GENETICALLY MODIFIED MAIZE AS RABBIT FEED INGREDIENT

CHRENKOVÁ Mária [1], CHRASTINOVÁ Ľubica [1], FORMELOVÁ Zuzana[1], POLÁČIKOVÁ Mária [1], LAUKOVÁ Andrea [2], ONDRUŠKA, Ľubomír [1], SZABÓOVÁ Renáta [2]

[1]Animal Production Research Centre, Nitra: Institute of Nutrition, Hlohovecká 2, 951 41 Lužianky, Slovak Republic
[2]Institute of Animal Physiology, Slovak Academy of Sciences, Šoltésovej 4-6, 040 01 Košice, Slovak Republic

63rd Annual Meeting EAAP 2012

INTRODUCTION

Genetically modified (GM) crops, which have been developed, offer a wide variety of benefits to producers including resistance to insects, disease and herbicides. GM maize MON 88017 x MON 89034 contains different transgenic traits: Bt toxins against Lepidoptera (butterflies and moths), Bt toxin against Coleoptera, and glyphosate tolerance. In the European context, Slovakia ranks among other 7 EU countries which have practical experience in Bt maize cultivation; these are: Spain, France, Romania, Portugal, Germany, the Czech Republic and Poland (Ervin et al, 2010).
The objective of this work was to determine the effect of selected maize hybrids (MON 88017 X MON 89034) in diets on nutrient digestibility and growth performance, analysis of the fatty acid composition in meat, physical and chemical characteristics of meat in MLD muscle substance, and caecal fermentation pattern in rabbits.

MATERIAL AND METHODS

- A total of 90 weaned rabbits (male sex, Hycola hybrid, housed individually in cages)
- were divided into 3 experimental groups.
- •The rabbits in the 1st group were fed mixture including 12% transgenic maize (MON 88017X MON 89034).
  •The rabbits in the 2nd group were fed mixture including 12% isogenic maize (DKC 5143)
- •The rabbits in the 3rd group were fed mixture including reference maize (LG 3475) the testing period lasted from weaning at day 35 to day 77 of animals life. The trial ended with slaughter (LW ≈ 2500 g). Rabbits were fed *ad libitum* and they had free access to drinking water from nipple drinkers. Body weight and feed consumption were registered weekly and feed conversion ratio values were calculated. Between 65 and 70 days of age, 5 rabbits from each group were selected for digestibility tests using the balance method. Physical charakteristics, content of proteins, fat and water holding capacity were determined in m.l.d. (*muscle Longissimus dorsi*) by standard method according to the norm STN 57 0185. We determined totally 12 fatty acids of fat the series C12:0 up to C22:1 using gas chromatograph with a flame ionization detector (FID) though the retention times of the fatty acid methyl esters (FAME) content in a standard mixture for each fatty acid. The FAME were expressed in % of total FA. Where: other MUFA-monounsaturated FA , include C14:1, C16:1 and PUFA–polyunsaturated FA, include C18:2n-6, C18:3n-3.
- The caecal samples from each of three slaughtered rabbits were collected for microbiological analysis, pH, VFA and lactic acid were determined. Volatile fatty acid values (lactic acid in g/100g; acetic, propionic and butyric acids in mmol/100g) were determined using gas chromatography from caecal content at day 42.
- The results were quoted as mean ± standard deviation (SD); statistical evaluation of
- the results was performed by the one-way ANOVA and Tukey test.

Ingredients and chemical analysis of the experimental diets for rabbits

Feed ingredients	in %	Chemical analysis (g. kg^{-1})	Experimental group with maize		
			1- transgenic MON88017 x MON 89034	2- isogenic DKC 5143	3- reference LG 3475
Lucerne meal	41.0	Crude protein	157.4	157.3	158.6
Dried beet pulp	19.0	Crude fibre	192.9	191.9	188.7
Rape extr. meal	20.0	Fat	29.9	30.5	29.2
Wheat	3.0	N free extract	438.8	437.7	442.4
Maize	12.0	Organic matter	819.1	817.3	818.9
Molasses	0.9	Starch	136.5	136.5	141.7
Mineral & Vitamins	3.2	Calcium	6.6	6.9	6.8
Rape oil	0.5	Phosphorus	4.9	5.5	5.7
Limestone, pulverized	0.4	ME (MJ. kg^{-1})	10	10	10.1

