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DATA FOR THE DOMESTIC RABBIT'S DRINKING WATER SUPPLY

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Abstract

A short review article was prepared on the domestic rabbit's drinking water consumption and the external and internal factors that significantly influence it. The rabbit's need for drinking water is influenced, among other things, by age, sex, body weight, lactation phase and milk production, the dry matter, fiber and protein content of the feed, the mineral content of the water, the temperature of the water, the possibility of access to water and/or feed and the ambient temperature. The domestic rabbit's water consumption habits are partly derived from the ancestral behavior of the wild rabbit (Oryctolagus cuniculus), and partly influenced by the design of the drinkers. Continuous satisfaction of the rabbit's demand for drinking water in artificial housing conditions is a basic welfare requirement.
Keywords: *rabbit, drinking water, animal welfare, water quality, drinkers*
JEL Code: *Q19, Q25*

ADATOK A HÁZINYÚL IVÓVÍZELLÁTÁSÁHOZ

Összefoglalás

Rövid összefoglaló cikk készült a házinyúl ivóvízfogyasztásáról és az azt jelentősen befolyásoló külső és belső tényezőkről. A nyúl ivóvízigényét befolyásolja többek között az életkor, az ivar, a testtömeg, a laktációs fázis és a tejtermelés, a takarmány szárazanyag-, rost- és fehérjetartalma, a víz ásványianyag-tartalma, az ivóvíz hőmérséklete, a vízhez és/vagy takarmányhoz való hozzáférés lehetősége és a környezeti hőmérséklet. A házinyúl vízfogyasztási szokásait részben ősétől az üregi nyúltól (Oryctolagus cuniculus) örökölt viselkedése, részben az itatók kialakítása befolyásolja. A nyúl ivóvízigényének folyamatos kielégítése mesterséges tartási körülmények között alapvető jólléti követelmény.
Kulcsszavak: *nyúl, ivóvíz, állati jóllét, vízminőség, itatók*

Introduction

Today, people keep rabbits (*Oryctolagus cuniculus)* for many purposes, some people breed them on farms for their meat, researchers use them as laboratory animals, and more and more people keep them as pets. Unfortunately, the increase in popularity of the rabbit has not usually been accompanied by knowledge of the biology and behavior of it. It is in the basic interest of every rabbit owner to ensure the well-being of the animal, so that his/her rabbits do not suffer, get sick, starve or thirst as a result of proper keeping. Especially in the field of the latter, there are still many misconceptions.

Relatively few summary works have been published on the domestic rabbit's demand for drinking water, its consumption, and its drinking habits. The literature on feeding is extremely rich, but the investigation of drinking water, as perhaps the most important nutritional element, is undeservedly poor. This short literature review is a continuation of a previously started work (BODNÁR - BODNÁR, 2020), which aims to collect and provide information about the supply of drinking water for domestic rabbits.

Literature review

The intake of drinking water for the rabbit

Animals, if given a choice, prefer drinkers with an open water surface, but do not consume more water from them than from drinkers with a valve (103.5±51.3 g/day vs. 109.3±49.2 g/day) offering water *ad libitum* (TSCHUDIN et al., 2011) although it allows for a more natural fast water intake. On the other hand, GÁBOR et al. (1988) previously found that under the same climate parameters, animals drank up to one and a half times more from drinking bowls than from drinkers with weight valves. At the same time, the milk production of the mother rabbits increased by 9%, and in the fattening rabbit groups, the body weight gain improved by 8.7-27.8%, and the mortality during rearing decreased by 6.5%.

Rabbits consume an average of 50-100 ml/body weight kg/day of water, but this largely depends on the composition and water content of the feed (HARCOURT-BROWN, 2002). (The data of different authors may differ significantly from this values – see in Table 1. (BODNÁR – BODNÁR, 2020)). The average water consumption of 13-week-old New Zealand White pupil rabbits is 0.42 liters/day (EL-MONEIM et al., 2013). Feeds with a high protein content require a higher water intake, and dry feed with a high fiber content also absorbs more water from the intestinal tract, thus causing a feeling of thirst.

