# EFFECT OF GNAWING STICKS ON THE WELFARE OF GROWING RABBITS

**Princz Z.*, Nagy I., Biró-Németh E., Matics Zs., Szendrő Zs.**

University of Kaposvár, H-7400 Kaposvár, Guba Sándor Str. 40, Hungary
*Corresponding author: Princz.Zoltan@ke.hu

## ABSTRACT

The objective of the experiment was to analyse the effect of the application and type (hard vs. soft) of gnawing sticks on the productive performance, gnawing stick consumption and occurrence of ear lesions related to aggressive behaviours in growing rabbits. Pannon White rabbits (n=156) weaned at the age of 5 weeks were placed in pens having a basic area of 0.86 $m^2$ (13 rabbits per pen) using a stocking density of 16 rabbits per $m^2$. The rabbits were housed in the pens until the age of 11 weeks. Three groups were formed according to the gnawing sticks: H = hard stick (White locust); S = soft stick (Little-leaf linden); C = control (no gnawing sticks were provided). Diameter and length of the gnawing sticks were 3 cm and 20 cm, respectively. Productive traits in the three groups (i.e., weight gain, body weight, feed consumption, feed conversion) were not different among the three groups. However, rabbits in the S group consumed significantly ($P<0.001$) more gnawing stick than those in the H group (H: 0.11 vs. S: 1.24 $cm^3$/day/rabbit). Compared to the C group (17.3%) occurrence of ear lesions was significantly ($P<0.05$) lower both in the H (7.7%) and the S (1.9%) groups. From these results we conclude that, under group housing conditions, the application of gnawing sticks (especially those made from soft tree like little-leaf linden) can decrease the frequency of aggressive behaviours of rabbits without influencing their performance.

**Key words**: Growing rabbit, Gnawing stick, Performance, Ear lesions.

## INTRODUCTION

In recent years increasing importance has been attached to the analysis of the rabbits' welfare. From the viewpoint of animal welfare the main problems in the cage and pen housing systems are the limitation of locomotion, the barren environment and the occurrence of aggressive behaviour. For environmental enrichment hay, bracket, box (hiding area) or gnawing sticks can be placed in the pens. Most frequently gnawing sticks are placed in the rabbit cages and their effect on the animals' performance and behaviour is analysed (Hansen *et al.*, 2000; Luzi *et al.*, 2003; Jordan *et al.*, 2003; Verga *et al.*, 2004; Princz *et al.*, 2007a). In most experiments only the effects of gnawing sticks made from a single tree species are investigated. Based on our former results (Princz *et al.*, 2007b) the usefulness of the gnawing stick is mainly determined by its hardness. In the present study the effect of gnawing sticks (from a soft and hard tree) on the production, ear lesions and gnawing stick consumption of growing rabbits were analysed and compared to a control group (where no gnawing stick was provided).

## MATERIALS AND METHODS

The experiment was carried out at the University of Kaposvár using Pannon White rabbits of both sexes. Animals were housed in a closed climatized rabbitry. During the experiments the room temperature was 18 °C and the daily lighting was 16 hours.

Rabbits were fed a commercial pellet *ad libitum* (5-9 weeks of age: 10.3 MJ DE/kg, 14.5% crude protein, 2.0% fat, 17.5% crude fibre, 50 ppm Tiamulin, 500 ppm Oxitetracycline, 1 ppm Diclazuril; 9-11 weeks of age: 10.6 MJ DE/kg, 16.0% crude protein, 3.0% fat, 16.0% crude fibre). Water was available *ad libitum* from nipple drinkers.

The rabbits (n=156), weaned at the age of 5 weeks, were placed in pens having a basic area of 0.86 $m^2$ (0.5 m x 1.72 m). The rabbits were reared in these pens until the age of 11 weeks. One third (4) of the 12 pens was not enriched with gnawing sticks (control group). In the other pens after stripping the bark off, 3-3 gnawing sticks (length=20 cm, diameter=3 cm) were placed horizontally at a height of 15 cm on the wall of the pens (Figure 1).

**Figure 1**: Placement of gnawing stick into the pen

Two groups were created depending on the tree species the gnawing sticks came from: H=hard stick (White locust); S=soft stick (Little-leaf linden). The consumed gnawing sticks were replaced during the fattening period. The body weight and feed consumption of the rabbits were measured every second week at which their daily weight gain and feed conversion ratio were also calculated. The volume of the gnawing sticks was measured prior to their placement in the pens and also after the termination of the experiment. The difference between the two volumes was used to determine the gnawing stick consumption during the experiment. The volume of the gnawing stick was measured by dipping the gnawing stick into a glass cylinder filled with water. The amount of extruded water was used for volume calculation. The number of ear lesions was counted in every rabbit at the age of 11 weeks.

