PARAMETERS OF FATTENING AND SLAUGHTER PERFORMANCE OF RABBITS FED ON MIXTURES CONTAINING UNTREATED AND TREATED STRAW

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Abstract- The effect of feeding New Zealand White rabbits on pelleted feed with untreated and treated straw on the indices of fattening and slaughter performance was studied. Rabbits fattened on pellets with treated straw consumed less feed by about 0.2 kg, and their mortality decreased to 9.0%. Indices of slaughter performance were about the same as in the control group.

INTRODUCTION

The objective of this work was to examine the possibility of using untreated and sodium hydroxide and ammonia-treated wheat straw in feeding young rabbits from birth to weaning. Partial replacement of expensive and energy-consuming dried forage with untreated or treated straw should decrease the costs of complete pelleted production. On the other hand, this will enable the straw available to be used and managed in a rational way.
Such studies have not been conducted in Poland. In world literature available, there are only reports by JENSEN (1988), JENSEN *et al.* (1986), BLAS *et al.* (1979) and LINDEMAN *et al.* (1981 and 1982).
For this reason we decided to undertake studies on the possible use of untreated and sodium hydroxide and ammonia-treated wheat straw in rabbit nutrition and to determine its effect on the parameters of fattening and slaughter performance.

MATERIAL AND METHODS

The fattening performance studies were carried out on young rabbits from weaning at 35 days until 90 days. A total of 1600 young rabbits were used, with equal numbers of bucks and does, which were fed on the following complete pellets :

- in group K, 400 does and 400 bucks were fed on a pelleted containing 30% dried forage;
  in the remaining groups, 10 or 12% dried forage was replaced with untreated or treated straw:
- in group S, 400 does and 400 bucks were fed on a pelleted containing 10% untreated wheat straw,
- in group A, 400 does and 400 bucks were fed on a pelleted containing 12% NaOH-treated wheat straw,
- in group B, 400 does and 400 bucks were fed on a pelleted containing 12% NH_3-treated wheat straw.

All the complete pellets 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).
Complete pellets were composed of grass meal, ground barley, ground maize, wheat bran, rolled oats and soybean meal, supplemented with meat-and-bone meal (1%), fodder yeast (15) and salt (0.4%). Each of the complete pellets was supplemented with 2% premix KF including robenidin (a coccidiostatic).
Winter wheat straw was treated using two methods, leaching and ammonification.
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 H_2O)/1 kg chopped straw.
Wheat straw ammonification involved the following proportion: 100 kg chopped straw was treated with 12 kg 25% NH_3. The treated straw was protected against escape of ammonia in plastic bags for 6-8 weeks.

The fattening value was evaluated by observing:

- individual body weights of rabbits at 35 and 90 days,

- feed intake by controlling feed provided and leftovers
- rabbit mortality.

All the animals were provided with identical housing conditions throughout the experiment. A cascade system of galvanized wire metal cages was used in a closed room with adjustable microclimate. Room temperature ranged from 15 to 18°C. The light day was 12 h/day. The rabbits had free access to drinking water thanks to automatic nipple drinkers.

After the fattening, 90-day-old rabbits were fasted for 24 hours and randomly selected and slaughtered, 48 rabbits from each experimental group. Slaughter analyses included the following parameters: warm carcass weight, and the weight of kidney, heart and lungs, liver, blood, alimentary canal, fur, head and legs.

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

$$Y_{ijkl} = u, + a_i + b_j + c_k + (ab)_{ijk} + e_{ijkl}$$

where

Y_{ijkl} - observation of animal l in season k of sex j from feeding group i
u - mean value
a_i - effect of feeding group i (i=1...4)
b_j - effect of sex j
c_k - effect of season k
$(ab)_{ijk}$ - sex x feeding group x season interaction
e_{ijkl} - 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 - NH_3-treated straw.

RESULTS

Analysis of variance made for fattening traits showed that differences between the means for sex and seasons were small and statistically nonsignifi-cant. Neither was a statistically significant sex x feeding group x season interaction proven. For this reason, the present results of fattening traits are tabulated without accounting for sex and seasons.

Young rabbit fattening was started after weaning at 35 days. Rabbit body weights were similar at that time and ranged from 728 g in group S to 732 in group A (Table 2). Coefficients of variation for this trait were low and ranged from 13.0 to 15.0%.