Table 1. Daily drinking water requirement of medium sized rabbits / 1. táblázat: Közepes testméretű nyulak napi ivóvíz szükséglete

	ml	Source
Young animal	200-300	[17]
Adult animal	300-500 1100-1300	[17] [12]
Doe with litter (0-14 days)	800-1500	[17]
Doe with litter (14-28 days)	1500-2500	[17]
Doe with litter (28-42 days)	2500-3500 3800	[17] [2] [5] [22]
Adult New Zealand White rabbit normal value (range)	200 (160-250)*	[2]
Adult animal	420-570	[16]

*ml/kg body weight

Source: BODNÁR – BODNÁR, 2020 / Forrás: BODNÁR – BODNÁR, 2020

The need for drinking water of does is significantly affected by lactation. The peak of milk production is around the 21st day after the birth of the offspring (207.6 g/day), when the demand for water increases accordingly (BAKR et al., 2015).

When does were kept at different environmental temperatures, they found that the effect of temperature was stronger than that of feeding (SZENDRŐ et al., 1999). The results of the investigation of the relationship between water consumption and ambient temperature are contradictory.

Hematological and biochemical parameters of 6-month-old New Zealand White male rabbits were investigated under natural conditions. In spring, the ambient temperature extremes were 18.9°C and 27.1°C, while in summer they were 26.5°C and 32.2°C. The average relative humidity did not differ significantly (86.1% vs. 89.5%). In summer, the animals' feed intake and body weight decreased, and their water consumption increased. In summer, the hemoglobin and red blood cell count decreased, the white blood cell count increased compared to spring, and the activity of some plasma enzymes also decreased (OKAB et al., 2008).

When access to drinking water is limited, it affects the behavior: the time spent drinking, the frequency of visits to drinking devices, the amount of water drunk and the intake of feed (dry matter) are reduced. Limiting drinking water consumption has similar consequences to limiting feed consumption in terms of production indicators, but its effect is all the more significant. At the same time, the rate of digestive problems and deaths decreased significantly in the water-restricted group (VERDELHAN et al., 2004).

Rabbits weaned at the age of 35 days were selected in several treatments, but all of them were limited to 4 hours of water consumption per day. The treatments did not show any positive effects, the feed conversion rate worsened, but mainly mortality increased. The group receiving water for 1 hour every 5 hours consumed 74% of the control, while those who drank for 4 hours every 20 hours consumed only 21% of the ad libitum consumption of the control group. According to the results, the amount of drinking water intake can be controlled by scheduling the same water supply time (GUALTERIO et al., 2008). However, the restriction of drinking water cannot be considered for productive herds, the experiment is only suitable for simulating the consequences if the water supply is obstructed for some extraordinary reason.

Examining rabbits exposed to heat stress, they found that under farm conditions water and feed consumption were related to each other, but shearing the animals, although their rectal temperature decreased, had no effect on drinking water consumption (VILLALOBOS et al., 2008). The water/feed ratio was lower (2.5 ml water/g feed) than others measured in a climate chamber (3.5 and 8.3 ml/g at 26 and 32ºC).

If rabbits are fed fresh green fodder, their need for drinking water is reduced (BREWER, 2006), but contrary to popular belief, it does not replace completely drinking water (especially in the long term). Rabbits' limited access to feed also affects water consumption: drinking water intake can increase by up to 650% and this can cause excessive sodium loss.

The optimum ambient temperature for the rabbit is between 15-20°C. If the animal does not get enough water during heat stress, the removal of water from the cecum and large intestine increases, which can lead to a pathological condition (BREWER, 2006). Disruption of water supply can often lead to dehydration.

A continuous supply of water is essential for all husbandry methods and purposes from an animal welfare point of view, and also from the point of view of ensuring performance for productive herds.

Quality of drinking water

Room temperature water is usually suitable for quenching thirst. In winter fattening rabbits, it was observed (WANG et al., 2019) that the production indicators of the group that drank warm water improved significantly compared to the performance of the group that drank cold water. The reason behind this phenomenon is that the microflora of the cecum changed favorably due to the warm water, and the number of diarrhea cases decreased. The phenomenon seems suitable for increasing the well-being of the animals during the winter, especially in the postweaning period.

