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# *Influence of Herbs Mixture in Pigs Feeding on Performance and Some Lipid Parameters in Blood and Backfat*

Wpływ mieszanki ziołowej w żywieniu tuczników na wzrost i niektóre wskaźniki lipidowe we krwi i słoninie

In recent years an increased interest in utilization of growth promotors of natural origin is observed. This is connected not only with phytotherapy and prophylaxis in veterinary medicine, but also with practical application in animal feeding (2, 5, 7, 8). The use of the herb, seems to be very promising especially biological activity substances, in food and feed supplements (4, 5). Some investigations with herb mixture additive confirm an impact on the performance and some meat characteristics (3, 7, 8).

The aim of these investigations was to determine the influence of probiotic and herb mixture additives on growth performance, carcass traits, some biochemical blood parameters and fatty acid composition of backfat in fattening pigs.

## MATERIAL AND METHODS

A hundred and fifty pigs of (Polish Large White x Polish Landrace) x (Duroc x Pietrain) crossbreed (75 gilts and 75 barrows) were allotted to three feeding groups. The animals of the control group (I) were fed with the standard mixtures for growing (PT-1) and finishing period (PT-2). In groups II and III, the standard mixtures were supplemented with 0.2 g probiotic (*Enterococcus faecium*, $5 \times 10^9$ $g^{-1}$) or with 30 g in PT-1 and 20 g in PT-2 herb mixture per 1 kg diet, respectively. The herb mixture components were: herb of great nettle (*Urtica dioica)* and common yarrow (*Achillea millefolium)*, lyophilized garlic (*Allium sativum)* bulbs, fruits of juniper (*Juniperus communis)*, leaves of great plantain (*Plantago lanceolata)* and rhizomes of wheat-grass (*Agropyron repens*).

The initial weight was 25 kg and the slaughter weight was about 105 kg BW. The pigs were housed in pens with slatted concrete floors (ten gilts or ten barrows per pen). Feed in dry mash form and water was available *ad libitum*. Individual live weights were recorded at initial experiment, by 65 kg BW and at slaughter. The feed consumption per pen was noted once per week. The temperature of the room was controlled and maintained at 21± 1°C with air speed <0.05 cm $s^{-1}$.

The mixtures were prepared from commercial ingredients. The composition of the grower (up to 65 kg BW) and finisher diets contained barley, wheat, triticale, soybean meal, meat-bone meal and mineral-vitamins premix. All nutrients including the vitamins and trace elements were consistent with the level recommended by nutrient requirements of pigs (6).

Chemical composition, including DM, crude ash, crude fibre, ether extract, crude protein, minerals (Ca and P) and amino acid composition, was determined according to routine laboratory procedures (1).

The blood for analysis was taken three times from jugular vein at the body weight of 40 kg, 80 kg and before slaughter. In the blood serum the levels of protein, glucose, total cholesterol, LDL, HDL and triglyceride with the procedure of AOAC (1) were determined. Pigs were stunned by electric shock and then killed by exsanguination. After slaughter, the 12 right carcasses (6 gilts and 6 barrows) of each treatment were chilled overnight and the following data were recorded using the Polish Pig Progeny Station method: carcass weight, length of carcass, backfat thickness over the shoulder, between the third and fourth lumbar vertebra, on the midback between the third and fourth last ribs and on the rump at three locations over the cranial, medial and caudal part of the gluteus muscle and also loin and ham weight. The ham was further dissected into lean meat and subcutaneous fat and bones. The loin eye area was also measured and weight of right side perirenal fat was determined. In backfat fatty acid composition was determined with chromatography method.

Statistical significance of difference between means of daily gains, feed utilization, carcass quality, fatty acid composition and serum characteristics data of treatments ($P<0.05$) was calculated by t-Student test. The results are given as the arithmetic means and standard error of means (SEM).

## RESULTS AND DISCUSSION

The herb mixture supplement to the mixtures (group III) improved ($P<0.05$) the average daily gains of pigs in growing period by 5 % and finishing by 3.8 % in comparison with the control treatment (Table 1). The animals receiving mixtures with probiotic (group II) had significantly higher (4.7 %) daily gains in the growing period. There was noted only a slight positive influence (by 2.3%) of the probiotic in the finishing period. Analogically to the daily gains, the herbs mixture additive improved the utilization of feed by the animals – feed conversion ratio in group III was ca. 2.9 % lower in comparison with the control treatment. A similar, positive influence on daily gains and feed utilization was received by Urbańczyk and Hanczakowska (8), who added commercial plant herbage extract Aromex-Solid to the diet. That supplement improved daily gains and feed conversion by 3-5%. The probiotic additive had a bit better influence on feed utilization in the growing period in comparison with herbs mixture additive.

