

REPRODUCTIVE PERFORMANCE OF RABBITS FED ON MIXTURES CONTAINING UNTREATED AND TREATED STRAW

BIELANSKI P., NIEDZWIADK S., ZAJAC J.

Department of Fur Animal Breeding, National Research Institute of Animal Production, 32-083 Balice n. Cracow, Poland

Abstract - The effect of feeding New Zealand White rabbits on diets containing untreated and NaOH and NH₃ treated wheat straw on indices of reproductive performance was studied. Birth-to-weaning mortality of young rabbits in groups fed on pelleted feed with treated straw decreased from 15.1% in the control group to 13 and 11.6%. Litter weight at 21 days of age increased by 98 to 329 g compared to the control group. Indices of milk yield and reproductive performance of does improved.

INTRODUCTION

The objective of this work was to examine the possibility of using untreated and sodium hydroxide and ammonia treated straw in feeding rabbits of the foundation herd.

No such work has been done in Poland, and only reports were published in available literature - JENSEN 1988; JENSEN *et al.*, 1986; BLAS *et al.*, 1979; and LINDEMAN *et al.*, 1981 and 1982.

Therefore it was considered advisable to undertake studies on the possible use of untreated wheat straw and sodium hydroxide and ammonia treated straw in rabbit feeding and its effect on parameters of reproductive performance.

MATERIAL AND METHODS

The effect of diets with untreated and treated wheat straw was observed on New Zealand White rabbits. A total of 801 female and 80 male rabbits of the reproductive herd were studied. The males and females were divided into 4 groups:

- in group K, 203 does and 20 bucks were fed on a complete pelleted containing 30% dried forage ;

In the remaining groups, 10 or 12% of dried forage was replaced with untreated or treated straw:

- in group S, 198 does and 20 bucks were fed on a complete pelleted containing 10% untreated wheat straw ;

- in group A, 201 does and 20 bucks were fed on a complete pelleted containing 12% NaOH-treated wheat straw ;

- in group B, 199 does and 20 bucks were fed on a complete pelleted containing 12% NH₃-treated wheat straw.

All the mixtures had identical nutrient and energy content: 16% crude protein, 14% crude fibre, 3% crude fat and 2400 kcal (10.042 MJ) of metabolizable energy (Table 1).

Winter wheat straw was enriched in two ways.

Leaching involved sodium hydroxide straw treatment by a feeder spraying machine in the following proportion - 133.3 ml NaOH solution (4 kg solid NaOH + 9.3 kg H₂O)/1 kg chopped straw.

Wheat straw ammonification involved the following proportion: 100 kg chopped straw was treated with 12 kg 25% NH₃. The treated straw was protected against escape of ammonia in plastic bags for 6-8 weeks.

Doe reproductive performance was evaluated on the basis of 4176 litters. Maternal values of the doe were determined by a milk yield coefficient, according to the following formula :

$$M = \frac{c_2 - c_1}{21 \times c_2} \times 100 \quad (1)$$

where

M - milk yield coefficient of the doe,

c₁ - litter weight (g) 24 h after birth,

c₂ - litter weight (g) 21 days after birth.

Also a coefficient of doe reproductive performance (WR) was calculated for one year of their utilization, expressed as body weight of rabbits weaned from 1 doe in a year according to the formula given by NIEDZWIADK (1989):

$$WR = n * A$$

where :

- WR - reproductive performance,
- n - number of rabbits weaned from 1 doe in a year (head),
- A - average rabbit body weight at weaning (kg).

Statistical calculations were done by analysis of variance using Statgraphics software (1987). The following linear model was assumed for the characters of reproductive performance:

$$Y_{ij} = + a_i + b_j + (ab)_{ij} + e_{ij}$$

where :

- Y_{ij} - observation of animal j of feeding group i
- u - mean value
- a_i - effect of feeding group i (i=1...4)
- b_j - effect of year j
- $(ab)_{ij}$ - feeding group x year interaction
- e_{ij} - error

Table 1 : Percentage composition and chemical and energy value of pellets.