Drinking water cooled to 10-15°C in the summer heat can reduce the adverse physiological effects caused by heat stress (EL-MONEIM et al., 2013), presumably as a result of the heat removal effect on the internal organs (e.g. hypothalamus).

According to several authors, the mineral content of drinking water significantly influences its effects, which depends on the type and amount of minerals and the animals' tolerance. Water with a relatively low salt content is specifically recommended for animals, while high salt content (limit value is around 3000 ppm) has a negative effect on their health (ABDELSATTAR et al., 2020). The results most often refer to sodium chloride.

On farms, the soluble salt content of drinking water may be high (MARAI et al., 2010), which can be up to 3000 ppm for rabbits. If it exceeds this value, on the one hand, the production properties deteriorate, especially in summer, and on the other hand, the water must be diluted with fresh water or the drinking water must be desalinated.

Drinker types

In the case of drinkers, the type of drinker (automatic nipple (Figure 1), bottle or bowl (Figure 2), material (metal, ceramic, glass or plastic), the number of animals per drinker, their functionality and cleanliness (contamination can be excrement, urine, mud, rust, etc.) are important (SILVA - SOTOMAIOR, 2021). Based on their survey, 72.7% of farms use automatic valve drinkers, while 9.1% only use clay pots. In 27.3%, the drinkers were dirty (usually together with the cage). and in two cases the valves were faulty and leaking. The lack of hygiene and the rise in relative humidity caused by the runoff water can lead to diseases.
According to the results of HARCOURT-BROWN (2002), some rabbits are unable to learn to use self-drinkers, so they can only drink successfully from a bowl.

Rabbits significantly spend more time at automatic nipple drinkers with longer drinking bouts than those at open bowls (TSCHUDIN et al., 2011). The visits of nipple drinkers were more frequent and the speed of drinking was 3-4 times slower. This is presumably due to the fact that they can drink more easily and in larger sips from the drinking bowl.

Figure 1. Rabbits drink from nipple drinker / 1. ábra: Nyulak szelepes önitatóból isznak
Source: Owe construction / Forrás: Saját szerkesztés

Figure 2. Drinking bowl in a show cage / 2. ábra: Itatótál kiállítási ketrecben
Source: Owe construction / Forrás: Saját szerkesztés

According to HOY's (2000) studies, animals visit the automatic drinkers on average 42.6 times a day, where they spend 72 seconds each time, which is 3.3% of the 24 hours a day (compared to this, they used to feed 62.6 times, for 230 seconds each time, which is 16% of the day).

In group housing, there should be enough drinkers in the booth so that the rabbits can drink without disturbing or competing with each other. At least two waterers with weight valves are required for ten rabbits (SZENDRŐ, 2019).

Bottle drinkers are widely used, especially among those who keep rabbits as a hobby. A tube with a ball valve at the end extends from the bottle. The rabbit moves the ball while sucking on the valve to get water. Despite the many advantages and popularity of the device, it has some common failures, such as the ball does not close and the water flows out of the bottle, the ball gets stuck and completely blocks the water path, and in cold weather, keeping the cage outside in the bottle and the valve easily freezes water, so this device requires constant attention and maintenance (HARCOURT-BROWN, 2011).

An efficiently functioning drinking system, good management and clean drinking water available ad libitum help meet the welfare requirements of rabbit farming (EFSA, 2005).

Conclusion

Based on the collected scientific results related to the supply of drinking water for domestic rabbits, the following conclusions can be made:

- Feeding feed with a high water content (e.g. fresh grass) reduces, and feeding feed with a high dry matter content (e.g. pellets, hay) significantly increases the rabbit's requirement for water.
- Animals exposed to heat stress increase their water consumption, but can only reduce their body temperature within narrow limits with spawning water.
- Does produce the most milk during the 3rd week of lactation, so that is when their need for water is greatest.
- Mineral content of water below 3,000 ppm is desirable, but salinity above 3,000 ppm is unsuitable for consumption.
- The rabbit can only partially compensate for the lack of water intake after long-term water restriction.
- Animals prefer the drinking bowl, but automatic weight valve systems require less manual labor to clean and monitor.

In the case of animals kept in an artificial environment, closed, the entire water requirement must be continuously taken care of by the animal keeper.

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