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UTILIZATION OF AGRICULTURAL BY-PRODUCTS IN THE NUTRITION OF RABBIT

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Introduction

The crude fibre need of rabbits kept in small farms is covered mostly with natural tame hay.

The great farm technology requires intensiv natrition, the feeding of pelleted rabbit feed, in which the demand for crude fibre have to be insured concentrated.

The rabbit utilizes crude fibre relatively poorly /SLADE-HINTZ,1969; SPREHDBURY,1975;LEBAS,1975/ in nutritive matter supply, it is also not considerable as energy source /LANARI,1976/ its presence in feed harmfully influences the digestibility of the other nutritives /PARIGI-BINI,1971; LEBAS,1982; WARD-OWEN,1984/ yet essential in its feed. Its lack causes digestion disorders, increases death and influences production results unfavourably.
In present rabbit feed mixes generally occurs alfalfa meal or other tame hay as a fibre carrier component.

To satisfy the fibre content of rabbit feeds the agricultural and foof industrial by-products rich in fibre offer themselves obviously.

Methods and materials

In our study we utilized the tested by-products - in the light of their nutritive value and crude fibre content - gradually in the feed mix of the fatted rabbits, in minimum 6, maximum 3o percent.
The by-products rich in fibre were used to substitute completely or partly the alfalfa meal occuring in 4o % in the control feed. The arising absence of protein was supplied with extracted sunflower and rape seed course-meal. The developed experimental feeds with iso-N-content generally contained 13-16 % crude fibre, 1o.5-11.8 MJ/kg digestable energy, conversely to the by-product free feed of 13.o % crude fibre and 11.8 MJ/kg digestable energy content. The used by-products were blended into the rabbit feed dried, cut rough /1-3 mm granulation/.
In our study we used New Zealand White rabbits weaned at the age of 5 weeks, minimum 2o maximum 6o animals per treatment. In each of the experimental groups the litter were distributed into individual cages, paying attention to the setting in live mass and sex rate. The fattening experiments took from the age of life of 5 weeks till 1o-12 weeks of life. The feeding experiment was supplemented with utilization test, we placed 4-4 female rabbits per treatment into utilization cages at the age of 1o weeks.

Results of the experiment

The most important production indexes /daily average body mass gain, specific feed consumption and death/ experienced at the feeding of agricultural by-products used at different rate in the rabbit feed is introduced summarized in table 1.

From the table it can be observed that the applied by-products generally impair the body mass gain by increasing the dose, with the exception of corn-stalk and wheat bran. At the lower dose differences are still not considerable, at the higher dose in turn they are verified statistically in a number of cases.
A similar tendency can be observed also in the specific feed utilization, in this case however, feed utilization improves also with the distribution of tomato murc beside the corn stalk and wheat bran. The distribution of fibre content by-products more or less moderated the deaths of digestive organ desease origin.
The digestibility coefficients of the organic matter - with the exception of the beetroot slice - generally degrades slightly with the increasing dose of the by-products applied.
In the fibre digestion similar tendency can be observed with the exception of the beetroot slice, broiler litter, bean straw and apple murc. The fed by-products in turn do not impair significantly the crude protein digestibility in most cases.

Evaluation of results,conclusions

With the increase of the wheat straw ration in the feeds the body mass gain /above lo %/ and the specific feed utilization spoils, in turn the death of digestive organ desease decreases. Supplementation of fibre content of the rabbit feeds because of dietic effect can be recommended in 6-lo % of the roughly cut wheat straw.
The corn-stalk contains also fibre digestable for the rabbit, what is able to utilize it as energy source. Its lo-15 % utilization in the feed mix of animals, favourably influences the animals'body mass gain, specific feed utilization.

Distributed in structural form /2-4 mm/ its feeding is of dietic effect.
We found close negative relationship between the percent rate /x/ of the corn-cob and the digestibility of the feed mix organic matter /y_1/ as well as of crude fibre /y_2/, what can be expressed by the:

$y_1 = 68.3 - 0.34\ x$; r=0.98, respectively

$y_2 = 28.3 - 0.35\ x$; r=0.93 linear equation.

The feeding of rabbit diet containing corn-cob impairs the body mass gain and specific feed utilization of the rabbits parallel with the increase of the rate of cob. Rabbits do not kindly consume the feed mix made by its use, so despite of its low nutritive value beside its distribution the extra feed intake is not typical. Its feeding does not decrease the illness of diarrhoeal origin.

The increase of the rate of the sunflower hull /above 10%/ impairs the digestibility of the nutritive matters.
We established close negativ correlation between the percental sunflower content /x/ and the digestibility of the N-free extracted matter of the rabbit feed, what is reflected by the

$y = 82.6 - 0.38\ x$; r= -0,91 linear equation.

The impairment of digestibility of the crude protein of the feed mix the rabbit with the consumption of its coecotroph excreta is able to compensate to a certain extent /FEKETE-BOKORI,1984/.
The relatively acceptable production results /body mass gain, specific feed utilization/ experienced beside the feeding of a diet containing 10% sunflower hull is mainly due to the hardly digestable structural fibre of the by-product, the favourable dietic effect of what to a certain limit balances the nutritive matter loss of the worse feed utilization.