Item	Groups			
	K	S	A	B
Grass meal	30	20	19	19
Untreated straw	-	10	-	-
Straw treated NaOH	-	-	12	-
Straw treated NH ₃	-	-	-	12
Ground barley	15	15	15	15
Ground maize	15	17	15	15
Wheat bran	12,6	10	11	11
Oat flakes	10	10,6	10,6	10,6
Soybean meal	10	10	10	10
Meat and bone meal	1	1	1	1
Milk powder	3	3	3	3
Fodder yeast	1	1	1	1
Salt	0,4	0,4	0,4	0,4
Premix KF	2	2	2	2
Total	100	100	100	100
Crude protein (g/kg)	168	162	162	163
Crude fibre (g/kg)	142	138	142	141
Crude fat (g/kg)	33,8	32,1	32,1	32,1
Met. energy (MJ/kg)	10,44	10,26	10,32	10,32
(kcal/kg)	2495	2452	2466	2466

* Group K - control, group S - untreated straw, group A - NaOH-treated straw, group B - NH₃-treated straw.

RESULTS AND THEIR DISCUSSION

The average number of litters from 1 doe per annum was slightly higher (by 0.1 to 0.3 litter) in groups fed on treated straw (Table 2). The number of litters from a doe was high by Polish standards (NIEDZWIADK, 1984; KOPANSKI, 1990), but lower by almost 2 litters than on specialized west-European farms (ZAJAC *et al.*, 1994 and 1994a).

Litter size at birth was high and even across the groups. NIEDZWIADK (1983) quoted the same number of live born rabbits (7.4) for the New Zealand White breed. In experiments by JENSEN *et al.* (1986) on White Danish rabbits - which is one of the preferred breeds in Poland for slaughter material production - 8.7 to 9.0 rabbits per litter were obtained in successive generations, with an average of 8.4 young rabbits. LINDEMAN *et al.* (1982), in an experiment on hybrid rabbits (New Zealand White x Californian) which involved feeding leached straw, quotes higher number of live born rabbits per litter - from 8.0 to 10.7. It must be said, however, that the studies by the

above authors cover the results of 1 to 3 litters. In the present study, the results are the means of 2 years, when 801 does were used for reproduction.

There were from 0.19 to 0.21 stillborn rabbits in groups fed on a mixture containing NH₃ and NaOH treated straw, which is slightly less than in the group fed on a complete pelleted containing untreated straw. Similar findings are given by JENSEN *et al.* (1986) and LINDEMAN *et al.* (1982).

Table 2 : Effect of diets on parameters of reproductive performance

Item	Group*			
	K	S	A	B
No. of does	203	198	201	199
No. of litters per doe and year	5,2	5,1	5,4	5,3
Litter size (no. of live born rabbits)	v% 12,5	12,8	12,7	12,4
No. of stillborn rabbits per litter	7,3	7,3	7,4	7,3
No. of rabbits in litter at weaning	v% 25,6	25,2	26,2	25,1
Birth-to-weaning mortality (%)	0,23	0,27	0,19	0,21
Litter weight at birth (g)	v% 33,0	33,6	32,7	32,8
Neonatal weight (g)	6,2	6,2	6,5	6,3
Litter weight at 21 days	v% 24,8	26,5	25,6	25,7
Milk yield coefficient (M)	(%) 15,1 ^{ab}	15,1 ^{cd}	12,2 ^{ac}	13,7 ^{bd}
Rabbit weight at weaning (g)	477,8	458,2	472,5	477,9
Coefficient of doe reproductive performance (WR)	v% 20,8	22,6	22,2	24,2
	65,5	62,8	63,8	65,5
	v% 8,8	9,3	10,0	9,9
	1810 ^A	1848 ^B	1946 ^C	2177 ^{AB}
	v% 20,6	19,9	21,9	e
				21,2
	3,50 ^f	3,58	3,61	3,72 ^f
	v% 9,2	9,0	9,9	9,6
	816,5	774,2 ^g	802,3	833,2 ^g
	v% 25,7	25,0	23,5	25,0
	26,32 ^{hij}	24,48 ^{hkl}	28,16 ^{ik}	27,82 ^{jl}
	v% 28,3	27,4	27,8	28,0

Numbers with the same capital letters (A,B...) differ highly significantly (P<0.01); numbers with the same small letters (a,b,...l) differ significantly (P<0.05)

* For explanation - see Table 1.