Table 1. Daily gains and feed conversion ratio of fattening pigs

| Item | Groups | | | Sex | | SEM[1] |
|---|---|---|---|---|---|---|
| | I-control | II-probiotic | III-herbs | gilts | barrows | |
| Initial body weight, kg | 25.2 | 25.3 | 25.1 | 25.2 | 25.2 | 1.03 |
| Slaughter body weight, kg | 104.4 | 105.2 | 105.1 | 105.5 | 104.3 | 1,89 |
| Daily gains, g | | | | | | |
| growing period | 678[a] | 710[b] | 712[b] | 711 | 689 | 26 |
| finishing period | 782 | 800 | 812 | 790 | 806 | 42 |
| whole fattening period | 730 | 755 | 762 | 750 | 748 | 40 |
| Feed conversion ratio, kg $kg^{-1}$ | | | | | | |
| growing period | 3.48[a] | 3.36[b] | 3.38[ab] | 3.42 | 3.39 | 0.11 |
| finishing period | 3.62 | 3.60 | 3.58 | 3.54 | 3.66 | 0.17 |
| whole fattening period | 3.55 | 3.48 | 3.48 | 3.48 | 3.53 | 0.14 |

SEM - standard error of the means of groups; a, b - $P < 0.05$.

Table 2. Carcass traits and intramuscular fat content of the muscles of fattening pigs

| Item | Groups | | | Sex | | SEM[1] |
|---|---|---|---|---|---|---|
| | I-control | II-probiotic | III-herbs | gilts | barrows | |
| Dressing, % | 78.1 | 78.0 | 78.2 | 77.9 | 78.2 | 2.13 |
| Length of carcass, cm | 84.9 | 85.0 | 84.9 | 84.8 | 85.1 | 1,19 |
| Backfat thickness, mm | | | | | | |
| over the shoulder | 33.8 | 33.6 | 33.2 | 32.1 | 34.9 | 2.0 |
| on the midback | 20,2 | 20.0 | 19.9 | 19.0[a] | 21.1[b] | 1.5 |
| on the rump, mean of 3 measurements | 25.5 | 25.2 | 25.3 | 24.7 | 25.8 | 1.6 |
| average of 5 measurements | 26.1 | 25.8 | 25.8 | 25.0[a] | 26.7[b] | 1.3 |
| Loin weight, kg | 8.92 | 8.96 | 9.04 | 8.99 | 8.95 | 0.74 |
| Loin "eye" area, $cm^2$ | 42.7 | 43.9 | 44.1 | 44.0 | 43.1 | 3.3 |
| Intramuscular fat in loin, % | 1.48 | 1.51 | 1.50 | 1.47 | 1.53 | 0.12 |
| Ham weight, kg | 9.41 | 9.53 | 9.52 | 9.50 | 9.48 | 0.87 |
| Lean of ham, % | 63.3 | 63.9 | 64.5 | 64.2 | 63.6 | 4.5 |
| Subcutaneous fat of ham, % | 21.3 | 21.1 | 21.5 | 20.8[a] | 21.8[b] | 0.8 |
| Intramuscular fat in ham, % | 1.54 | 1.52 | 1.57 | 1.52 | 1.56 | 0.17 |
| Weight of right side leaf fat, kg | 1.18 | 1.14 | 1.11 | 1,10 | 1.16 | 0.24 |

SEM - standard error of the means of treatments; a, b - $P < 0.05$.

Table 3. Some biochemical indices in the blood serum of fattening pigs

| Item | Groups | | | Sex | | SEM[1] |
|---|---|---|---|---|---|---|
| | I-control | II-probiotic | III-herbs | gilts | barrows | |
| Protein, g/l | 6.84 | 6.86 | 6.94 | 6.90 | 6.86 | 0.23 |
| Glucose, mmol/l | 4.92 | 4.98 | 4.93 | 4.93 | 4.95 | 0,19 |
| Triglicerides, mmol/l | 1.03 | 1.02 | 1.01 | 1.01 | 1.04 | 0.08 |
| Total cholesterol, mmol/l | 2.89 | 2.84 | 2,82 | 2.84 | 2.86 | 0.19 |
| LDL, mmol/l | 1.66[a] | 1.63[ab] | 1.54[b] | 1.58 | 1.63 | 0.10 |
| HDL, mmol/l | 1.02 | 1.01 | 1.08 | 1.06 | 1.02 | 0.07 |

SEM - standard error of the means of treatments; a, b - $P < 0.05$.

