# PRODUCTION AND BEHAVIOUR OF GROWING RABBITS DEPENDING ON THE SEX-COMPOSITION OF THE GROUPS

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## ABSTRACT

The objective of this study was to analyse the effects of the sex-composition of group on the production and behaviour of growing rabbits. Altogether 168 growing rabbits were evaluated between the ages of 5 and 11 weeks. Seven rabbits were placed to each pen (0.9 x 0.5m). The rabbits placed to the same pen were full sibs (FS), only females (F), only males (M), or mixed sexes (FM). Body weights and feed intake were measured weekly; average daily gain and feed conversion ratio were calculated. Mortality was also continuously registered. Using infrared cameras, 24-hour recording was performed at the ages of 7, 9 and 11 weeks. The rabbits with visible injuries were counted in all pens at the ages of 6, 7, 8, 9, 10 and 11 weeks. The sex-composition of the groups had no effect on the production (weight gain, body weight, feed intake, feed conversion ratio, mortality). No differences were found on behavioural patterns. Lesions on the body caused by the aggressive animals were initially observed at the age of 7 weeks. It was more frequent for the F group at the ages of 7 and 9 weeks, but on the contrary, at the age of 11 weeks the occurrence of the lesions was 40.5% in the M group, which was higher than that of the other groups (23.8-28.6%). Based on the results it could be concluded that housing the growing rabbits segregated by sex, especially only males, was disadvantageous.

**Key words**: Growing rabbits, Group-housing, Sex-composition, Production, Behaviour

## INTRODUCTION

Finding the optimal group size has high importance in housing of growing rabbits (EFSA, 2005). One of the critical points of group housing is the aggressive behaviour. In the domesticated rabbits, aggressive behaviour initiates during the period of sexual maturity, at 60-90 days of age (Verga *et al*., 2006; Rommers and Meijerhof, 1998; Maertens and Van Herck, 2000). In larger groups, the proportion of the aggressive rabbits does not increase, however, they can injure more counterparts (Bigler and Oester, 1996; Princz *et al*., 2009). There is no available information about the effect of the sex-composition of groups (males, females) on the production and behaviour of growing rabbits. According to Von Holst *et al.* (2002) separate rank orders are formed for the females and males in the European wild rabbits and the fighting is restricted to the animals of the same sex. On the contrary, among the domesticated growing rabbits, Vervaecke *et al*. (2010) observed that there were no separate rank orders for the sexes, and aggression occurred also between male and female rabbits. Introducing a strange animal into the pen of another "home" rabbit, Mykytowycz *et al.* (1974) observed aggressivity equally prevalent in both sexes and inter-sexual fighting occurred as frequently as fighting between members of the same sex.

The objective of our study was to analyze the production and behaviour of growing rabbits (highlighting the occurrence of injuries) depending on the sex-composition of the groups (only males or females, groups of mixed sexes or full-sibs).

## MATERIALS AND METHODS

### Animals and experimental design

The analysis was conducted at the rabbit farm of Kaposvár University using the maternal line of the Pannon rabbit breeding programme. Rabbits (n=168) were weaned at the age of 5 weeks and housed in open top wire net pens having a basic area of 0.9 x 0.5 m (16 rabbitsl/$m^2$). Each pen was equipped with a 30 cm long feeder and two nipple drinkers. The daily lighting period was 16 hours with an intensity of 50-80 Lux, while the temperature ranged between 15-19°C. The rabbits received commercial diets (5-9 weeks of age: 10.3 MJ DE/kg, 14.5% crude protein, 17.5% crude fibre; 9-11 weeks of age: 10.6 MJ DE/kg, 16% crude protein, 16% crude fibre).

In the 24 pens 4 groups were formed:
M = 7 males per pen,
F = 7 females per pen,
MF = 3-4 males and 3-4 females per pen (not full-sibs),
FS = 7 full-sibs per pen (mixed gender).

Body weights and feed intake (per pen) were measured weekly. Average daily gain and feed conversion ratio were calculated. Mortality was also continuously registered.

Using infrared cameras, 24-hour recordings were performed at the ages of 7, 9 and 11 weeks. During these days nobody entered the rooms in order not to disturb the rabbits' behaviour. Analysing the recordings the actual behaviour of the rabbits were registered at every half an hour (sampling method). Then the proportions of every behaviour patterns were calculated. The rabbits with visible injuries were counted in all pens at the ages of 6, 7, 8, 9, 10 and 11 weeks. Wounds on the rabbits' ears (holes or scratches originating from biting) or on other body parts were considered as injuries.

### Statistical Analysis

Productive data and the occurrence of the different behaviour patterns were analysed by means of one and two factor analysis of variance (age, group sex-composition). For average daily gain and body weight the rabbit was the experimental unit, while for feed intake and feed conversion ratio the pens were considered as experimental units. Occurrence of lesions was analysed by means of one factor analysis of variance. Mortality was evaluated by $Chi^2$-test. All statistical analyses were performed using SPSS10.0 software package.