The diarrhoeal symptom discharge experienced at feeding of a rabbit feed of high bean straw content is due to its structural fibre, favourable dietary effect.
Its modest, but more valuable nutritive matter content than that of the cereals'straw utilizes comparatively well in rabbit. It is due to this, that the lo % feed mixture does not impair the production indexes in rabbit fattening.
The dried beetroot slice by means of its good dietary feature, its low acid binding ability, can play a role in the preservation of the good health state of the digestive tract /PROHÁSZKA,1983/. Its fibre without structure is easily digestable and can not be considerable in the preservation of bowels peristole /LEBAS-COLIN,1975/. The beetroot slice can not count as a single, exclusive fibre carrier in the nutrition of rabbit, the advantage of its utilization /in lo-2o %/ appears rather at forming the low stomach chemical reaction and at its role in the energy system.

The utilization of tomato murc at lo-2o % in the rabbit feed, by means of the good digestibility of its fat and protein content remarkably contributes to the protein and energy supply of rabbits. To a certain limit fat /TELEKI and DARWIS,1978;PARIGI-BINI,1971/ promotes the better digestibility of feeds, improves the body mass gain and feed utilization of the rabbits. Its large scale distribution can produce a reverse effect of this /LEBAS,1975; GIPPERT and PÓKA,1979/ since it predisposes to diarrhoeal disease.
The protein, fibre and carbonhydrate content of the broiler litter is nearly identical to that of alfalfa meal, the rabbit digests it moderately similarly to alfalfa, so it is understandable that feeds made by its employment do not influence the production results compared to the control.

Its structural fibre promotes the quick voiding of the feed from the caecum and large intestine, it takes part in keeping in order the digestive tract of the rabbit. At its 2o % rate, the digestion inhibiting effect of its fibre already succeeds.

The wheat bran beneficially contributes to the favourable production results experienced at its 2o % employment by means of its advantageous dietary effect, easily digestible nutritive matter content.

The favourable dietary effect, acid reaction of the fibre of apple murc anvantageously influences the utilization of the starch value digestible energy and crude protein of the rabbit feed made by its use, moderates the disease of diarrhoeal origin. At a rate of lo % it does not influence the production indexes considerably, but greatly moderates the death of digestive organ disease origin.

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Production results

1.table

Experimental treatments Tested material	in %	Daily body mass gain $\bar{x}$ g		Specialiti feed utilization $\bar{x}$ g		Death %
Control	-	33,5	3,7	2,83	- o,2o	22
Wheat straw	6	34,2	3,9	2,93	o,23	18
	13	32,8	3,4	3,19	o,37^{x}	12^{x}
	2o	31,9	3,5^{x}	3,28	o,36^{x}	1o^{x}
Control	-	33,1	3,9	3,1o	o,41	15
Corn stalk	1o	33,2	4,1	3,o8	o,22	13
	15	33,8	5,7	3,o5	o,12	11
	2o	32,3	5,8	3,16	o,4o	13
Control	-	33,5	6,4	3,14	o,64	25
Corn cob	1o	32,o	4,5	3,48	o,42^{x}	18
	2o	28,8	4,1^{x}	3,78	o,64^{x}	2o
Control	-	33,2	5,7	2,99	o,38	14
Sunflower hull	1o	32,4	3,1	3,o1	o,19	12
	15	32,o	4,3	3,17	o,34	15
	2o	29,8	3,7^{x}	3,22	o,25	18
Control	-	33,7	o,62	3,19	o,41	22
Bean straw	1o	33,2	o,58	3,12	o,35	1o
Control		33,9	3,3	3,15	o,25	2o
Beetroot slice	12	33,7	5,4	3,o1	o,33	15
	25	32,o	6,4	2,89	o,35	2o
Control	-	34,4	5,8	3,21	o,33	2o
Tomato murc	1o	34,1	4,8	3,2o	o,41	12
	2o	34,5	4,6	3,1o	o,4o	18
	3o	31,2	4,1^{x}	3,15	o,33	15
Control	-	33,7	3,8	3,25	o,55	18
Strawy broiler litter	1o	33,1	3,3	3,26	o,48	12
	2o	32,o	4,8	3,31	o,68	15
Control	-	35,5	o,47	3,2o	o,23	15
Wheat bran	1o	35,8	o,52	3,12	o,28	13
	2o	36,7	o,56	3,o6	o,31	11
Control		32,8	7,3	3,22	o,92	18
Apple murc	1o	31,3	7,5	3,12	o,87	8
	2o	3o,1	6,8	3,23	o,79	1o

