
Effects of feeding regime and fattening season on performance and production efficiency of small-scale rabbit farms.

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Abstract

Five small scale family farms with rabbits of local breed were included in the study. Two groups of rabbits per farm were fattened during summer and winter seasons. One group was fed in usual way with feeds produced in farm consisted mainly of alfalfa dry or fresh depending on season and family residues. The feeding of the other group was daily supplemented with 25 g concentrate feedstuffs (17% protein) bought in the market. Supplementation with concentrate feedstuffs showed to improve meat production from rabbits in both seasons. Live weight at the end of fattening was increased with 210 g and 360 g respectively during winter and summer season. The factors that affect the differences in live weight realized were feeding regime, sex of rabbit ($P < 0.001$) and season of fattening ($P < 0.01$). Approaching growth curves with theoretical one of Gompertz showed that concentrate adding in feed ration improved daily weight gain. It did not affect the dynamics of body weight change. It affects the gradient of quantity of daily gains of rabbits. Concentrate supplementation of daily feeding during fattening period increased up to 15 % the meat production as well as net income of the farm.

Key words: rabbit, local breed, extensive system, fattening, feed supplementation

1. Introduction

The rabbit production in Albania consists mostly of small-scale farms, which is used as an alternative by the farmers either to improve the meat supply for their families or to enhance their incomes through live animal commercialization at the local markets [1, 5]. Rabbits are of local breed and reared in extensive conditions. The farmers intend to produce meat from rabbits with fewer expenses for their growth. The rabbits are kept in simple housings build up with native tools. The farmers do not implement any

veterinary or zoo-prophylactic protocol and sanitary hygienic conditions are low. The rabbit feeding is mainly based on farm products and family residues. Concentrate feedstuffs are bought in the market. They are mainly used for mature rabbits during intensive reproductive period. The fattening period of rabbits starts from weaning up to 101 days and no concentrate feedstuffs is used for their feeding. The summer and winter are considered as most difficult seasons for rabbits growing because of limited availability of feeds [1, 2, 5] as

consequence the rabbit meat production is low. We hypothesized that rabbits produce under their genetic capacities. To verify this hypothesis and to realize an added value in meat production from rabbits in fattening this experiment was undertaken. Five different farms located in different communes were included in experiment. A comparative study of two different feeding regimes with and without concentrate feedstuffs of rabbits born and fattened during winter and summer seasons was developed.

2. Material and method.

Five family farms having in average 5-8 does per farm were included in the experiment. The farms are located in two different regions. Two farms in Poshnje, two other in Kutalli both communes of Berati region and one farm in Lushnja region. Berati and Lushnja regions are respectively located in south central and central west of Albania. Two groups of rabbits per farm were established to prove the effect of feeding regime in two different seasons on meat production performances. After weaning period the control group was fed in traditional way ad libido with feeds produced in farm consisted mainly of alfalfa dry or fresh depending on seson and family residues. The feeding of the other group during the fattening period was daily supplemented in average with 25 g concentrate feedstuffs (CN320 with 88.0 % dry matter, 17.0% crude protein, 3.2 % ether extract , 9.0% ash, 12.5 % crude fiber, 12000

IU Vit. A, 1500 IU Vit. D, 60 mg Vit. E) bought in the market. The rabbits were born and fattened during summer and winter seasons. The rabbits of each group per farm were born from the same 2-3 does in both seasons. The young rabbits of each litter were equally divided in two groups to distribute uniformly the effect of the does. It was paid attention to have nearly the same sex ratio per group. 75 heads of rabbits, 33(f) and 42(m) for winter season and 64 heads of rabbits, 28(f) and 36(m) for summer season were included in the experiment. The rabbits were individually weighed with a balance of 0.001 accuracy, every 7 days starting from 31 days of weaning age up to 101 days of fattening period. The rabbits belonged to a local breed.

