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THE INFLUENCE OF ADDITION OF SELECTED GROWTH STIMULANTS ON PIG FATTENERS PRODUCTION RESULTS AND FATTY ACIDS PROFILE*

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The aim of the experiment was to study the influence of herb extract and acidifier on fattening results of 48 crossbred pigs, carcass quality and fatty acids content. The results of fattening performance and carcass quality showed the possibility of removal of the antibiotic promoters from pigs' diets. The chosen stimulants (herb extract and acidifier) use had no significant influence on fatty acids profile in lipid fraction of the lean meat.

INTRODUCTION

Introducing the restriction on antibiotic use increased the interest in other growth promoters [Grela, 2000 a]. The application of bio-stimulants in pigs' feeding has not decreased the productive results, but their effect on meat quality is not known yet. In available literature there is no information about relation between antibiotic and other growth promoters, and fatty acids profile in pork. The content of fat, cholesterol and fatty acids (SFA, PUFA, MUFA) has an influence on dietetic value of pork. The level of saturated fatty acids (palmitic and stearic) in pork has especially unfavourable effect on humans, because of increasing the cholesterol level. By decreasing the cholesterol level in blood unsaturated fatty acids prevent artheriosclerosis and metabolic disorders [Bartnikowska, 2000]. The recommendation of international dietetic commission estimates the proper PUFA: SFA and PUFA n-6: PUFA n-3 ratio, which should be 0.6 and 2.0, respectively [Esner *et al.*, 1996]. The higher content of PUFA in pork has reduced oxidation immunity and shelf life of processed meat and susceptibility rancid flavour.

The aim of the experiment was to study the influence of growth promoter: herb extract and acidifier on fattening results of 48 crossbred pigs, carcass quality and fatty acids content.

MATERIAL AND METHODS

The crossbred 48 fatteners, gilts and barrows, were allocated by analogy to the three groups, 16 pigs per group. All pigs were in pens with straw, 5–6 head per pen. The control group (K) did not receive any stimulant. For experimental group 1 (D_1) and experimental group 2 (D_2), the herb extract and acidifier were added respectively. The all-mash PT-1 and PT-2 (Table 1) were used for I (20 kg–55 kg) and II (55 kg–100 kg) fattening period. The lard was added to all-mash for I period. The herb Extract Pig Grower XT with natural herb extract and ethereal oil (D_1) and acidifier ZitroSan containing mix of orto-phosphorus acid (50%) and citric acid (1%) on silica carrier (D_2) were added to the diets. The fatteners were fed according to Swine Nutrition Requirements [1993], twice a day, with *ad libitum* access to water.

TABLE 1. Content (%) and nutritional value of diets.

Specification	Groups					
	Control K		Exp. D_1		Exp. D_2	
	PT-1	PT-2	PT-1	PT-2	PT-1	PT-2
Wheat ground	10.0	-	10.0	-	10.0	-
Barley ground	45.0	55.8	47.1	57.9	47.1	56.4
Rye ground	-	10.0	-	10.0	-	10.0
Wheat bran	20.0	15.3	16.2	11.5	17.3	14.1
Soybean meal 45%	11.2	4.9	11.9	5.6	11.6	5.2
Rapeseed meal 34%	3.0	5.0	3.0	5.0	3.0	5.0
Meat meal	5.0	4.0	5.0	4.0	5.0	4.0
Lard	0.8	-	0.8	-	0.7	-
Mineral-vitamin mixture	5.0	5.0	5.0	5.0	5.0	5.0
Bio-stimulant	-	-	1.0	1.0	0.3	0.3
Metabolic energy MJ/kg*	12.56	12.50	12.56	12.50	12.60	12.50
Crude protein, %	17.62	15.90	18.15	14.97	18.08	15.20
Crude fat, %	2.30	2.02	1.81	1.99	2.51	1.95
Crude fibre, %	5.01	4.74	4.39	5.21	4.71	5.35
Lysine, %	1.02	0.87	1.03	0.88	1.03	0.88

*estimated by analysis

In fatteners from 18–19 kg to about 100 kg of body weight, the gain ratio and feed conversion were controlled. After fattening, 18 pigs were slaughtered (6 per each group). The carcass quality was estimated using dissection method [Różycki, 1996]. The meat samples from *Musculus longissimus dorsi* (MLD), after last rib, were collected and cold stored (-20°C) according to the procedure of Baryłko-

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-Pikielna [1975]. After thawing, the fatty acids profile was estimated on gas-chromatography HP 6800 according to Polish Norm 5509 [1978] and 5508 [1990].

The results were analysed using one factorial analysis of variance with least squares method [SPSS, 2000]. In the analysis of fattening results, the initial body weight and for carcass trails – the weight of half-right carcass were regarded as covariable. The average least squares of trials and their standard error were presented in Table 2 and 3.

TABLE 2. Results of fattening performance and carcass quality.