## RESULTS AND DISCUSSION

Productive traits are summarized in Table 1.
No significant differences were observed in any trait, because there is no, or insignificant sexual dimorphism until slaughtering (Lebas *et al.*, 1986). Based on the results production of the growing rabbits was not influenced by the sex-composition of the groups, and housing full-sibs gave no improvement. Any sign of aggression was not found on the 3 dead rabbits in group F.

**Table 1:** Effect of sex-composition of groups on productive performance of growing rabbits

| Traits | Groups | | | | SE | Prob. |
|---|---|---|---|---|---|---|
| | Littermates | Females | Males | Females & Males | | |
| Rabbits, no. | 42 | 42 | 42 | 42 | | |
| Weight gain (g/d) | 39.3 | 38.4 | 35.7 | 39.1 | 0.35 | 0.781 |
| Live weight 11 wk (g) | 2610 | 2569 | 2582 | 2599 | 17.1 | 0.843 |
| Feed intake ( g/d) | 129 | 123 | 125 | 126 | 1.5 | 0,706 |
| Feed conversion | 3.27 | 3.24 | 3.23 | 3.25 | 0.03 | 0.942 |
| Mortality (%) | 0.0 | 7.1 | 0.0 | 0.0 | | NS |

Frequencies of the behavioural patterns depending on the sex-composition of groups are shown in Table 2.

**Table 2:** Effect of sex-composition of groups on behavioural patterns of growing rabbits (Means of ages at 7, 9 and 11 weeks)

| Behavioural patterns | Groups | | | | SE | Prob. |
|---|---|---|---|---|---|---|
| | Littermates | Females | Males | Females & males | | |
| Eating (%) | 10.13 | 10.38 | 9.71 | 9.81 | 0.18 | 0.373 |
| Drinking (%) | 2.05 | 2.08 | 1.63 | 1.93 | 0.07 | 0.144 |
| Resting (%) | 64.56 | 65.06 | 63.33 | 65.34 | 0.37 | 0.291 |
| Moving (%) | 2.35 | 2.08 | 2.59 | 2.74 | 0.11 | 0.085 |
| Comfort (%) | 14.19 | 14.22 | 13.54 | 14.03 | 0.31 | 0.648 |
| Social (%) | 3.44 | 2.64 | 3.31 | 3.26 | 0.14 | 0.188 |
| Exploration (%) | 3.17 | 3.24 | 2.57 | 2.53 | 0.14 | 0.120 |
| Aggressive (%) | 0.14 | 0.31 | 0.32 | 0.40 | 0.08 | 0.569 |

Sex-composition of groups had no effect on the growing rabbits' behaviour for the active (23:00 and 5:00 hours), resting (11:00 and 17:00 hours) and the total (00:00 and 24:00 hours) periods.

The effect of age was significant at several occasions (data are not shown). Higher occurrence rates were observed for eating, drinking and moving for the 7 week old rabbits compared to that of the 11 week old animals ($P<0.05$). On the contrary, higher frequencies of comfort, social and aggressive behaviours were recorded for the 11 week old rabbits compared to the rabbits aging 7 weeks ($P<0.05$). Resting and eating (during the active and resting periods) were also more frequent at the age of 7 weeks ($P<0.05$). However, for 11 week old rabbits increased proportion of comfort behaviours were observed (in both periods) ($P<0.05$).

Proportion of injuries originating from aggression can be seen in Table 3.

**Table 3:** Effect of sex-composition of groups on injures (%) on the body of growing rabbits depending on the age

| Age, week | Groups | | | |
|---|---|---|---|---|
| | Littermates | Females | Males | Females & males |
| 6 | 0 | 0 | 0 | 0 |
| 7 | $0^{a}$ | $11.9^{b}$ | $0^{a}$ | $0^{a}$ |
| 8 | $9.5^{b}$ | $14.3^{b}$ | $9.5^{b}$ | $0^{a}$ |
| 9 | $14.3^{ab}$ | $28.6^{b}$ | $16.7^{ab}$ | $9.5^{a}$ |
| 10 | 28.6 | 28.6 | 33.3 | 19.0 |
| 11 | 28.6 | 27.5 | 40.5 | 23.8 |

[a, b] Means in a row with different subscripts were significantly different ($P< 0.05$).

Injuries were initially detected at the age of 7 weeks. Injured rabbits could be found most frequently in female groups at the ages of 7, 8 and 9 weeks ($P<0.05$). Among the 10 and 11 week old rabbits, the injuries were more frequent in the male groups, but the differences were not significant. Describing the behaviour of the European wild rabbits, Von Holst *et al.* (2002) noted that separate rank orders were formed for the females and males and fighting was restricted to the animals of the same sex. On the contrary, in domesticated rabbits, Mykytowycz *et al.* (1974) and Varvaecke *et al*. (2010) reported that aggression was also present between males and females.

Based on our results, sex-composition of the groups had no effect on the frequency of the various behaviour forms. Nevertheless, injuries originating from aggression were more numerous when the groups consisted of rabbits of single sex (only males or females).

Occurrence rate of aggressive behaviour during the period of 24 hours is depicted in Figure 1.

