EFFECT OF DIGESTAROM® FEED ADDITIVE ON RABBIT CARCASS TRAITS AND MEAT SENSORY ATTRIBUTES

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Abstract – At kindling, rabbit does and litters were divided into two dietary groups (n=162 kits/group) and fed either a control diet (C) or a diet supplemented with Digestarom® (D: 300 mg/kg) feed additive. Subsequently, weaned rabbits were allocated to 3 different dietary groups (n=108 rabbits/group): CC and DD received the C and D diet from 5 to 12 weeks of age, respectively. Differently, DC group was fed with D and C diets from 5 to 8 weeks of age and from 8 to 12 weeks of age, respectively. At 12 weeks of age animals were slaughtered and carcass yields were calculated. Fore, mid and hind carcass parts were dissected and ratios to the chilled carcass were calculated. Sensory analysis of the loin meat considered spice, rancid and Digestarom® ingredients perception. Before weaning, D positively affected reference carcass weight ($P<0.001$), carcass yield ($P<0.001$) as well as the proportion of the mid part on the RC ($P<0.05$). Differently, the relative amount of the fore part on the RC was significantly higher in C group compared to D ($P<0.05$). Sensory analysis scores evidenced that D increased meat spiciness both before and after weaning which was associated with rancidity. However, overall acceptability remained unaffected.

Key Words – Rabbit, Diets, Herbs, Spices, Carcass quality, Sensory analysis

I. INTRODUCTION

The use of antibiotics as growth promoters in animal nutrition was banned in 2006 to avoid a possible presence of their residues in the meat, the latter perceived as a health safety issue by consumers. As a consequence, consumers have also taking an increasing interest towards more "natural" meat and meat products (1). This new interest led to a massive development in the research of natural feed additives for food producing animals (2). Such additives must guarantee both satisfactory growth performance as well as meat quality. Digestarom® 1315 is an example of plant formulation designed for rabbits farming and consists of a mixture of 10 different herbs and spices: onion, garlic, caraway, fennel, gentian, melissa, peppermint, anise, clove and oak bark. The potential antioxidant, antibacterial, antimicrobial, appetizer and digestion enhancer effects of some of the above mentioned herbs and spices were shown in some studies (3, 4, 5) and were mostly attributed to the effect of plant phytochemicals, such as flavonoids and carotenoids. Moreover, in other researches evaluating the effect of Digestarom® on rabbits performances (6, 7), the combination of such herbs and spices provided positive results. When herbs and spices were included, often individually, in animal diets (8) or directly added to the meat (9), they affected meat color, consistency, texture, as well as its flavor, ultimately influencing consumers acceptance positively.

On the basis of the considerations above mentioned, this study aimed to evaluate the effect of Digestarom® feed additive for growing rabbits on carcass traits and, for the first time, on the sensory acceptability of their meat.

II. MATERIALS AND METHODS

For this study maternal line rabbits of the Pannon breeding program were used. At kindling, rabbit does and litters were divided into two dietary groups (n=162 kits/dietary group) and fed either a control diet (C) or a diet supplemented with Digestarom® (D: 300 mg/kg) feed additive. At weaning, each dietary group was further divided into 3 dietary groups (n=108 rabbits/group): CC received the control diet and DD the D diet from 5 to 12 weeks of age,

respectively. Differently, DC dietary group was fed with D and C diets from 5 to 8 weeks of age and from 8 to 12 weeks of age, respectively. On Overall 6 groups were created: c-CC, c-DC, c-DD, d-CC, d-DC, d-DD. The animals were housed (3 rabbits/cage) in wire-mesh cages (61 x 32 cm), the temperature was 15-18 °C and the photoperiod was 16L:8D.

At 12 weeks of age, rabbits were weighed (SW) and transported to a slaughterhouse located 200 km far from the experimental farm. After slaughtering, carcasses were chilled for 24 h at 3 °C, weighed (CC), and dissected according to the recommendations of the World Rabbit Science Association (10). Then, carcass yields as well as the ratio of fore, mid and hind parts to the reference carcass (RC) were calculated.