RESULTS

Effect of treatment on performance of rabbits

Investigated parameters (n=30)	Experimental group with maize		
	1- transgenic MON88017 x MON 89034	2- isogenic DKC 5143	3- reference LG 3475
Daily weight gain g/day	40.97	36.95	39.0
Feed conversion ratio in g/g	3.43	3.46	3.49
Feed intake g/day	129.6	128.6	130.6
Carcass yield in %	57.27	57.78	57.85
Coefficient of nutrients digestibility in % (n=5)			
Crude protein	65.74 ± 2.89	60.18 ± 2.49^{ac}	68.65 ± 3.37^{b}
Fat	86.88 ± 0.68^{b}	74.88 ± 0.67	86.61 ± 2.48^{b}
Crude fibre	20.50 ± 2.15	20.88 ± 3.75	20.26 ± 2.73
Nitrogen-Free Extract	72.12 ± 1.88	66.26 ± 5.18	67.98 ± 3.69
Starch	91.20 ± 2.20	91.98 ± 1.57	90.43 ± 1.70
Organic matter	59.45 ± 1.98	54.62 ± 3.12	59.13 ± 2.25
Meat quality traits of MLD of rabbits 24 h *post mortem* (g.100g^{-1} MLD)			
Content of water	75.43 ± 0.67	75.5 ± 0.10	75.67 ± 0.06
Total proteins	22.17 ± 0.15	22.43 ± 0.15	22.7 ± 0.53
Content of fat	1.37 ± 0.65	0.93 ± 0.21	0.96 ± 0.06
Energetic value (kJ.100g^{-1})	422.79 ± 25.36	410.93 ± 9.55	416.64 ± 9.79
Water holding capacity	33.39 ± 4.18	35.72 ± 4.74	35.35 ± 1.33
pH 24	5.73 ± 0.29	5.53 ± 0.21	5.56 ± 0.03
Fatty acids profile of intramuscular lipids of rabbit meat (% of the total FA)			
SFA	39.24 ± 2.37	37.44 ± 1.41	36.65 ± 1.36
MUFA	29.27 ± 1.02	28.76 ± 1.03	30.39 ± 1.16
Σ ω 6 PUFA	25.55 ± 2.25	26.94 ± 1.59	25.77 ± 1.70
Σ ω 3 PUFA	5.93 ± 0.54	6.85 ± 0.15	7.19 ± 0.83
n6/n3 fatty acids ratio	4.31 ± 0.09	3.93 ± 0.23	3.60 ± 0.24
Nutritional quality of fat = PUFA/SFA	1.55 ± 0.16	1.67 ± 0.10	1.73 ± 0.10
Qualitative parameters in caecum			
Acetic acid (mmol.100g^{-1})	7.258	7.586	8.256
Propionic acid (mmol.100g^{-1})	0.590	0.670	0.714
Butyric acid (mmol.100g^{-1})	1.423	1.949^{a}	1.927^{a}
Other VFA (mmol.100g^{-1})	0.311	0.267	0.253
Lactic acid (g.100g^{-1})	0.020	0.021	0.037^{ab}
pH	6.31	6.18	6.15

CONCLUSION

Obtained results demonstrate minimal differences in individual nutrient digestibility in tested mixtures and performance, physical and chemical characteristics of meat in MLD muscle substance and fatty acid profile of rabbits meat.
Live weight growth, feed conversion and health of rabbits after feeding the complete feed mixtures with 12 % proportion of Bt (MON 88017 x MON 89034), isogenic maize (DKC 5143) and reference maize (LG 3475) did not negatively influence zootechnical parameters and biochemical parameters in caecum. Bt maize deteriorated neither the health in animals nor the production of animal proteins valuable for human nutrition compared with conventional maize.