Performance traits and gnawing stick consumption were evaluated by means of one factor analysis of variance, while mortality and occurrence of ear lesions were analysed with a chi square test using the SPSS 10.0 software package.

## RESULTS AND DISCUSSION

### Production

The enrichment of the pens with gnawing sticks and the type of sticks used (i.e., hard or soft) did not affect the growing rabbits' production (Table 1). Daily weight gain, body weight at the age of 11 weeks, feed consumption and feed conversion of the growing rabbits were not significantly different among the three groups. According to Hansen *et al*. (2000), Jordan *et al*. (2003), Verga *et al*. (2004) and Princz *et al*. (2007a) environmental enrichment has a favourable effect on the occurrence of aggressive behaviour in rabbits and may also influence the rabbits' production. The present results, however, do not support an effect of gnawing sticks on the rabbits' production. Rather, they agree with studies in which the supply of gnawing sticks application did not influence the growing rabbits' performance (Jordan *et al*., 2004). Contrary to these authors Princz *et al* (2005) found larger body weight at the end of the growing period while Luzi *et al*. (2003) observed higher daily weight gain in

the groups enriched with gnawing sticks. Jordan *et al*. (2004) found no association between the presence of gnawing sticks and feed consumption of the growing rabbits, while Maertens *et al*. (2004) reported that in the enriched group the rabbits consumed more feed (131 vs. 128 g/day). Decrease of production could logically be explained by the lower feed intake caused by the gnawing stick consumption, but no evidence for this possibility was found in this study.

**Table 1**: Effect of gnawing sticks on the productive performance of growing rabbits

| Age, weeks | Group | | | SE | Prob. |
|---|---|---|---|---|---|
| | C (Without gnawing stick) | H (White locust) | S (Linden) | | |
| Rabbits (n) | 52 | 52 | 52 | | |
| | Body weight (g) | | | | |
| 5 | 981 | 974 | 975 | 5.2 | 0.844 |
| 7 | 1567 | 1534 | 1548 | 9.5 | 0.366 |
| 9 | 2184 | 2175 | 2175 | 12.9 | 0.858 |
| 11 | 2598 | 2614 | 2600 | 15.4 | 0.901 |
| | Weight gain (g/d) | | | | |
| 5-7 | 41.8 | 39.9 | 40.9 | 0.54 | 0.374 |
| 7-9 | 44.1 | 45.8 | 44.8 | 0.62 | 0.761 |
| 9-11 | 29.6 | 31.3 | 30.3 | 0.51 | 0.378 |
| 5-11 | 38.5 | 39.0 | 38.7 | 0.34 | 0.804 |
| | Feed intake (g/d) | | | | |
| 5-7 | 99.9 | 95.8 | 97.1 | 1.1 | 0.281 |
| 7-9 | 136 | 134 | 136 | 0.8 | 0.331 |
| 9-11 | 129 | 128 | 125 | 1.2 | 0.481 |
| 5-11 | 121 | 119 | 119 | 0.8 | 0.447 |
| | Feed conversion | | | | |
| 5-7 | 2.39 | 2.39 | 2.38 | 0.16 | 0.932 |
| 7-9 | 3.08 | 2.92 | 3.05 | 0.03 | 0.367 |
| 9-11 | 4.38 | 4.09 | 4.13 | 0.09 | 0.383 |
| 5-11 | 3.16 | 3.05 | 3.09 | 0.23 | 0.153 |

## Gnawing stick consumption

The rabbits in the S group consumed significantly ($P<0.001$) more gnawing stick than those in the H group at all ages (Table 2). This result is in accordance with the findings of our previous study (Princz *et al*., 2007b) and may be explained by specific characteristics of the linden (e.g., softness, odour, taste, pH etc).