Four-members trained panel of the Department of Animal Medicine, Production and Health (University of Padova, Italy) was used. Panelists evaluated by ranking test the 90 loins (*Longissimus thoracis et lumborum* –LL- muscle) of rabbits (15 LL per treatment). The test was carried out in 3 days in which 30 samples per day were evaluated (5 samples/treatment). Each LL was divided in four parts and distributed to panelists. Each panelist received always the same part of the sample. For every descriptor (olfactory rancidity, olfactory spicy; flavor rancidity, flavor spicy, overall acceptability), meat samples were ordered from the less intense (rank 1) to the more intense (rank 6). Finally, panelists were also asked to indicate if and which of the ingredients constituting Digestarom® (onion, garlic, caraway, fennel, gentian, melissa, peppermint, anise, clove and oak bark) they could recognize.

Carcass traits and sensory data were analyzed by a Mixed ANOVA using SAS 9.1. statistical analysis software for Windows (11) with cage as random effect, and before weaning (BW: C, D), and post weaning (PW: CC, DC, DD) as fixed effects. Flavors perception data were analyzed by a One-way ANOVA (PROC GLM) with the treatment (c-CC, c-DC, c-DD, d-CC, d-DC, d-DD) as fixed effect. Least square means were obtained using the Bonferroni test and the significance level was calculated at a 5% confidence level.

III. RESULTS AND DISCUSSION

Carcass traits (Table 1) were significantly affected by the dietary treatment in the BW period.

Table 1 Effect of the dietary Digestarom® supplementation on rabbit carcass traits

Periods	BW		PW			MSE[1]
Diets	C	D	CC	DC	DD	
No. rabbits	162	162	108	108	108	
SW, g	2613	2604	2585	2615	2626	15
CC, g	1553	1556	1543	1556	1564	10
RC, g	1279^{A}	1289^{B}	1272	1285	1295	9
Slaughter yield, % SW	59.4	59.7	59.6	59.4	59.5	0.1
RC yield, % CC	82.3^{A}	82.8^{B}	82.3	82.5	82.7	0.1
Ratio to the RC:						
Fore part	28.3^{b}	28.0^{a}	28.2	28.1	28.2	0.1
Mid part	32.3^{a}	32.7^{b}	32.4	32.5	32.6	0.1
Hind part	37.6	37.7	37.7	37.7	37.5	0.1

^{A,B} Means in the same row with different superscripts significantly differ (P<0.001); ^{a,b} Means in the same row with different superscripts significantly differ (P<0.05); [1]MSE= Means Squared Error

Reference carcass (RC) weight and RC yield were significantly higher in D compared to C rabbits (P<0.001). Differences were due to greatest proportion of the mid part of the carcass (P<0.05). Our results confirmed those of another study on growing rabbits (5) in which Digestarom® at dose 300 mg/kg feed improved rabbits body weight at 9 weeks of age (age at slaughter). The latter study showed also higher slaughter yields in Digestarom® supplemented animals, not observed in our study, however. In a previous study on growing rabbits (7) it was found that a dietary supplementation of 300 mg Digestarom®/kg feed improved feed conversion ratio compared to a control group, without affecting rabbits body weight. According to literature (3, 4, 5, 6), a combination of different herbs and spices, and thus of phytochemicals, can provide synergistic effects. However the positive effect of Digestarom® on rabbits carcass traits observed in our study was restricted only on those rabbits who fed the feed additive BW, whereas PW no differences were found on the carcass traits considered.

Table 2 depicts aroma and flavor attributes perceived in the rabbit LL. Digestarom® dietary inclusion remarkably affected the considered descriptors (olfactory and flavor rancidity and

spicy) when offered in the BW period, with less effect when administered in the PW period.

