

Short communication

THE EFFECT OF *CURCUMA LONGA* DRIED POWDER IN THE DIET ON WEIGHT GAIN OF RABBIT DOES

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ABSTRACT

The aim of the present study was to evaluate the effect of different concentrations of *Curcuma longa* plant additive to the diet on the weight gain of rabbit does. Rabbit females ($n = 45$) of New Zealand White breed of the same age (2 months) were used in the experiment. Rabbit does in the control group (C; $n = 15$) were fed a commercially available feed. In the experimental groups 5 g (E1; $n = 15$) and 20 g (E2; $n = 15$) of *Curcuma longa* dried powder was added to 100 kg feed mixture. The highest average weight gain per week was observed in the first experimental group (E1; 235.7 ± 22.35 g) when compared to the control (C; 216.2 ± 25.59 g) and the second experimental (E2; 220.5 ± 31.94 g) groups. The highest total average weight gain of rabbit does was observed in the E1 (2103.3 ± 63.22 g) compared to the second (E2, 2045 ± 84.36 g) and control (C, 1950 ± 126.88 g) groups. In conclusion, supplementation of *Curcuma longa* plant powder to the commercially diet for rabbit positively affected weight gains in rabbit does. Therefore, to improve growth performance, further studies are required to define an optimal supplementation of *Curcuma longa* to the rabbit diet.

Keywords: rabbit does; *Curcuma longa*; weight gain

INTRODUCTION

In the last years, rabbit production on the commercial level acquired increasing interest due to their prolificacy, rapid growth rate and meat yields (Savietto *et al.*, 2015; Mínguez, 2014; Ricke *et al.*, 2012; Gondret *et al.*, 2005).

More suitable composition of feed mixture or administration of natural additives at a suitable concentration might be beneficial in livestock farming without negative effect on the environment and the animal as an individual (Wareth *et al.*, 2014; Githiori *et al.*, 2003; Amber *et al.*, 2004; Namkung *et al.*, 2004).

Positive effect of biologically active substances and extracts from *Acacia saligna* (Tamir and Asefa, 2009), *Morus australis* (Wu *et al.*, 2013), *Yucca schidigera* (Földešiová *et al.*, 2013), *Agave tequilana* (Sáyago-Ayerdi *et al.*, 2014), *Saposhnikovia divaricata*, *Lonicera japonica*, *Chelidonium majus* (Park *et al.*, 2014) a. o. on weight gain were observed in lambs, mice, rabbits, rats and broilers.

Curcuma longa Linn, a member of *Zingiberaceae* family, commonly known as turmeric, originate in tropical and subtropical regions of India and China. Medicinal properties of *Curcuma longa* have been attributed primarily to curcuminoids, which are located

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in the plant rhizome. Curcumin (diferuloylmethane) is the most important fraction of *Curcuma longa* (Araújo and Leon, 2001). Polyphenol curcumin, extracted from dried rhizomes of the plant, acts through inhibition of mitogen-activated protein kinases (Jeon *et al.*, 2013). Although turmeric is consumed every day in Asian countries, no toxic effect on the health of population was found (Ammon and Wahl, 1991).

Beneficial effects of curcuma on the animal liver protection (Deshpande *et al.*, 1998), treatment of the human diabetes (Eshrat and Hussain, 2002), steroidogenesis, proliferation and apoptosis in porcine ovaries (Kádasi *et al.*, 2012) were found.

In particular, yellow rhizome, containing curcumin, is used to treat digestive, neuropsychiatric diseases (Mei *et al.*, 2011) and osteoarthritis in combination with a ginger (Low Dog, 2006).

Furthermore, the plant has also been shown to possess high antioxidant (Maheshwari *et al.*, 2006; Wojdyło *et al.*, 2007) anticarcinogenic (Hatcher *et al.*, 2008), antibacterial (De *et al.*, 2009) and anti-inflammatory (Jurenka, 2009) effect.

The objective of this study was to evaluate the effect of different concentrations of *Curcuma longa* dried powder as an additive to the diet on the average weight gain (g) per week and the total average weight gain of the rabbit does.