Traits	Groups			Se
	K	D_1	D_2	
The initial body weight, kg	19.2	19.0	17.9	0.75
The finishing body weight, kg	99.4	99.5	98.7	0.83
Daily body gain, g	720	716	714	8.53
Feed intake during fattening, kg	248.1	252.9	248.8	3.56
Feed conversion, kg/kg	3.08	3.14	3.12	0.05
Body weight at slaughtering, kg	100.5	102.1	99.5	0.67
Weight of right half of carcass, kg	38.3	37.9	37.2	0.25
Dressing, %	75.8	74.3	75.3	0.41
Loin eye area, cm^2	46.7	47.6	43.7	1.90
Average backfat thickness, cm	2.22	2.22	2.39	0.07
Weight of ham without backfat and skin, kg	7.52	7.56	7.37	0.15
Lean of main cuts, %	61.32	61.62	58.75	1.18

TABLE 3. The SFA, MUFA, PUFA content of *Musculus longissimus dorsi* (% of total fatty acids).

Specification	Groups			Se
	K	D_1	D_2	
SFA	39.89	39.98	39.15	0.307
MUFA	48.90	50.88	49.00	0.800
PUFA n-3	4.73	4.34	5.28	0.298
PUFA n- 6	6.48	4.79	7.52	0.867
PUFA	11.21	9.13	12.80	0.987
PUFA n-6/PUFA n-3	1.42	1.08	1.42	0.181
PUFA/SFA	0.28	0.23	0.33	0.025

RESULTS AND DISCUSSION

There were no statistically significant differences in fattening parameters between feeding groups (Table 2). The control pigs had the highest body gain in fattening. The feed intake re-calculated per one pig was similar in K and D_2 groups, but in D_1 group it was higher by about 2% (Table 2). The total feed conversion in fattening was the lowest in group K, while in group D_1 and D_2 it was higher by about 1.9% and 1.3 %, respectively.

Different results were obtained by PanCosma [Report, 1999], in which the Pig Grower XT addition increased by 5.9% daily body weight and the feed conversion in comparison to the control negative group (without growth promoter). The pigs from K group which did not receive any stimulant had good growth rate and feed conversion, so it confirms general opinion that in good environmental conditions, in the healthy herd, the good productive results may be obtained without growth promoter in the diet.

There was no significant influence of growth stimulant on the carcass quality (Table 2). The fatteners from D_1 group had the highest loin eye and similar to K average backfat thickness. The higher loin weight and loin eye were observed by Grela [2000 a] when herb mixture was added to the all-mash. The biggest backfat thickness and the smallest loin eye, less ham weight without backfat and skin noticed in the present study were characteristic for pigs from D_2 group (addition of ZitroSan).

Using the extract of Pig Grower XT [Report, 1999], the improvement of the carcass quality was observed, more total lean (increase from 55.8% to 58.3%), slighter backfat in P2 (by about 5.2%) and the bigger height of loin eye (4.1%).

There was no significant effect of stimulants on the SFA, MUFA and PUFA content in total fatty acids from lipid fraction of MLD (Table 3). The tendency of decreasing PUFA n-3 and PUFA n-6 in group D_1 in comparison with K (the difference 8.3% and 26%, respectively) was observed. Grela [2000 a] reported the higher content of PUFA n-3 and PUFA n-6 when the herbs were added to the diets. In our experiment, the acidifier ZitroSan had positive influence on fatty acids profile, improved by 11.6% PUFA n-3 and by 16.1% PUFA n-6 in comparison with K. In groups K and D_2, PUFA n-6: PUFA n-3 ratio was similar (1.42: 1), but lower by about 24% in group D_1, but it was not present in higher PUFA n-3 content. Kołodziej *et al.* [2001] reported a close correlation between MUFA content and cholesterol level ($r = +0.48$). Pork meat with higher PUFA level has a lower, therefore the most desirable, cholesterol level ($r = -0.59$). Grela [2000b] received similar results. He observed the increasing PUFA content in backfat and decreasing LDL content in the serum of finishing pigs when the herb mixture or probiotic was used.

The relation PUFA: SFA fluctuated from 0.23 (group D_1) to 0.33 (group D_2), so it was confirmed by Kołodziej *et al.* [2001].

CONCLUSIONS

Favourable and comparable results of fattening performance and carcass quality in pig groups receiving the herb extract (D_1), the acidifier (D_2) or without stimulant (K) showed the possibility of removal of the antibiotic promoters from pigs' diets.

There was no significant influence of stimulants on the fatty acids profile in lipid fraction of the lean meat.