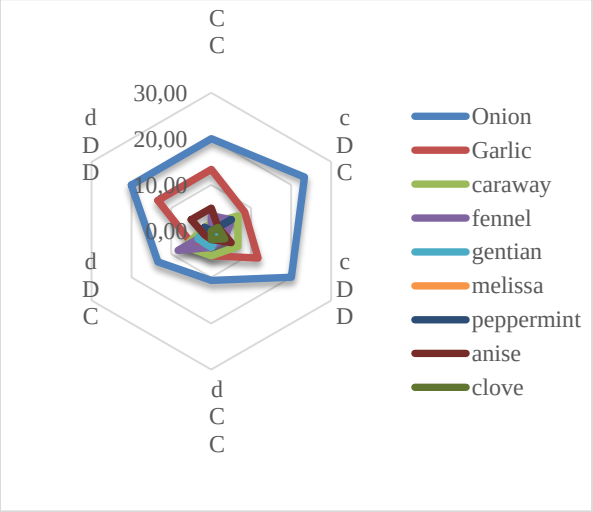
Table 2 Effect of the dietary Digestarom® supplementation on sensory scores of *Longissimus thoracis et lumborum* (LL) meat

Periods	BW		PW			MSE[1]
Diets	C	D	CC	DC	DD	
No. samples	45	45	30	30	30	
Olfactory:						
Rancidity	3.2^{a}	3.6^{b}	3.0^{X}	3.6^{Y}	3.8^{Y}	1.7
Spicy	3.2^{A}	3.8^{B}	3.4	3.6	3.4	1.7
Flavor:						
Rancidity	3.0^{A}	4.0^{B}	3.3	3.5	3.7	1.6
Spicy	3.2^{A}	3.7^{B}	3.5^{xy}	3.2^{x}	3.8^{y}	1.7
Overall acceptability	3.6	3.4	3.6	3.4	3.4	1.7

^{A,B,X,Y} Means in the same row with different superscripts significantly differ (P<0.01); ^{a,b,x,y} Means in the same row with different superscripts significantly differ (*P*<0.05).

In general, LL meat belonging to Digestarom® group was judged more spicy but also more rancid (in both BW and PW periods) compared to the control. Considering the PW period, a longer supplementation of Digestarom® progressively increased attributes scores. However panelists did not observe differences in the overall acceptability due to the feed additive inclusion. Panelists perceived the spices presence in the meat and probably this was confused with olfactory and flavour rancidity. This could explain why overall acceptability was similar among groups. This hypothesis can be supported by the recent study of Cullere *et al.* (12) in which rancidity and other off-flavors of rabbit meat patties where associated to increasing levels of the supplemented rooibos (*Aspalathus linearis*) plant additive. In literature, sensory attributes deriving from meat of animals fed with natural compounds are contrasting: meat of young hybrid pigs fed with a plant extract mix (oregano and sweet chestnut) received higher scores for color, taste and overall liking (13). Conversely, dietary supplementation of Chia (*Salvia hispanica L.*) seeds in two different experiments on rabbits (8) and hens (14) did not affect sensory scores.
Figure 1 shows panelists ability to discern Digestarom® ingredients in the meat.

Figure 1. Flavor perception of Digestarom® spices



Onion and garlic showed the highest percentages, thus being the mainly recognized flavors. Surprisingly, onion and garlic were detected also in the control meat. In these two spices, belonging to the same genus (*Allium*), thiosulfinates are present. They are volatile sulfur compounds responsible for their characteristic pungent aroma and taste (15). Evidently, despite the precautions taken during the sensory analysis, their persistency affected also the flavor of meat belonging to the C group. This hypothesis was confirmed by another experiment (16), in which panelists recorded higher flavor scores for the meat of broilers fed with a garlic supplementation compared to that of untreated animals.

IV. CONCLUSION

The study confirmed that Digestarom® can provide a positive effect on carcass traits of growing rabbits. In addition, despite the panelists recorded higher scores for spicy and rancidity descriptors in D meat, the overall flavor did not change among dietary treatments. Consequently, on the basis of the above mentioned results, Digestarom® seems to be an effective natural feed additive for growing rabbits without affecting overall flavor of their meat.

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