MATERIAL AND METHODS

Animals

Two months old clinically healthy rabbit does of the New Zealand White line (NAFC Nitra, SR) were used in this experiment. The animals were housed in individual cages, under a constant photoperiod of 14 hours of light day, average relative humidity $60 \pm 5\%$ and temperature $17 \pm 3\text{ }^{\circ}\text{C}$. The rabbits were fed *ad libitum* and water was provided *ad libitum* with nipple drinkers.

Rabbit does ($n = 45$) were divided into three groups: control (C; $n = 15$) and two experimental groups (E1; $n = 15$ and E2; $n = 15$). The does in the control group were fed a commercially available complete feed mixture. In experimental groups the complete feed mixture was enriched with *Curcuma longa* dried powder at the concentrations of 5 g (E1) and 20 g (E2) per 100 kg. The animals were fed for 63 days (9 weeks) and weighted weekly.

The treatment of the animals was approved by the Ministry of Agriculture and Rural Development of the Slovak Republic, no. SK P 28004 and Ro 1488/06-221/3a.

Statistical analysis

The data were analysed by the t-test using Sigma Plot statistical package (Systat Software Inc., Germany).

RESULTS AND DISCUSSION

In our study we tested effect of the addition of *Curcuma longa* dried powder to the complete feed mixture on the average weight gain (g) per week and the total average weight gain (g) of rabbit does.

The highest average weight gain of rabbit does per week (g) was found in the first experimental group (E1; 235.7 ± 22.35) when compared to the control (C; 216.2 ± 25.59) and the second experimental group (E2; 220.5 ± 31.94) (Table 1).

Total average weight gain (g) was higher in the first experimental group (E1; 2103.3 ± 63.22) compared to the second (E2; 2045 ± 84.36) and control (C; 1950 ± 126.88) groups (Table 2, Figure 1).

In accordance to Holder *et al.* (1978) we suggest that slightly lower weight gain in the second experimental group compared to the first experimental group might be due to the higher concentration of *Curcuma longa* in feed mixture, which can cause poor absorption from the intestine.

In our study, we found that the addition of both concentrations (5 g and 20 g kg^{-1} diet) of *Curcuma longa* dried powder into rabbit complete feed mixture had a positive effect on average weight gain per week and total average weight gain of analysed rabbit does.

Positive effect of *Curcuma longa* powder to the diet was also found in broiler chickens. Higher weight gain was observed in the birds fed the diet containing *Curcuma longa* at level of 0.5 %, compared to the birds receiving 0.25 %, 1 % and control birds (Al-Sultan, 2003). Osava *et al.*, (1995) and Al-Sultan (2003) attributed the increase in the body weight gain to the antioxidant activity of *Curcuma longa*.

Moreover, Durrani *et al.* (2006) reported significantly positive effect of curcuma at the level of 0.5 % on weight gain of birds. It was also shown, that curcumin added to the diet of kids during the hot summer months significantly improved the final live body weight and average daily body gain of kids compared to the control (Habebband and Tarabany, 2012). On the other hand, similarly to our results no significant effect of the supplementation of curcuma powder in the broiler rabbit (Basavaraj *et al.*, 2010) and in the broiler chicks feed a mixture (Mehala and Moorthy, 2008) were reported.

Table 1: Weight gain (g) per week of analysed rabbit does fed with *Curcuma longa* enriched feed

Groups	Weight gain per week (g)										Average weight gain per week (g) (Mean \pm S.E.M.)
	1 st week	2 nd week	3 rd week	4 th week	5 th week	6 th week	7 th week	8 th week	9 th week	10 th week	
C ($n = 15$)	286.20 \pm 80.77	280.77 \pm 27.86	258.46 \pm 23.26	245.38 \pm 28.43	223.08 \pm 27.29	185.38 \pm 31.88	227.69 \pm 47.73	183.85 \pm 19.29	59.23 \pm 29.41	216.20 \pm 25.59	
E1 ($n = 15$)	258.00 \pm 29.13	291.30 \pm 17.75	310.70 \pm 19.28	283.30 \pm 21.86	278.00 \pm 29.18	217.30 \pm 28.07	208.00 \pm 22.28	170.70 \pm 20.31	86.00 \pm 17.91	235.70 \pm 22.35	
E2 ($n = 15$)	222.86 \pm 27.08	263.57 \pm 30.69	327.10 \pm 40.35	299.30 \pm 16.82	254.30 \pm 18.53	232.90 \pm 14.76	211.40 \pm 22.84	165.00 \pm 32.39	69.30 \pm 27.60	220.50 \pm 31.94	