REFERENCES

1. Bartnikowska E., Jakość żywności pochodzenia zwierzęcego a zdrowie człowieka. Roczniki Nauk. Zoot., Supl., 2000, z. 4, 9–15.
2. Baryłko-Pikielna N., 1975, Zarys analizy sensorycznej żywności. PWN, Warszawa (in Polish).
3. Enser M., Hallet K., Hewitt G.A., Fursey J., Wood J.D., Fatty acids content and composition of English beef, lamb and pork at retail. Meat Sci., 1996, 42, 4, 443–456.
4. Grela E., Wpływ dodatku ziół na wartość rzeźną tusz oraz wybrane cechy organoleptyczne i chemiczne mięsa. Rocz. Nauk Zoot Suplement, 2000a, z. 6, 167–171 (in Polish).

5. Grela E., Influence of herbs mixture in pigs feeding on performance and some lipid parameters in blood and backfat. Annales-Universitatis-Mariae-Curie-Skłodowska. Sectio-EE-Zootechnica, 2000 b, 18, 243–250.
6. Kołodziej A., Pietruszka A., Jacyno E., Fiałkowska B., The relationship between lipid components of *Musculus longissimus dorsi* of the pig. 4th International Conference, Genetic and Animals Breeding, Prerov, Czech Republic, 2001, 25–27.
7. Normy Żywienia Świń (Swine Nutrition Requirements), 1993, Wartość pokarmowa pasz. PAN Instytut Fizjologii i Żywienia Zwierząt, Omnitech Press, Warszawa (in Polish).
8. ISO 5509 – Polska Norma, 1978, Oleje i tłuszcze roślinne oraz zwierzęce. Przygotowanie estrów metylowych kwasów tłuszczowych.
9. ISO 5508 – Polska Norma, 1990, Oleje i tłuszcze roślinne oraz zwierzęce. Analiza estrów metylowych kwasów tłuszczowych metodą chromatografii gazowej.
10. Report, Xtract improves live weight gain and feed conversion with a tendency towards leaner carcasses in growing and finishing pigs. PanCosma Tech. Bulletin 1999, 1463, pp. 1–2;
11. Różycki M., 1996, Zasady postępowania przy ocenie świń w stacjach kontroli użytkowości rzeźnej trzody chlewnej. Stan hodowli i wyniki oceny świń. Wyd. Wł. IZ XIV, 69–82 (in Polish).
12. SPSS, 2000: SPPS, wersja 10.0 for Windows user's guide, 2000, by SPSS inc. USA.

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WPŁYW DODATKU WYBRANYCH STYMULATORÓW NA WYNIKI PRODUKCYJNE TUCZNIKÓW I PROFIL KWASÓW TŁUSZCZOWYCH

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Wprowadzone w UE ograniczenia w stosowaniu antybiotyków spowodowały wzrost zainteresowania innymi promotorami wzrostu. Stosowanie ich w żywieniu świń nie pogarsza wyników produkcyjnych, lecz nie jest znany do końca ich wpływ na jakość mięsa. W dostępnej literaturze brak jest informacji na temat powiązań między stosowanymi stymulatorami a profilem kwasów tłuszczowych w wieprzowinie. Niezbędne nienasycone kwasy tłuszczowe zapobiegają miażdżycy i zaburzeniom metabolicznym. Poprawa wartości wieprzowiny jest bezsporna. Proporcje PUFA:SFA i PUFA n-6:PUFA n-3 powinny wynosić 0,6 i 2,0 [Esner *et al.*, 1996].

W tuczu 48 szt. (20–100 kg) porównano stymulatory wzrostu: ziołowy ekstrakt Pig Grower XT (grupa D_1), zakwaszacz ZitroSan (grupa D_2) z grupą K bez stymulatora. Wartość pokarmowa 1 kg mieszanek wynosiła 12,50–12,60 MJ EM, 17,6–18,2% białka og., 15,0–15,9%, odpowiednio w I i II okresie tuczu (tab. 1). Przeprowadzono poubojową ocenę wartości rzeźnej (n=18), [Różycki, 1996] oraz ocenę składu kwasów tłuszczowych we frakcji lipidowej mięsa (MLD).

Nie stwierdzono istotnych różnic w parametrach tucznych między grupami żywieniowymi (tab. 2). Nie stwierdzono istotnego wpływu stymulatorów na wartość rzeźną tusz (tab. 2) i na zawartość SFA, MUFA i PUFA we frakcji lipidowej mięsa (tab. 3). Zaistniała tendencja do obniżenia zawartości PUFA n-3 i n-6 w grupie D_1 w porównaniu z grupą K. W grupach K i D_2 zaobserwowano podobny stosunek PUFA n-6: PUFA n-3 (wynosił 1,42:1), natomiast w grupie D_1 był on o 24% niższy. Stosunek PUFA do SFA wahał się od 0,23 (w grupie D_1) do 0,33 (w grupie D_2). Porównywalne w grupach wyniki oceny tucznej i cech rzeźnych wskazują na możliwość wycofania antybiotyków z mieszanek dla tuczników. Nie stwierdzono istotnego wpływu zastosowanych stymulatorów na profil kwasów tłuszczowych we frakcji lipidowej mięsa.