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USING A MIXTURE OF RED CLOVER AND BIRD'S-FOOT TREFOIL IN DIETS FOR GROWING RABBITS

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ABSTRACT

The aim of the study was to evaluate the different inclusion ratios of a mixture of clover and bird's foot trefoil to replace pure alfalfa in diets of growing rabbits. Four diets containing 0, 15, 20 and 25.6% of the legume mixture (C, Mix15, Mix20, Mix25, respectively) were formulated to replace alfalfa. The chemical composition of diets was similar (DE: 10.1, CP: 17.3-17.8%, CF: 16.4-16.9%). Rabbits were weaned at 37 d and at the end of experiment they were 79 d of age. Significant differences were found in initial weight between C group and the rabbits consumed mixed diets, however no significant differences were found between Mix15, Mix20 and Mix25 groups, which indicates that rabbit does fed the Mix feed had an advantage. Body weight gain and feed conversion ratio of the four groups were similar. The mortality of Mix25 group was the highest (10.7% vs. C: 9.2%, Mix15: 8.8% and Mix20: 5.8%). It can be concluded that the mixture of red clover and bird's foot trefoil alfalfa mix can be included to up to 20% in ratio to replace pure alfalfa in diets of growing rabbits, but it must be careful to mix greater ratio in the diet.

Key words: Growing rabbit, Red clover, Bird's foot trefoil, Feeding, Growth performance

INTRODUCTION

The 2013 reform of the Common European Agricultural Policy (CAP) introduced a green direct payment scheme ('greening'). The aim was to further improve sustainable management of natural resources linked to farming through payments for beneficial practices to the environment and the climate. Besides, crop diversification and the maintenance of permanent grassland greening requires farmers to reserve 5% of their arable land for ecological focus areas (European Commission). Because of this, some Hungarian farmers grow at least two crops on their land. One possibility might be to mix different legumes e.g., red clover (*Trifolium pratense*) and bird's foot trefoil (*Lotus corniculatus*), which is also beneficial for insect fauna. They also are good source of pollen and nectar for bees and bumble bees (Brain, 1951).

Alfalfa (*Medicago sativa*) is one of the basic forages of rabbits' diets (Villamide *et al.*, 2009). Red clover is also accepted by wild rabbits (Monk, 1989). Bird's foot trefoil is a less used forage. Bird's foot trefoil is similar to alfalfa in feeding value in ruminants (Williams *et al.*, 2011). Its crude protein content is between 17.2 and 20.9% (Kaplan *et al.*, 2009). According to Lebas (2004) the acceptable level of alfalfa, red clover and bird's foot trefoil in the diet are 50%, 20% and 30%, respectively.

The objective of this field trial was to evaluate the different inclusion ratios of a mixture of clover and bird's foot trefoil alfalfa mix to replace pure alfalfa in diets of growing rabbits. The hypothesis was that feeding the mix diets would not impair the growth performance of growing rabbits.

MATERIALS AND METHODS

Animals and experimental design

The field study was carried out in the rabbit farm of Olivia Ltd using Pannon crossbred growing rabbits. Animals were weaned at 37 d of age, and the trial was finished when they were 12 weeks old. The ambient temperature ranged between 18-25°C and 16 h daily lighting was applied. The rabbits were housed in Landkaninchen enclosures (103 x 53 cm) as basic floor with a (13.5 cm x 22 cm) hole leads to the - 1 level, additional plastic-mesh platform (41.5 x 53 cm) 25 cm above the enclosure floor as 2nd floor, third floor (53 cm x 32 cm) iron mesh 25 cm above the second plastic mesh floor and -1 level (48 cm x 68 cm) iron mesh under the ground floor; the total surface (floor and platforms) was 1.23 m². Kits were born in these enclosures, and at weaning rabbit does were moved into another enclosure and the kits stayed in the same place (9-10 rabbits/enclosure).

Four diets were formulated containing 0, 15, 20 and 25.6% (C, Mix15, Mix20, Mix25, respectively) of a mixture of clover and bird's foot trefoil to replace pure alfalfa in rabbits' diets. From the kindling till 28 days the Mix groups of does and their kits received a pellet with 8% mix and then, from 28 to 37 days the mixed weaning diets, and from 37 to 72 days, the fattening diets (Table 1). Pellet and water were available *ad libitum*. Here, it has been only presented the productive performances of growing rabbits. Animals were allocated in 3 experimental batches per diet with 9-10 rabbits/batches.

Chemical composition of diets were calculated from raw material composition and was similar among them (digestible energy: 10.1, crude protein: 17.3-17.8%, crude fiber: 16.4-16.9%).

Because it was a field study, no individual weight and feed intake per enclosure were measured. Only the total weight and feed intake of the three groups were known. The average weight, the daily weight gain and the feed conversion ratio of the four groups were calculated. However, at the end of trial the rabbits were weighed individually at the slaughter house.