x P<o,o5

2.talbe

Results or utilization experiments

Experimental treatments		Digestibility coefficients in %		
Tested material in %		Organic matter	Crude protein	Crude fibre
Control	-	77,5 ± 2,1	68,3 ± 4,1	36,3 ± 4,8
Wheat straw	6	7o,9 ± 1,8x	67,2 ± 4,5	28,8 ± 2,7x
	13	68,7 ± 1,9x	69,o ± 2,1	27,3 ± 1,8x
	2o	64,3 ± 2,6x	67,5 ± 4,7	3o,5 ± 3,6x
Control	-	73,3 ± o,9	69,2 ± 1,7	3o,3 ± 2.9
Corn stalk	lo	73,5 ± 1,2	76,7 ± 1,3	33,2 ± 2,9
	15	72,7 ± 2,4	71,4 ± 3,7	29,8 ± 5,1
	2o	68,7 ± 1,4	72,2 ± 3,3	26,3 ± 4,4
Control		68,2 ± 1,8	66,8 ± 3,5	28,7 ± 3,2x
Corn cob	lo	64,5 ± o,5x	67,4 ± 2,1	23,2 ± 6,1x
	2o	61,7 ± 1,4x	63,9 ± 3,2	21,8 ± 9,8x
Control		69,2 ± 2,2	67,8 ± 3,1	3o,3 ± 4,8
Sunflower hull	lo	7o,5 ± 1,2	66,8 ± 1,1	27,8 ± 3,9
	15	68,3 ± 2,9	68,7 ± 1,5	26,8 ± lo,5
	2o	66,3 ± 2,2	67,7 ± 2,2	24,1 ± 4,3
Control	-	73,3 ± o,9	69,2 ± 1,7	3o,3 ± 2,8
Bean-straw	lo	72,8 ± 1,1	7o,3 ± 2,3	31,2 ± 2,9
Control	-	69,5 ± 1,5	72,4 ± 1,8	29,6 ± 2,6
Beetroot slice	12	74,1 ± o,9x	72,6 ± 1,5	31,9 ± 1,8
	25	71,9 ± 1,1	68,3 ± 1,3x	32,3 ± 3,4
Control	-	72,6 ± 1,6	67,8 ± 3,2	26,6 ± 4,4
Tomato murc	lo	72,6 ± 1,7	69,4 ± 2,9	22,3 ± 4,9
	2o	71,7 ± 1,1	65,5 ± 2,8	23,6 ± 6,6
	3o	72,4 ± 2,2	69,7 ± 1,6	18,6 ± 7,1
Control	-	69,7 ± 1,5	72,5 ± 1,8	29,8 ± 2,5
Broiler litter	lo	68,8 ± 1,2	7o,2 ± 1,6	31,5 ± 3,1
	2o	67,7 ± o,5	67,8 ± 1,8x	3o,4 ± 1,5
Control	-	75,3 ± 2,6	69,2 ± 2,1	36,2 ± 3,9
Wheat bran	lo	72,8 ± 3,6	71,8 ± 3,4	35,8 ± 4,1
	2o	71,3 ± 2,2	73,3 ± 2,2	35,3 ± 3,4
Control	-	72,2 ± 2,1	68,5 ± 2,9	3o,5 ± 2,1
Apple murc	lo	71,5 ± 2,6	64,6 ± 3,4	32,1 ± 2,4
	2o	72,7 ± 1,8	61,3 ± 2,9x	33,3 ± 2,5

x P < o,o5

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The authors distributed the tested 10 kinds of fibrous by-products generally in 5-10-15-20-30 % in the fattening rabbit diet. The body mass gain, specific feed consumption and health condition of the rabbits was controlled. On the fibre supplementation of rabbit diets the wheat straw, sun-flower hull at 5-10 %, bean-straw, apple murc in 10 % corn stalk, broiler litter in 10-15 % can be utilized. Feeding them up decreases the number of digestive organic illnesses originated from fibre missing, the production results are not influenced considerably. The rabbits utilize the nutritive value of tomato murc, wheat bran, dried beetroot slice well, can successfully be utilized in their feed mixture at 10-20 %. The dried beetroot slice contributes primarily to satisfy the need for energy of rabbits, the tomato murc and wheat bran the energy, protein and fibre.

DIE VERWERTUNG DER LANDWIRTSCHAFTLICHEN NEBENPRODUKTEN IN KANINCHENFÜTTERUNG

Die Verfasser dosierten die geprüften lo-artigen faserigen Nebenprodukte im allgemeinen in 5-lo-15-2o-3o % in das Mischfuttermittel für Kaninchen. Körpermassenzuwachs von Kaninchen, sowie ihre Futtervewendung und Gesundheitszustand kontrolliert wurden. Zur Fasernergänzung von Kaninchenmischfuttermittel sind Weizenstroh und Sonnenblumenschalen in 5-lo %,Bohnenstroh und Apfeltrester in lo %, Maisstengel und Broilerstreu in lo--15 % zu utilisieren. Ihre Vewendung vermindert die aus Fasernmangel strammende Zahl der Erkrankungen von Verdauungsorganen und sie beeinflu3en die Produktionsresultate beträchtlich nicht. Die Kaninchen verwerten den Nährstoffgehalt von Tomatentrester, Weizenkleie, getrokneten Rübenschnitzeln sehr gut, und sie sind in ihrer Futtermischung in lo-2o % zu benutzen. Der getrocknete Rübenschnitzel trägt in erster Linie zur Befriedigung des Bedarfs an Energie von Kaninchen d.h. an Energie Tomatenresten und Weizenkleie bzw. an Eiweiß und Fasern bei.