Table 2 : Results of rabbit fattening

Item		Groups			
		K	S	A	B
Initial body weight (g)	x	730	728	732	731
	v%	13.9	15.0	13.0	13.2
Final body weight (g)	x	2426	2408	2433	2455
	v%	9.8	10.2	11.1	10.6
Average daily gain	x	30.8	30.5	30.9	31.3
	v%	11.3	12.5	10.9	11.1
Feed conversion rate (kg)	x	3.70	3.82^{ab}	3.63^{b}	3.56^{a}
	v%	10.4	11.0	10.6	9.9
Mortality (%)		10.0^{c}	12.0^{cde}	9.0^{d}	9.5^{e}

Numbers with the same small letters (a,b,..e) differ significantly (P£0.05)
* - For explanation - see Table 1.

After fattening, at 90 days, rabbits fed on a complete mixture containing ammonia-treated straw reached the highest body weight, followed by rabbits fed on a complete pelleted containing NaOH-treated straw (lower by 22 g), the control group (lower by 29 g) and the group fed on a complete pelleted containing untreated straw (lower by 47 g).
Rabbits fed on a complete pelleted containing NH_3 and NaOH-treated straw had the lowest feed intake per 1 kg body weight gain. Their feed conversion rate was lower by 0.1-0.2 kg than in the rest of the feeding groups. For the whole experimental period, the lowest feed intake was in group B (3.56 kg) and the highest in group S (3.82 kg feed), the difference being statistically significant.
Rabbit health from weaning to the end of fattening was one of the principal determinants of breeding and especially of nutrition. Rabbit mortality in groups fed on pelleted leached and ammonified straw was low. The lowest mortality rate during fattening throughout the experiment occurred in groups A (9.0%) and B (9.5%), followed by groups K (10.0%) and S (12.0%). The differences were confirmed statistically.
In recent years more and more attention is paid not only to the quantity but also to the quality of rabbit meat produced. Rabbits are bred for the high meat content of carcass (OUHAYOUN, 1989).
Rabbit body weights after 24-hour fasting were even in groups and ranged from 2440 to 2470 g. Variation coefficients were low at 9.8 to 10.4% (Table 3). Carcass weight without head was the highest in group A (1370 g), and the lowest in group S (1336 g). Total weight of edible parts, that is carcass without head, liver, heart, kidneys and lungs was the highest in group A (1490 g), followed by groups B (1485 g) and K (1480 g). The weight of edible parts was the lowest in group S (1460 g). The differences between groups were not confirmed statistically.
Slaughter yield - the principal indicator of slaughter value, quoted in literature in terms of carcass, carcass with pluck, and carcass with pluck and head, and calculated as a ratio of warm carcass weight to rabbit body weight before slaughter - ranged from 54.8 to 55.1%.

Table 3 : Results of rabbit slaughter analysis

Item	Groups*							
	K		S		A		B	
	x	v%	x	v%	x	v%	x	v%
Rabbit weight before slaughter (g)	2450	10.3	2440	9.8	2470	10.4	2460	9.9
Weight of edible parts 20 min after slaughter:								
- carcass without head (g)	1350	12.7	1336	12.9	1370	11.9	1351	12.3
- liver (g)	80	18.3	83	17.8	78	18.9	79	17.6
- heart, kidneys, lungs (g)	50	13.9	41	14.2	42	13.6	55	14.0
Total edible parts (g)	1480	13.7	1460	13.9	1490	14.2	1485	13.6
Weight of offal:								
- fur (g)	260	18.5	267	19.1	266	19.5	256	18.9
- blood (g)	70	24.2	50	25.1	62	24.9	58	24.3
- legs (g)	80	21.4	78	22.2	82	22.6	83	21.9
- alimentary canal (g)	420	12.5	448	13.2	431	12.9	437	11.9
- head (g)	120	11.2	114	11.0	114	11.4	117	11.6
Total offal parts (g)	950	12.6	957	12.9	955	13.2	951	11.9
Slaughter yield (carcass only) (%)	55.10	8.3	54.75	7.9	55.47	8.4	54.92	8.8
Yield of edible parts (carcass +pluck) (%)	60.41	8.1	59.84	7.8	60,32	8.5	60.37	9.0
Yield of edible parts (carcass+ head+pluck) (%)	65.31	8.4	64.51	7.5	64.94	8.7	65.12	9.1
Slaughter losses (%)	0.80	12.9	0.90	11.8	1.01	13.1	0.98	13.4
Carcass length (cm)	33.2	4.9	32.1	5.3	33.9	5.5	33.8	5.1

* - For explanation - see Table 1.