The average daily gain were calculated from weekly weighing and the live weight at the end of fattening period

To evaluate the effect of feed supplementation on live weight of rabbits at the end of fattening period (101 days) the data were analyzed according the general linear model (GLM, *STATGRAF Centurion XVI.*) as follow:

$$Y_{ijkln} = \mu + a_i + b_j + c_k + f_l + s_n + (ac)_{ik} + (af)_{il} + (cf)_{kl} + e_{ijklnm}$$

Where:

Y_{ijkln} - live weight at the end of fattening period.

μ - Theoretical average

a_i - feed ration effect of (i=1,2)

b_j - litter effect (j=1,14)

C_k - seson effect i (k=1,2)

f_l - farm effect ($l=1,5$)

s_n - sex effect ($n=1,2$)

$(ac)_{ik}$ - interaction effect of "feed ration and season"

$(as)_{in}$ - interaction effect of "feed ration x sex"

$(cf)_{kl}$ - interaction effect of "season x farm"

e_{ijklmn} - residual effects

Growth curves were build according to Gompertz model (as the best statistical model to describe the growth curve of young animals) describing the growth for two seasons (summer and winter) and feeding regime (with or without concentrate feedstuff adding), using estimates for the averages of live weight of rabbits in different phases of fattening period. The average live weights were calculated from periodic weighing every 7 days starting from birth up to slaughter weight for both two groups and seasons:

$$y = k \exp. (-\exp (-b(t-c)))$$

Where y - live weight of the rabbit

t – age (in days) of rabbit

k - asymptote of live weight growth curve.

b, c – parameters adjust both slope and inflection point of growth live weight curve.

To estimate the effect of feed ration supplementation with concentrate feedstuffs in reducing the effect of season, corresponding curves of season effect on live

weight at the end of fattening period of rabbits were compared. The curves were estimated for each sex.

Evaluation of economic effect of feeding regime (concentrate supplementation) in both seasons was also done and used to formulate relevant recommendations.

3. Results and discussions.

The data of Table 1 show that there is no significant difference between respective average live weights of females and males rabbits of control and experimental group at weaning period. Within each group there is significant difference between average live weights of females and males ($P<0.05$). That proves the analogy between control and experimental groups concerning live weight at the beginning of experiment. So to study the variance of live weights of rabbits at slaughter age with General Linear Model (GLM) it was not necessary to include the covariance component that reflect the stochastic relation between live weight at weaning and live weight at slaughter age.

3.1. The effect of feeding regime.

Verification of statistical hypothesis (*t-Student*) shows that there are significant differences of average live weights at slaughter age in both cases between sexes within each group or between the same sexes in different groups. ($P<0.05$). These results show that the hypotheses of meat production increasing from feed ration supplementation

rabbits in small scale family farm conditions could be proved.

3.2. The effect of fattening season.

There are significant differences between average live weights at slaughter age

of rabbits grown in different seasons ($P < 0.05$). These results are also found from previous studies [4].

The results of variance analyses are given in Table 2.

Table 1: Estimations of average live weights of rabbits at weaning (37 days)* and at slaughter age (101 days)*

Season	At weaning age			
	Control group		Experimental group	
	Females	Males	Females	Males
Winter	592.3±4.2 ^a	648.4±5.9 ^b	587.5±5.0 ^a	624.2±4.8 ^b
Summer	590.4±5.1 ^a	675.1±4.3 ^b	605.4±5.1 ^a	714.3±5.4 ^c
	At slaughter age			
Winter	1873.3±32.6 ^a	2080.4±30.8 ^{bc}	2093.1±32.2 ^{bc}	2277.5±33.2 ^d
Summer	1986.2±28.7 ^b	2123.2±31.2 ^{cd}	2312.2±30.1 ^d	2528.3±28.8 ^e

*a-d means within a column with no common superscript, differ significantly ($P < 0.05$)

Table 2: Phenotypic variance of “live weight at slaughter age”.