**Table 2**: Gnawing stick consumption of growing rabbits between 5 and 11 weeks of age

| Age, weeks | Group | | SE | Prob. |
|---|---|---|---|---|
| | H (White locust) | S (Linden) | | |
| Rabbits (n) | 52 | 52 | | |
| | Gnawing stick consumption ($cm^3$/rabbit/d) | | | |
| 5-7 | 0.27 | 0.66 | 0.08 | <0.001 |
| 7-9 | 0.05 | 1.03 | 0.19 | <0.001 |
| 9-11 | 0.01 | 2.02 | 0.39 | <0.001 |
| 5-11 | 0.11 | 1.24 | 0.22 | <0.001 |

## Ear lesions

The environmental enrichment with gnawing sticks significantly reduced the frequency of ear lesions caused by aggressive behaviours, as determined at the age of 11 weeks (Figure 2.). In the C group 17.3% of the rabbits were injured, while the proportions of the injured rabbits in the H and S groups decreased by approximately 10% and 15%, respectively, in accordance with the findings of our previous study (Princz *et al*., 2005).

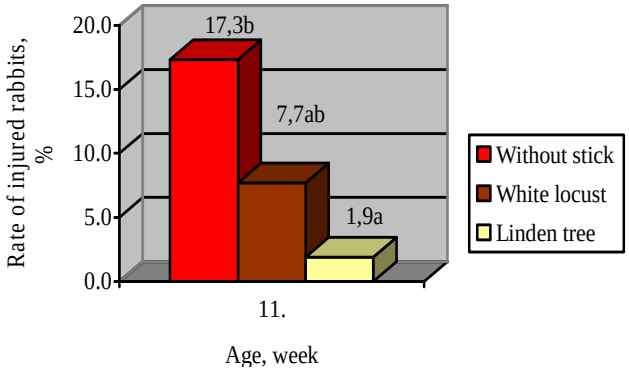


**Figure 2**: The effect of providing one of two types of gnawing sticks on the incidence of ear lesions at the age of 11 weeks, ($^{a,b}$ differences are significant at P≤0.05)

## CONCLUSIONS

Gnawing sticks made from soft trees are an environmental enrichment factor that can reduce the frequency of aggressive behaviours (ear lesions) without decreasing the production of growing rabbits. Providing Little-leaf linden gnawing sticks can be recommended especially for group housing conditions.

## ACKNOWLEDGEMENTS

Financial help of the GAK OMFB-01335/ALAP-00121 and Öveges József (KPI) scholarship is gratefully acknowledged.

## REFERENCES

Hansen L.H., Berthelsen H. 2000. The effect of environmental enrichment on the behaviour of caged rabbits (*Oryctolagus cuniculus*). *Appl. Anim. Behav. Sci., 45, 277-292.*

Jordan D., Štuhec I., Pečlin G., Gorjanc G. 2003. The influence of environmental enrichment on the behaviour of fattening rabbits housed in individual wire cages. *13. Arbeitstagung über Haltung und Krankheiten der Kaninchen, Peltztiere und Heimtiere, Celle, Germany, 119-126.*

Jordan D., Varga A., Kermauner A., Gorjanc G., Štuhec I. 2004. The influence of environmental enrichment with different kind of wood on some behavioural and fattening traits of rabbits housed in individual wire cages. *Acta Agriculturea Slovenica, 84 Suppl. 1, 73-79.*

Luzi F., Ferrante V., Heinzl E., Verga M. 2003. Effect of environmental enrichment on productive performance and welfare aspects in fattening rabbits. *Ital. J. Anim. Sci., 2, Suppl. 1, 438-440.*

Maertens L., Tuyttens F., van Poucke E. 2004. Grouphousing of broiler rabbits: Performances in enriched vs barren pens *In*: *Proc. 8th World Rabbit Congress, 2004 Spetember, Puebla, Mexico, 1247-1250.*

Princz Z., Szendrő Zs., Dalle Zotte A., Radnai I., Biró Németh E., Metzger Sz., Gyovai M., Orova Z. 2005. Effect of different housing on productive traits and on some behaviour patterns of growing rabbits. *In: Proc. 17th Hung. Conf. Rabbit Prod., Kaposvár, Hungary, 95-102.*

Princz Z., Dalle Zotte A., Radnai I., Biró Németh E., Matics Zs., Orova Z., Nagy I., Szendrő Zs. 2007a. Behaviour of growing rabbits under various housing conditions. *Appl. Anim. Behav. Sci. doi: 10.1016/j.applanim.2007.06.013.*

Princz Z., Orova Z., Nagy I., Jordan D., Štuhec I., Luzi F., Verga M., Szendrő Zs. 2007b. Application of gnawing sticks in rabbit housing. *World Rabbit Sci., 15, 29-36.*

Verga M., Zingarelli I., Heinzl E., Ferrante V., Martino P.A., Luzi F. 2004. Effect of housing and environmental enrichment on performance and behaviour in fattening rabbits. *World Rabbit Sci., 13, 139-140.*