C – control group, commercially available diet (normal diet); E1 – 5 g of *Curcuma longa* dried powder added to 100 kg of normal diet; E2 – 20 g of *Curcuma longa* dried powder added to 100 kg of normal diet

Table 2: Average weight per week (g) and total average weight gain of analysed rabbit does fed with *Curcuma longa* enriched feed

Groups	Average weight of rabbit does per week (g)										Total average weight gain (g) (Mean \pm S.E.M.)
	1 st week	2 nd week	3 rd week	4 th week	5 th week	6 th week	7 th week	8 th week	9 th week	10 th week	
C ($n = 15$)	1713.08 \pm 83.30	1999.23 \pm 103.41	2280.00 \pm 116.59	2538.46 \pm 128.04	2783.85 \pm 148.68	3006.92 \pm 150.51	3192.31 \pm 156.99	3420.00 \pm 183.50	3603.85 \pm 187.85	3663.08 \pm 171.73	1950.00 \pm 126.88
E1 ($n = 15$)	1842.67 \pm 44.37	2100.67 \pm 53.24	2392.00 \pm 58.98	2702.67 \pm 65.03	2986.00 \pm 64.66	3264.00 \pm 72.93	3481.33 \pm 73.03	3689.33 \pm 86.68	3860.00 \pm 78.22	3946.00 \pm 77.07	2103.30 \pm 63.22
E2 ($n = 15$)	1818.57 \pm 47.31	2041.43 \pm 57.87	2305.00 \pm 63.48	2632.14 \pm 65.84	2931.43 \pm 77.90	3185.71 \pm 77.78	3418.57 \pm 86.23	3630.00 \pm 102.61	3795.00 \pm 118.74	3864.29 \pm 104.18	2045.00 \pm 84.36

C – control group, commercially available diet (normal diet); E1 – 5 g of *Curcuma longa* dried powder added to 100 kg of normal diet; E2 – 20 g of *Curcuma longa* dried powder added to 100 kg of normal diet

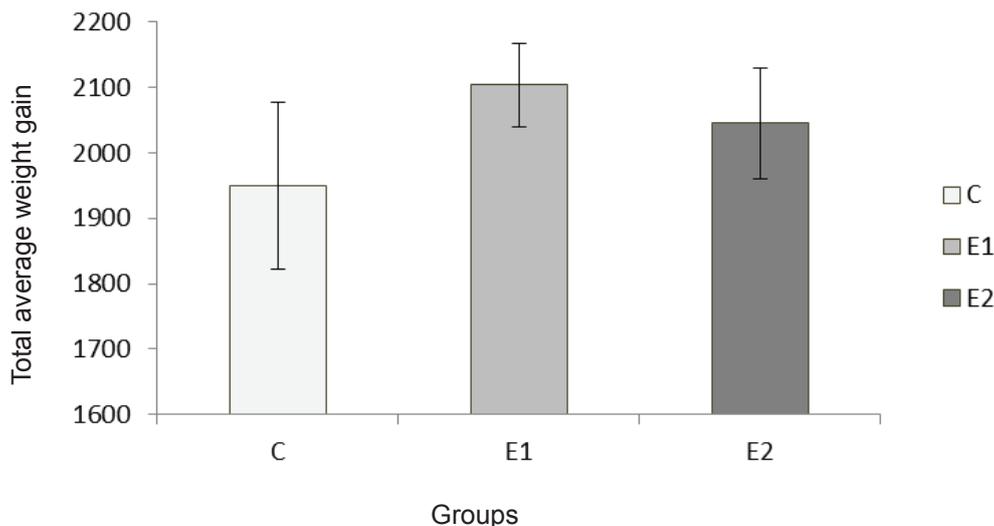


Fig. 1: Total average weight gain (g) of analysed rabbit does fed with *Curcuma longa* dried plant added into complete feed mixture

CONCLUSION

The supplementation of *Curcuma longa* plant powder to the commercially available diet for rabbits positively affects weight gains in rabbit does. Therefore, for improving growth performance, further studies are required to define an optimal supplementation of *Curcuma longa* to the rabbit diet.

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