.00	16.30	16.60	16.90	
CF %	12.00	14.38	16.76	19.14	
Ash %	9.50	9.56	9.62	9.68	
Ca %	0.90	0.98	1.06	1.15	
P %	0.60	0.53	0.47	0.40	

Slaughter test

At 8, 10 and 12 weeks of age four rabbits from each treatment were taken at random to study the carcass characteristics. Rabbits were starved for about 16 hours, individually weighed, slaughtered, skinned and eviscerated. Eviscerated carcasses were cut up to hindquarter, loin and forequarter with chest. The different cuts, giblets and abdominal fat were each weighed and related to the carcass weight as a percentage. After slaughtering and chilling (at +4°C for 24 hours), the carcasses were bagged, frozen and stored at -30°C for 2 to 3 weeks until testing.

Thawing took place for approximately 48 hours at +4°C. The right side of the hindquarter muscles from each carcass was removed to evaluate the physical characters of the meat. The pH was measured by digital pH meter after calibration with buffers pH 7.00 and pH 4.00 at 20°C. Meat brightness was determined by using Elector-Brightness (Göfometer). To determine the juice holding capacity a piece of 0.3 gm muscle from each individual meat sample was put on filter paper (previously held over saturated Kcl solution in a dessicator) and pressed between two glass plates for 5 minutes according to the Grau and Hamm method (1957). The areas of meat and meat juice were meas-

ured using an area-meter. The juice holding capacity was calculated according to the following formula:

$$JHC = \frac{\text{meat area}}{\text{meat + juice area}} \times 100$$

3 Results and Discussion

Growth performance and feed utilisation

Highest growth rates were recorded by rabbits of Group 2 (80% FM + 20 % hay) followed by group 5 (graduated hay levels) (Table 2). Rations of group 1, 3 and 4 had nearly the same effect on the growth of rabbits up to the age of 12 weeks.

Table 2: Growth performance of growing Dutch rabbits as affected by alfalfa hay levels in the diet

	Treatments				
	1 Mean ± S.E.	2 Mean ± S.E.	3 Mean ± S.E.	4 Mean ± S.E.	5 Mean ± S.E.
Initial live body weight (g)	646.50a ± 233.73	621.64a ± 193.27	590.39a ± 131.99	649.09a ± 105.75	612.80a ± 134.85
Final live body weight (g)	2790.57ab ± 457.35	3031.00a ± 264.40	2758.95b ± 314.98	2772.61b ± 247.49	2872.93ab ± 173.33
Total body gain (g)	2144.07	2409.36	21.56	2123.52	2260.13
Total feed consumption (g)	6552.00	7741.60	8470.98	9119.95	7854.00
Feed conversion (kg feed/kg gain)	3.057	3.212	3.905	4.294	3.475

There were significant differences between groups (2-3) and (2-4), while there was no significances between groups (1-2), (1-3), (1-4) and (1-5) (at 12 weeks old).

Typical effect of the additions of a fibre source such as alfalfa meal to a cereal based diet are shown by Pote et al., (1980). There are several possible explanations for the low growth rate of rabbits fed a high energy, low fibre diet. Laplace and Lebas (1977) observed that, finally, ground feed increased the retention time of digestion in the caecum and decreased dry matter intake. Lebas and Laplace (1977) further reported that highly digestible diets are consumed in lower quantities and retained in the digestive tract longer than high fibre diets.

These data showed that group 4 (40% FM + 60 % hay) recorded the least live weight gain, while group 2 (80 % FM + 20 % hay) was the highest followed by group 5. It is worth noting that the best results of (80 % FM + 20 % hay) is in good agreement with that of Aboul-Ela et al., (1976). Evans (1981) stated that the mean daily body weight gain

was significantly greater with the high fibre diets than with the low fibre diets. King (1983), however, found that the rabbits given extra fibre gained body weight slightly more rapidly than those on basal diet, but the differences in the means were not significant.

The results showed that total feed consumption was increased by increasing the hay levels. Champe and Maurice (1983) found that the feed intake, increased linearly with increasing fibre content within the alfalfa diets only by using equicaloric diets containing 3, 6, 9 or 12 % dietary crude fibre from either alfalfa or coastal Bermuda grass.

Rabbits receiving control diet and 20 % lucerne showed the best feed conversion while that

Carcass characteristics of slaughtered rabbits

The characteristics of slaughtered rabbits at 8, 10 and 12 weeks old are shown in Table 3.

The percentage of head weight and fur weight from the live weight were small and not exceeding 7.24 % and 14.73 % respectively. The giblet portions of ten weeks old were lower than those at 8 and 12 weeks old. Abdominal fat % was slightly increased, recording the highest percentage (1.24 %) with the concentrate group at the end of the feeding period. It is worth noting that carcass yield increased with increasing age. The present percentage of dressed weight was slightly higher than those obtained by Osman (1991) for New Zealand White rabbits at 14 weeks of age. Radwan (1990) also found that dressing percentage increased with increasing age in rabbits. Concerning forequarter, loin and hindquarter % it was clear that loin increased by increasing age while the other parts, fore and hindquarters, had irregular increase with age.