Source of variance	Shall.	MMS	F
Effect of feed ration	1	80161	8,22***
Effect of litter (doe)	13	8484	0,87
Effect of season	1	62608	6,42**
Effect of farm	4	29451	3,02*
Effect of sex	1	78211	8,02***
Interaction effect of “feed ration x season”	1	66509	6,82**
Interaction effect “feed ration x sex”	1	38423	3,94*
Interaction effect “season x farm”	4	11020	1,13
Residual effects.	116	9752	

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

Analyses of variance shows that the factors with higher effects on general phenotypic variance of live weight of rabbits at the end of fattening period could be listed as follow: feed ration, sex of rabbit, ($P < 0.001$) and growing season ($P < 0.01$). According the variance analyses there are statistically significant the interaction effect of “feed ration and seson” ($P < 0.01$) and “feed ration and sex” ($P < 0.05$). It means that:

(i) The rabbit’s responses to changes of feed ration are not the same at different seasons, winter or summer.

(ii) The animals of different sexes, respond in different way to changes in feed ration during fattening period.

This result is comparable with that found from [2, 3] relating to the effect on growth rate and live weight at the end of fattening period of feeding, seson of growth, the sex and their reciprocal interaction effect.

Figure 1: The effect of feeding on rabbit fattening (winter, summer – seasons)

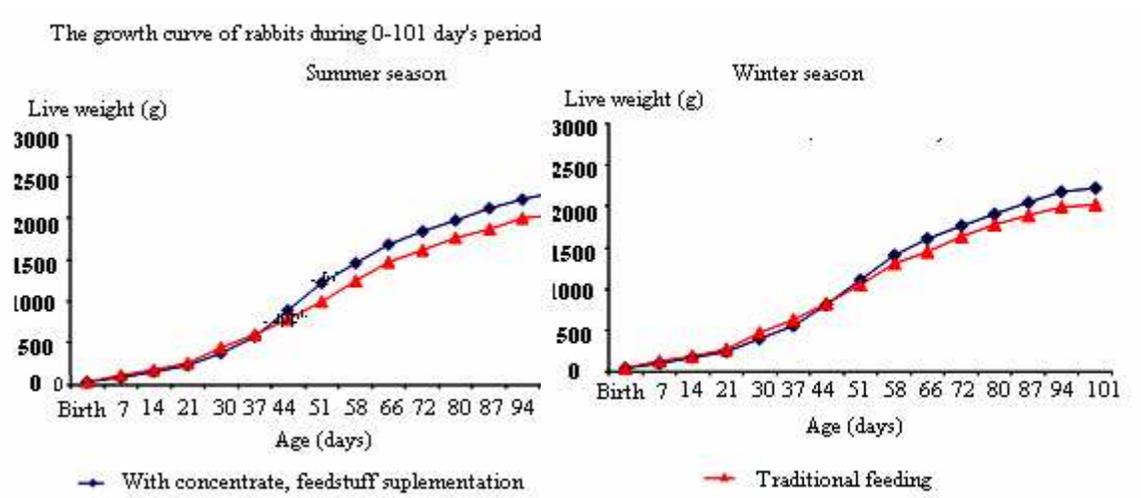
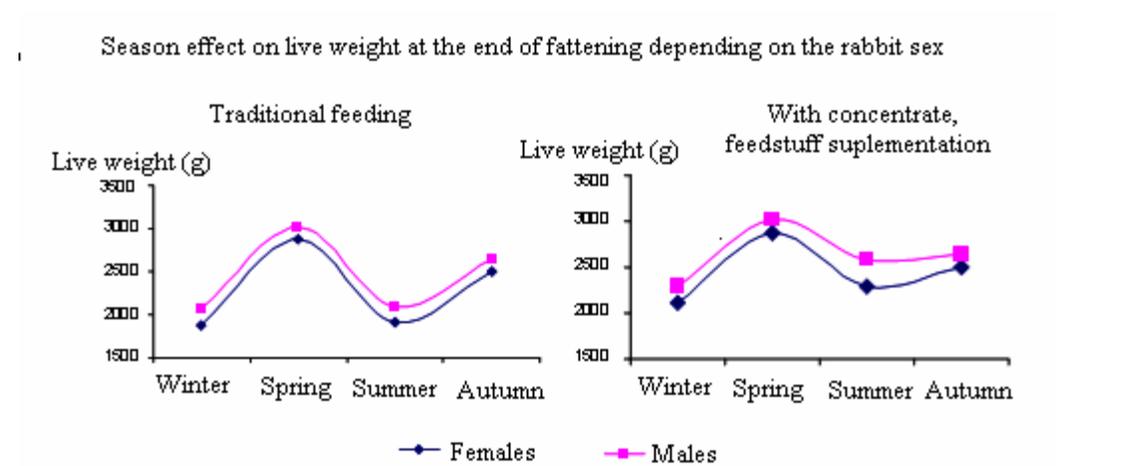