The highest number of rabbits weaned from a doe in litter (6.5) was achieved with feeding a complete pelleted with leached straw, which is in line with the results of Gut *et al.* (1989) and NIEDZWIADK (1983) for the same rabbit breed. In his studies JENSEN *et al.* (1986) quotes from 6.7 to 7.4 rabbits reared. Our results show that there was slightly higher mortality from birth to weaning. The lowest mortality was in the group fed on a complete pelleted with NaOH and NH₃ leached straw. Significantly higher mortality was found in the group fed on untreated straw, and in the control.

Most of the deaths occurred between birth and 14 days of age. Feeding, however, should not be regarded as having a significant effect on mortality in that period, since it is until 14 days of age that rabbits feed

on mother's milk only. It seems that mother's protection was crucial here, as close observation showed that about 80% of young rabbit mortality resulted from crushing by the doe or freezing, that is from lack of motherly care.

Litter weight at 21 days of age was the highest in the group of rabbits fed on ammonified straw, both in the successive years and for the whole experimental period. It was significantly higher than litter weight in the group fed on a complete pelletet with NaOH-treated straw, and highly significantly higher than in the control groups and in groups fed on untreated straw. Values achieved in the groups fed on straw enriched complete pellets were in line with the findings of GUT *et al.* (1989), NIEDZWIADK (1983; 1989) and higher than those of LINDEMAN *et al.* (1982).

Maternal value of does, expressed by a milk yield coefficient, was statistically highest in the group of rabbits fed on ammonia-treated straw. This value was also high in the group fed on leached straw. Similarly high parameters were achieved by Gut *et al.* (1989) and NIEDZWIADK (1989), and slightly lower by BIELANSKI *et al.* (1989). For the same breed of rabbits, but with a less intensive mating system, LABECKA (1990) quotes the value 4.03.

Rabbit weight at weaning at 35 days was the highest in the group fed on a complete pelleted with ammonia straw (833 g). NIEDZWIADK (1989) quotes the body weight of New Zealand White rabbits on day 28 at 560 g, while BIELANSKI *et al.* (1989) on day 35 at 600-700 g.

The highest reproductive coefficient of does (WR) was achieved for does fed on a complete pelleted containing sodium hydroxide treated straw, and slightly lower for does fed on ammonia straw. Significantly lower coefficients were obtained by the control group does and does fed on an untreated straw complete pelleted.

The coefficients of reproductive performance obtained indicate that it is advisable to supply complete pelletets with sodium hydroxide or ammonia treated straw. JENSEN *et al.* (1986), in his studies over 6 generations, did not prove a negative effect of feeding leached straw diets on parameters of reproductive performance of the Danish White does.

In summing up the results obtained it must be said that the use of complete pellets with enriched straw in feeding foundation herd does significantly improved parameters of reproductive performance, and especially litter weight at 21 days and percentage of young reared per litter. Foundation herd does, fed on experimental mixtures, had significantly higher coefficients of reproductive performance (WR) and milk yield.

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Fortpflanzungsnutzung den Kaninchen bei Fütterung von Mischungen mit Anteil von rohe und veredelte Stroh - Einsatz von pelletierte Fertigmischungen mit Anteil der veredelte Stroh bei fütterung der weibliche Tiere der Grund-Herde, hat im wesentlichen an verbesserung der Fruchtbarkeit- leistung beigetragen. Besonders an Wurfgewicht im Alter von 21. Tage sowie Aufzucht der junge Tiere. Die weibliche Tiere von Grund-Herde welche mit Versuchs-Mischungen gefüttert waren haben signifikant höhere Aufzuchtergebniss (WR) sowie Milchleistung.