Meat quality of slaughtered rabbits

The meat quality of slaughtered rabbits is shown in Table (4). The pH value of rabbits' meat was not influenced by the slaughter age for all groups. A similar trend was obtained by Osman (1991) for New Zealand White rabbits.

The mean value shows that meat of older rabbits was darker than that of younger ones. This may be due to higher meat content of myoglobin and homoglobin with advancing age. A similar trend was obtained by Osman (1991) for New Zealand White rabbits.

The water holding capacity decreased with increasing age (Table 4). It was clear that group 2 had higher water holding capacity than other groups at 8, 10 and 12 weeks. Ristić (1986) reported that the water holding capacity decreased with increasing age.

The present finding indicated that feeding Dutch growing rabbits on feed mixture or mixtures of fibre source such as lucerne meal only up to the extent of 20 % of the feed mixture not only gave the best performance but also revealed marked improvement in meat characteristics, while rearing these rabbits on higher levels of lucerne is not sufficient for meat production.

Table 3: Carcass characteristics of slaughtered rabbits

Treatment No.	Slaughter age (week)	Live body weight Mean ± SE	Fur W %	Head W %	Liver W %	Kidney W %	Heart + Lung W %	Giblets W %	Abdom. fat W %	Carcass W %	Fore-quarter W %	Loin W %	Hind-quarter W %
1	8	1790.00 ± 325.13	13.00	6.80	2.76	0,73	1.33	4.77	0.45	41.53	18.50	10.40	17.59
	10	2522.33 ± 413.57	12.49	6.14	2.75	0.73	1.11	4.60	1.11	49.56	19.23	11.97	18.79
	12	3035.33 ± 321.82	12.85	5.11	1.86	0.65	1.06	3.59	1.24	60.93	17.78	14.38	18.85
2	8	1871.88 ± 283.41	12.65	6.40	2.82	0.74	1.36	4.92	0.45	45.74	17.72	10.66	17.19
	10	2495.71 ± 252.68	12.35	5.08	2.85	0.69	1.13	4.67	0.96	50.41	18.81	12.55	18.99
	12	3064.75 ± 381.51	13.31	5.57	2.47	0.55	0.96	3.98	0.83	50.13	19.94	12.06	18.73
3	8	1663.88 ± 42.84	12.33	6.86	3.03	0.80	1.25	5.09	0.35	46.71	17.83	10.35	18.06
	10	2684.00 ± 49.00	14.73	7.24	3.76	0.63	1.12	5.51..	0.93	47.20	18.05	12.35	17.12
	12	2836.20 ± 293.50	12.74	5.85	2.60	0,62	0.90	'4.12	0.90	53.04	15.94	12.38	16.40
4	8	1766.28 ± 174.15	12.44	6.53	3.49	0.71	1.27	5.48	0.37	46.52	17.54	10.36	17.39
	10	2672.50 ± 127.92	14.07	6.82	3.18	0.65	0.91	4.74	1.09	49.20	17.65	13.31	19.94
	12	2702.63 ± 285.96	13.82	6.80	2.87	0.65	1.04	4.56	0.77	50.14	17.97	13.24	18.15
5	8	1944.00 ± 215.86	13.02	6.83	3.15	0.70	1.34	5.20	0.64	46.06	17.11	11.62	16.86
	10	2537.78 ± 264.67	12.68	7.24	3.34	0.68	1.12	5.14	0.73	46.86	17.30	11.99	18.49
	12	2844.71 ± 131.21	13.43	6.13	2.80	0.60	1.12	4.53	0.79	51.46	18.50	13.04	18.71

Means followed by the same symbol within each row do not differ significantly

Table 4: Meat quality of slaughtered rabbits

Treatments	Age (weeks)	ph		Colour (Göfo)		Water Holding Capacity	
		Mean ± S.E.		Mean ± S.E.		Mean ± S.E.	
1	8	6.03	0.99	35.00[b]	1.89	42.12	0.50
	10	6.06	1.37	35.00[b]	3.32	39.77	1.85
	12	6.09	0.62	41.67[a]	0.47	39.63	1.70
	sign.	N.S.		**		N.S.	
2	8	5.86	0.44	36.75[b]	2.38	45.74	0.87
	10	5.89	1.43	37.14[b]	2.85	42.35	1.25
	12	6.19	2.57	41.67[a]	1.25	46.15	1.60
	sign.	N.S.		**		N.S.	
3	8	5.95	0.48	35.00[b]	1.91	42.82[b]	1.30
	10	5.98	0.20	42.50[a]	0.50	34.15[a]	1.90
	12	6.03	0.00	42.50[a]	1.50	33.89[a]	2.50
	sign.	N.S.		**		**	
4	8	5.97	0.50	35.60	2.73	49.13[b]	1.90
	10	5.96	1.76	40.50	0.87	39.11[a]	1.70
	12	6.03	0.53	39.33	1.70	38.28[a]	3.13
	sign.	N.S.		N.S.		**	
5	8	86.11	1.01	39.40	2.42	48.17[b]	2.50
	10	6.16	1.23	38.83	3.13	37.38[a]	2.85
	12	6.00	1.10	39.00	0.00	36.67[a]	1.60
	sign.	N.S.		N.S.		**	

Means followed by the same symbol within each row do not differ significantly

4 Summary

Einsatz von Rohfaser in der Kaninchenfütterung

Zusammenfassung

Ein Hundert Mastkaninchen der Rasse Silbergrau wurden in der Mastperiode, im Alter 4 - 12 Wochen, zufällig auf 5 Futtergruppen verteilt mit dem Ziel. den Einsatz von Rohfaser (12,0 % bis 19,14 %) in der Fütterung zu prüfen.