Figure 2: Reduction of the effect of season on the rabbits fattening



The growth curves estimated as Gompertz model are given in Figure 1.

In both seasons the type of curves are almost the same and they do not depend by the feed ration. Gompertz model as a theoretical approximation reflect very well the growth curves of rabbits. ($0.72 \leq R^2 \leq 0.86$). This is because of local breed of rabbits is used in experiment, which have high genetic

capacities to cope with extensive conditions [6]. Due to this fact the differences in feeding or the effect of season do not significantly disturb the growth physiology. The differences between empiric growth curves and theoretical ones provided by growth model of Gompertz are not statistically significant ($P < 0.05$). Some concentrate feedstuffs adding in daily feed ration

improved daily weight gain. It did not affect the dynamics of body weight change during different periods of fattening. The experimental data shows that the gradient of growth has higher values at the first phases of fattening, 37-72 days period. After that period the values start to stabilize with some small fluctuations around a certain value. It is estimated to be around 16-17 g/day and 20-21 g/day respectively for winter and summer season.

The curves that represent the dynamic of season effect on live weight at the end of fattening period depending on sex in each of feeding ways are given in Figure 2. The curves were estimated using the average "least square" data for live weight at the end of fattening period of female and male rabbits grown in summer and winter season, estimated by Gompertz model. For two other seasons, autumn and spring the averages of live weight at the end of fattening period (101 days) were taken from previous study (2). The figure 2 shows that the season effect is stable no matter feed ration is supplemented or not with concentrate feedstuffs. Live weights at the end of fattening period are higher during autumn and spring season. Concentrate feedstuff supplementation alleviate the season effect. Rabbit fed with concentrate feedstuff supplementation were 210 g and 360 g heavier than the rabbits without supplementation, respectively in winter and summer season.

To evaluate the economic effect of feed ration supplementation in rabbit fattening, during two seasons, winter and summer, a family farm with 5 does was taken in consideration. In extensive conditions of rearing in average 6 young rabbits are weaned from a doe. 30 rabbits are grown in the farm during each season, winter or summer. Adding 25 g of concentrate feedstuff in their feed ration it means that for all the fattening period (winter and summer) the farm needed:

$$25 \text{ g/day} \times 64 \text{ days in fattening} \times 60 \text{ rabbits} = 96000 \text{ g}$$

The market price of concentrate feedstuff was about 40 leke/kg so to buy 96 kg of it the farmer spent 3840 leke.

The live weight gain at the end of fattening during winter season was 210 g that increased meat production with 6.3 kg live weight. In summer season the increasing of meat production was with 10.8 kg live weight. During these two fattening periods the farm produced in total 17 kg live weight more. Making calculation using the market price of 420 leke/kg live weight, the income of family farm resulted to be 7140 leke or the net income of 3300 leke.

4. Conclusions

1. In extensive conditions or rabbit rearing there is possible to increase the live weight at the end of fattening period supplementing the feed ration with some concentrate feedstuff.

2. The rabbit's responses to changes of feed ration are not the same at different seasons, winter or summer.
 3. The animals of different sexes, respond in different way to changes in feed ration during fattening period.
 4. Adding 25 g/day concentrate feedstuff per rabbit during difficult seasons, summer and winter; improve with 15 % the net farm income from rabbits selling.
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