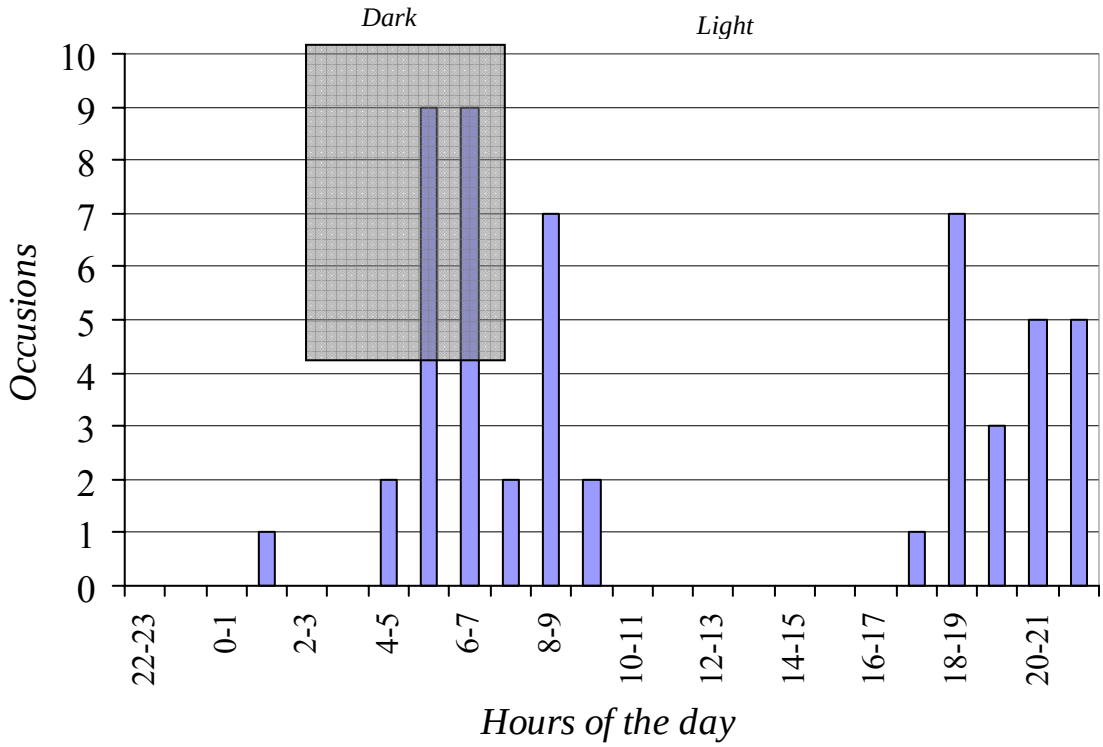


**Figure 1:** Occurrence of aggressive behaviour among growing rabbits during the day

Justifying our previous findings (Princz *et al*., 2009), no aggressive behaviour was detectable during the resting period. Increasing aggression was the most frequently observed during the transition periods (when switching on or off the light). This finding is in accordance with the observation that the European wild rabbits are most active at dawn and at sunset (Jilge, 1991).

## CONCLUSIONS

Based on the results it can be concluded that group housing rabbits of the same sex had no advantage from the viewpoint of production, on the contrary, the occurrence of aggressive behaviours and related inquires became more frequent.

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## REFERENCES

Bigler L., Oester H. 1996. Group housing for male rabbits.*In: Proc. 6th World Rabbit Congress. 1996. Toulouse, Vol.2, 411-415.*

EFSA (European Food and Safety Authority) 2005. Scientific report „The impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbit", EFSA-Q-2004-023, *EFSA Journal 267, 1-137.MORTON*

Jilge B. 1991. The rabbit: a diurnal or a nocturnal animal? Journal of experimental animal science. 34: 170-183.

Maertens L., Van Herck A. 2000. Performance of weaned rabbits raised in pens or in classical cages: first results. *World Rabbit Sci. 8 (suppl. 1), 435-440.*

Mykytowycz R., Hesterman E.R., Dudzinski, M.L., Edwards, C.B.H. 1974. An experimental study of aggression in cxaptive European rabbits, *Oryctolagus Cuniculus (L.). Behaviour, 52, 104-123.*

Princz Z., Dalle Zotte A., Metzger Sz., Radnai I., Biró-Németh E., Orova Z., Szendrő Zs. 2009. Response of fattening rabbits reared under different housing conditions. 1. Live performance and health status. *Livest. Sci. 121, 86-91.*

Rommers J.M., Meijerhof R. 1998. Effect of group size on performance, bone strength and skin lesions of meat rabbits, housed under commercial condition. *World Rabbit Sci. 6, 199-302.*

Varvaecke H., De bonte L., Maertens L., Tuyttens F., Stevens J.M.G., Lips D. 2010. Development of hierarchy and rank effects in weaned fattening rabbits (*Oryctolagus cuniculus*). *World Rabbit Sci*.

Verga M., Luzi F., Szendrő Zs. 2006. Behaviour of growing rabbits. In: Maertens, L., Coudert, P. (Eds): Recent advances in rabbit sciences. *ILVO, Melle, Belgium, 91-97.*