In der 1. Behandlung erhielten die Tiere Kraftfutter ohne Luzernemehl, in der 2. Behandlung erhielten sie 20 %, in der 3. Behandlung 40 %, in der 4. Behandlung 60 % Luzernemehl in der Futterration. Die Tiere der 5. Behandlung bekamen mit zunehmendem Alter alle 2 Wochen (4-6, 6-8, 8-10 und 10-12) höheren Luzernemehlanteil (0, 20, 40, 60 %) in der Fütterung.

Die Tiere der 2. und der 5. Behandlung zeigten in der Reihenfolge höheres Wachstum. Die Futteraufnahme war mit Erhöhung des Anteils an Luzernmehl geringer. In der 5. Behandlung zeigten die Tiere geringere Futteraufnahme.

Die Tiere, die keine (Behandlung 1) oder geringen Anteil (Behandlung 2) Luzernemehl bekamen, zeigten die beste Futterverwertung, während die Fütterung mit höherem Anteil Luzernemehl eine schlechtere Futterverwertung zur Folge hat. Die Tiere der 5. Behandlung, die mit zunehmendem Mastalter einen höheren Anteil an Luzernmehl bekamen, hatten mittlere Futterverwertung.

Die Schlachtausbeute im Alter von 12 Wochen war 66,05%, 55,70%, 58,89%, 56,94% und 57,59% und zeigte deutlich die Überlegenheit der Tiere der 1. Behandlung, die lediglich Kraftfutter angeboten bekamen. Das Schlachtalter übte keinen Einfluß auf den Ph-Wert des Fleisches aus, aber das Fleisch älterer Tiere war dunkler. Das Saft-haltevermögen des Fleisches der Tiere der 2. Behandlung (20 % Luzernemehl) war günstiger als bei den anderen Behandlungen.

Die vorliegende Untersuchung zeigte, daß der Einsatz von Rohfaser in der Kaninchen-fütterung bis zu 20 % oder eine langsame Erhöhung des Anteils im Futter einen günsti-geren Einfluß auf das Wachstum und die Schlachtkörperqualität als bei einem höheren Anteil von Rohfaser hat.

Uso de fibra bruta en la alimentaciòn de conejos

Resumen

Cien conejos de engorde, de la rasa Silbergrau, se han distribuido con la edad de 4 a 12 semanas, en el perìodo del engorde al azar a 5 grupos, con la meta a comprobar el uso de fibra bruta en la alimentaciòn (12,0 % a 19,14 %).

En el primer tratamiento los animales recibieron concentrado sin arina de alfalfa, en el segundo tratamiento recibieron 20%. en el tercero tratamiento 40%. en el cuarto 60% arina de alfalfa en su porciòn de alimento. Los animales del quinto tratamiento recibieròn con edad creciente a las dos semanas (4-6, 6-8, 8-10 y 10-12) una cantidad mayor de arina de alfalfa (0, 20, 40, 60%) en el alimento.

Los animales del segundo y del quinto tratamiento manifestaron en orden mayor crecimiento. La asimilaciòn del alimento fue con intensificaciòn del Parte de arina de alfalfa menor. En el quinto tratamiento los animales señalaron una menor asimilación.

Los animales cuales no recibieron o solo uns pequena parte de arina de alfalfa, manifestaron la mayor asimilaciòn del alimento. La alimentaciòn con un mayor parte de arina de alfalfa tiene como consequencia uns peor asimilaciòn del alimento. Los animales del quinto tratamiento, cuales con creciente edad de engorde recibieron uns mayor parte de arina de alfalfa, mostraron una asimilaciòn mediana del alimento.

El rendimiento de la matanzaen la edad de 12 semanas fue 66,05%, 55,70%,58,89%,56,94% y 57,59% y senalo claramente la superioridad de los animales

del primer tartamiento, cuales solo recibierón concentardo. La edad de matanza no tenia ninguna influencia por el valor del phde la carne, solo que la carne de animales de mayor edad era mas obscuro.La capacidad de mantener el jugo de la carne de los animales del segundo tratamiento (20% arina de alfalfa) fue mas favorable que en otros tratamientos.

La presente comprobaciòn manifestò que el uso de fibra bruta hasta 20% o una despacio elevaciòn de la porciòn en la alimentaciòn de conejos tiene un mas favorable por el crecimeinto y la calidad del curpo de matanza, en comparaciòn a una mayor parte de fibra bruta.

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