Table 4. Fatty acid composition in backfat of fattening pigs

| Fatty acid | | Groups | | | Sex | | SEM[1] |
|---|---|---|---|---|---|---|---|
| | | I-control | II-probiotic | III-herbs | gilts | barrows | |
| Miristic | 14:0 | 1.37 | 1.36 | 1.35 | 1.37 | 1.35 | 0.13 |
| Palmitic | 16:0 | 26.97 | 26.43 | 26.65 | 26.42 | 26.94 | 1,19 |
| Palmitoleic | 16:1n-7 | 2.36 | 2.38 | 2.41 | 2.46 | 2.30 | 0.31 |
| Stearic | 18:0 | 17.03 | 16.65 | 16.74 | 16.65 | 16.97 | 1.09 |
| Oleic | 18:1n-9 | 44.00 | 44.35 | 44.10 | 44.03 | 44.21 | 1.81 |
| Linoleic | 18:2n-6 | $6.17^{a}$ | $6.60^{b}$ | $6.43^{ab}$ | $6.70^{a}$ | $6.10^{b}$ | 0.51 |
| Linolenic | 18:3n-3 | $0.88^{a}$ | $1.12^{b}$ | $1.06^{ab}$ | 1.12 | 0.92 | 0.19 |
| 5-eikosanoic | 20:1n-6 | 1.22 | 1.21 | 1.26 | 1.25 | 1.21 | 0.14 |
| Saturated FA | | 45.37 | 44.44 | 44.74 | 44.44 | 45.26 | 3.85 |
| Monoenic FA | | 47.58 | 47.84 | 47.77 | 47.74 | 47.72 | 2.07 |
| Polyenic FA | | $7.05^{a}$ | $7.72^{b}$ | $7.49^{ab}$ | $7.82^{a}$ | $7.02^{b}$ | 0.64 |

SEM - standard error of the means of treatments; a, b - $P < 0.05$.

A similar influence of both additives was noted upon the average of 5 measurements of backfat thickness, loin "eye" area and intramuscular fat in muscle (Table 2), when probiotic or herbs mixture supplement was added to the diets. The barrows had generally thicker backfat (as average of 5 measurements) than the gilts, by 6.8 %. Also the contents of subcutaneous fat in ham was higher in barrows carcasses by 4.8 %. Similar effects were noted in the previous investigation (3) and by other authors (7).

The additives of probiotic and herbs mixture to the diets also had a positive impact on the cholesterol content, especially LDL fraction, decreasing it by 1.8 and 7.2% ($P<0.05$), respectively (Table 3). A higher HDL content was also noted in blood serum in animals of group III, receiving herb mixture.

The animals receiving mixtures with probiotic (group II) had significantly higher (9.5 %) polyenic fatty acids in backfat in comparison with the control treatment (Table 4). The herb mixture supplement to the mixtures (group III) improved the content of linoleic and linolenic acid in backfat of pigs, but it was not a statistically significant difference.

The gilts contained a higher concentration of polyenic fatty acid than the barrows.

## CONCLUSION

The mixture of six herbs (herb of great nettle *(Urtica dioica)* and common yarrow *(Achillea millefolium)*, lyophilized garlic *(Allium sativum)* bulbs, fruits of juniper *(Juniperus communis)*, leaves of great plantain *(Plantago lanceolata)* and rhizomes of wheat-grass *(Agropyron repens))* used as a feed supplements (30 g $kg^{-1}$ in PT-1 mixture and 20 g $kg^{-1}$ in PT-2) to the growing pigs diets improved daily gains and feed conversion ratio of fattening pigs. The impact of probiotic (*Enterococcus faecium*, 5 x $10^9$ $g^{-1}$) additive (0.2 g $kg^{-1}$) had a similar effect on pigs performance. Both growth promotors used in this experiment had no impact on the amount of fat in the carcass (backfat thickness taken from 5 measurements, subcutaneous fat of ham). They also increased polyenic fatty acid content in backfat and decreased LDL in the serum blood of fattening pigs. Herb mixture can therefore be safely used as an alternative growth promotor for the probiotic.

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## STRESZCZENIE

Badania wykonano na 150 tucznikach obu płci (75 loszek i 75 wieprzków) mieszańcach ras (pbz x wbp) x (Duroc x Pietrain) o masie początkowej około 25 kg, podzielonych na 3 grupy. Tuczniki grupy I – kontrolnej otrzymywały mieszanki standardowe typu PT-1 (25-65 kg masy ciała) i PT-2 (65-105 kg). Dla zwierząt w grupie II i III do mieszanek standardowych zastosowano dodatek 0,2 g probiotyku (grupa II) lub mieszanki ziołowej (grupa III) w ilości 30 g w okresie PT-1 i 20 g w PT-2. Mieszanka ziołowa zawierała: ziele pokrzywy (*Urtica dioica)* i krwawnika (*Achillea millefolium),* główki liofilizowanego czosnku (*Allium sativum),* owoce jałowca (*Juniperus communis),* liście babki lancetowatej(*Plantago lanceolata)* i kłącza perzu (*Agropyron repens*). Tuczniki trzymano w klatkach po 10 loszek lub 10 wieprzków. Zwierzęta żywiono *ad libitum* przy swobodnym dostępie do wody.

Dodatek mieszanki ziołowej do paszy przyczynił się do zwiększenia przyrostów dziennych tuczników w początkowym okresie tuczu oraz zmniejszenia zużycia paszy. Dodanie probiotyku (*Enterococcus faecium*, 5 x $10^9$ $g^{-1}$) wywarło podobny efekt na wzrost zwierząt jak przy mieszance ziołowej. Nie zaobserwowano istotnych zmian w ocenie wartości rzeźnej tusz pod wpływem czynników doświadczalnych. Zawartość wielonienasyconych kwasów tłuszczowych zwiększyła się w obu grupach otrzymujących dodatek probiotyku lub mieszanki ziołowej.