The slaughter yield for carcass weight without head ranged from 54.75% in group S to 55.47% in group A. The weight of edible parts was high, from 60.41% in group K, 60.32 in group A, 60.37% in group B, to 59.84% in group S. Slaughter losses were low and ranged from 0.8 to 1.01%. Group A carcasses were the longest (33.9 cm) and group S carcasses the shortest (32.1 cm).

DISCUSSION OF THE RESULTS

The key elements of rabbit breeding are the growth rate from weaning to achievement of slaughter weight, feed intake per 1 kg weight gain, and mortality, which compose fattening performance.

The body weight at the end of fattening was higher by 200-300 g than in the findings of BIELANSKI *et al.* (1989) and NIEDZWIADEK (1989) for the same breed. In their studies, BATTAGLINI and GRANDI (1988) and SZENDRO *et al.* (1988) achieved similar rabbit body weights. The higher weights (by about 200-300 g) are quoted by PARTRIDGE (1986), JENSEN *et al.* (1986) and JENSEN (1988).

Body weight gain for the whole fattening period and the average daily gain of over 30 g are considered beneficial. They equal the findings of the above authors, and are much higher than the findings of LABECKA (1990), who achieved 26-27 g gains in her studies.

The feed conversion rate obtained is considered good and corresponds to the findings of JENSEN *et al.* (1986), BATTAGLINI and GRANDI (1988) and NIEDZWIADEK (1983). MAERTENS and POETERS (1988) report that with intensive production of rabbit broilers in Belgium, feed intake per 1 kg body weight gain is 3.65 kg.

A similar mortality rate, that is 8-10%, is quoted by BATTAGLINI and GRANDI (1988) and MAERTENS and POETERS (1988). In the studies of JENSEN (1988) and JENSEN *et al.* (1986), the mortality rate was 4-7%, while SZENDRO *et al.* (1988) quotes the losses during fattening from 16 to 29%. The high mortality rate, even up to 30%, occurs on commercial farms in France (ROCHAMBEAU, 1988).

In their studies, LABECKA and GARDZIELEWSKA (1990) achieved a slaughter yield of 52%. Slaughter yield combined with pluck was about 60%. This corresponds to the results of foreign authors. Similar results were obtained by BLAS *et al.* (1979), PARIGI-BINI *et al.* (1992), MAERTENS (1992) and RUDOLPH *et al.* (1986).

In summing up the results obtained, it must be said that the use of NaOH and NH_3-treated straw in complete mixtures for rabbits during fattening improved their rate of growth, decreased feed intake per 1 kg body weight gain by about 0.07 and 0.14 kg, and significantly decreased young rabbit mortality. The slaughter analyses showed that carcasses of experimental animals were characterized by a high slaughter value, and did not differ from the control group.

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Die Mast- und Schlachtleistugsmerkmale den Kaninchen bei Fütterung von Mischungen mit Anteil von rohe und veredelte Stroh - An Anzahl von 1600 Neu-Zeländische Weiße Kaninchen wurde der Fütterungseinfluß von Rationen mit Anteil des rohes- und veredeltes Stroh (mit NaOH und NH3).
Gemästete junge Tiere wurden an 4 Gruppen geteilt:

- Kontrolgruppe; Mischfutter mit 30%. Anteil von Trockengras,

bei nächste 3 Gruppen 10 - 12% Trockengras wurde von rohe- oder veredelte Stroh ersetzt:

- Gruppa "S"; Mischfutter mit 10%. Zusatz von rohe Weizenstroh,
- Gruppa "A"; Mischfutter mit 12% Zusatz von veredelte mit NaOH Weizenstroh,
- Gruppa "B"; Mischfutter mit 12% Zusatz von veredelte mit NH3 Weizenstroh.

Im Mastabschnitt wurden bessere Zunahmen bei verringerten Futterverzehr pro Kg Zuwachs (um 0,07 und 0,14 Kg) festgestelt. Auch Aufzuchtverluste den jungen Kaninchen waren niedriger.