Table 1: Ration of feed ingredients in control (C) and experimental diets

Ingredients (%)	Weaning diets (28-37 days)				Fattening diets (37-72 days)			
	C	Mix15	Mix20	Mix25	C	Mix15	Mix20	Mix25
Alfalfa meal, 17% CP	25.6	10.6	3.3	-	25.6	10.6	-	-
Dried beet pulp	6.8	6.8	6.0	6.8	6.8	6.8	6.0	6.8
Wheat bran	21.2	21.2	30.0	21.2	21.4	21.4	28.5	21.4
Barley	6.5	6.5	3.76	6.5	6.5	6.5	5.4	6.5
Hay meal	5.0	5.0	-	5.0	5.0	5.0	-	5.0
Wheat flour	15	15	15	15	15	15	15	15
Sunflower meal, 30% CP	17.4	17.4	14.2	17.4	17.4	17.4	14.9	17.4
Sunflower meal, 20% CP	-	-	5.3	-	-	-	7.7	-
Legume mix	-	15.0	20.0	25.6	-	15.0	20.0	25.6
L-lysine	0.25	0.25	0.25	0.25	0.3	0.3	0.3	0.3
Mineral vitamin and premix	2.25	2.25	2.19	2.25	2	2	2.2	2

Statistical Analysis

Productive performances were analysed by one-way ANOVA of the GLM procedure of the Statistical Analysis System (SAS Institute, 2004). Mortality data were analysed by Likelihood ratio test.

RESULTS AND DISCUSSION

The main results of the study are shown in Table 2. The groups receiving diets supplemented with the mix of red clover, bird's foot trefoil and alfalfa performed higher initial weight than group C; however, no differences were observed between the groups Mix15, Mix20 and Mix25. It seems from the weaned weight that mixed diets were beneficial to rabbit does, probably their milk production was improved. The high milk production accounts for the high protein requirements for milk synthesis (Maertens *et al.*, 2006) than that of growing rabbits (Trocino *et al.*, 2000). Since the chemical composition of the diets was similar, it can be assumed that the nutrients (e.g. amino acids) in the mix (red clover, bird's foot trefoil or both) were better utilized than that of alfalfa or their dietary energy concentration was higher (better DP to DE ratio), or they were better digestible.

Table 2: Effect of mix of red clover and bird's foot trefoil replacement on growth performance of growing rabbits

Traits	Groups				SE	P
	C	Mix15	Mix20	Mix25		
n*	3	3	3	3		
Initial weight (37 d), kg ¹	0.78a	0.95b	0.92b	0.93b	0.02	0.015
Weight gain, g/day ¹	42.7	41.8	42.7	42.6	0.45	0.908
Final weight (79 d), kg ²	2.61a	2.71b	2.75c	2.76d	0.003	<0.001
Feed conversion ratio ¹	4.12	4.00	3.99	4.03	0.03	0.252
Mortality, % ²	9.2b	8.8b	5.8a	10.7c		<0.001

*number of groups/individuals, ¹ Calculated from average of 3 groups, ² Calculated from more than 30.000 individual data
Means with different letters on the same row differ significantly at 0.05 level.

Since weight gains of groups were similar, differences in final weights were based in the difference in initial weight. The huge individual data gave very sensitive significant differences but the differences between mix groups are not significant. The feed conversion ratio of groups fed by mixed diets were similar compared to group C, despite of the fact that their initial and final weight and consequently, also their maintenance requirement were higher. The mortality of group Mix25 was the highest and that of Mix20 the lowest. Maybe the high mixture of red clover and bird's foot trefoil in the diet can lead to a health problem. Based on the results of Samuel (1967), the preference order of the examined plants in case of cottontail rabbits, which closely resemble the wild European rabbit (*Oryctolagus cuniculus*), is as follows: red clover, alfalfa and bird's foot trefoil. According to Samuel (1967) if rabbits received only bird's foot trefoil, they did not consume it, which caused their death. Maybe there is a poison component or something similar in it, why a higher ratio in diet can lead to higher mortality. Contrary of the foregoing, according to Jones (1972), rabbits were observed consuming bird's foot trefoil on Dutch dune.

CONCLUSIONS

The plant produced in the greening program can be used for feeding rabbits. The mix of red clover and bird's foot trefoil can be included in a ration of up to 20% in diet of growing rabbits to replace alfalfa, but one must be careful to mix greater ratio of bird's foot trefoil in diet. Because of the results, further investigation is necessary to detect maximum mix ratio of legume mix to the diet of meat rabbit.

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Using a mixture of red clover and bird's-foot trefoil in diets for growing rabbits

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Objective: The aim of the study was to evaluate the different inclusion ratios of a mixture of clover and bird's foot trefoil to replace alfalfa in diets of growing rabbits.

Methods: The field study was carried out in the rabbit farm of Olivia Ltd using more than 30,000 Pannon crossbred growing rabbits between ages of 37 and 72 days. Four diets were formulated containing 0, 15, 20 and 25.6% (C, Mix15, Mix20, Mix25, respectively) of a mixture of clover and bird's foot trefoil to replace pure alfalfa in rabbits' diets.

Traits	C	Mix15	Mix 20	Mix 25	P level
Initial weight, kg	0.78a	0.95b	0.92b	0.93b	0.015
Growth, g/d	42.7	41.8	42.7	42.6	0.908
Feed conversion	4.12	4.00	3.99	4.03	0.252
Mortality, %	9.2b	8.8b	5.8a	10.7c	<0.001

Results : Before kindling mixed diets were beneficial to rabbit does and their kits, however after weaning no significant differences were found in growth and feed conversion ratio. The lowest mortality was found in group Mix20.

Conclusions: The plant produced in the greening program can be used for feeding rabbits. The mix of red clover and bird's foot trefoil can be included in a ration of up to 20% in diet of growing rabbits to replace alfalfa.