

Efficacy of diets with antibiotic and herb mixture additives in feeding of growing-finishing pigs

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ABSTRACT

Ninety six pigs of Polish Large White x Pietrain crossbreed (48 gilts and 48 barrows) were allotted to three feeding treatments: 1 – control, where the animals were fed with the control mixtures for growing (25-65 kg body weight) and finishing period (65-105 kg BW); treatment 2 and 3, where the control group mixtures were supplemented with 20 mg antibiotic "Avotan" or with 50 g herb mixture per 1 kg diet, respectively. The herb mixture components were: herb of great nettle (*Urtica dioica*), lyophilized garlic (*Allium sativum*) bulbs and rhizomes of wheat-grass (*Agropyron repens*). The pigs were housed in pens (four gilts or four barrows per pen). Feed and water were available *ad libitum* and individual liveweights and pen feed consumption were recorded on days 30, 60, 90 and 110 (at slaughter) of the trial.

Herb mixture supplementation of the diets improved the average daily gains and feed utilization ratio by about 5 and 10%, respectively. The antibiotic "Avotan" additive had approximately half the influence on pig performance. Backfat thickness (an average of 5 measurements) was increased significantly after treatment with either additive. Both additives also increased the percent of subcutaneous fat in the ham. Leanness of the ham increased significantly in both experimental groups. No significant changes in physico-chemical or sensorial characteristics of the meat were noted.

KEY WORDS: growing-finishing pigs, antibiotic, herb mixture, carcass quality

INTRODUCTION

For a couple of decades antibiotics, probiotics, organic acids and other chemotherapeutics have been intensively utilized in pig feeds (Korniewicz et al., 1990). Over the last years, however, there has been an increased interest in the utilization

of growth promoters of natural origin, as an alternative to chemotherapeutics. In this respect the use of herb supplements seems to be very promising (Grela, 1996; Kołacz et al., 1997). Some investigations with herb mixture additives have confirmed an impact on performance and on some meat characteristics (Soroka and Wideński, 1967; Urbańczyk and Hanczakowska, 1996, 1997).

The aim of these investigations was to determine the influence of the antibiotic "Avotan" and herb mixture additives on gains, carcass traits and sensorial characteristics of meat in fattening pigs.

MATERIAL AND METHODS

Animals

Ninety six pigs of Polish Large White x Pietrain crossbreed (48 gilts and 48 barrows) were allotted to three feeding treatments: 1 – control, where the animals were fed with the mixtures for growing (25-65 kg body weight) and finishing period (65-105 kg BW); treatment 2 and 3, where the control group mixtures were supplemented with 20 mg antibiotic "Avotan" or with 50 g herb mixture per 1 kg diet, respectively. The herb mixture components were: herb of great nettle (*Urtica dioica*), lyophilized garlic (*Allium sativum*) bulbs and rhizomes of wheat-grass (*Agropyron repens*). The initial weight was 25 kg and slaughter weight was about 105 kg BW. The pigs were housed in pens with slatted concrete floors (four gilts or four barrows per pen). Feed in dry loose form and water were available *ad libitum*. Individual liveweights and feed consumption per pen were recorded on days 30, 60, 90 and 105 (at slaughter) of the trial. The temperature of the room was controlled and maintained at $21 \pm 1^\circ\text{C}$ with air speed $< 0.05 \text{ cm s}^{-1}$.

Diets

The mixtures were prepared from commercial feeds. The composition of the grower (up to 65 kg BW) and finisher diets contained barley, wheat, triticale, soya-bean meal, meat-bone meal and mineral-vitamins premix. All nutrients including the vitamins and trace elements were consistent with the level recommended by nutrients requirements of pigs (1993). Antibiotic "Avotan" or herb mixture were added to the basal diet at 20 mg kg^{-1} and 50 g kg^{-1} , respectively. 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 (AOAC, 1980).

Carcass measurements

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 rib 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 bone. The loin "eye" area was measured and the weight of the right side perirenal fat was also determined. The pH₁ and pH₂₄, water-holding capacity, colour, aroma, tenderness, juiciness and taste intensity and its desirability were determined in muscle *longissimus dorsi*.

Statistical analysis

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

RESULTS AND DISCUSSION

The herb mixture supplement to the diets (treatment 3) improved ($P < 0.05$) average daily gains of pigs in the growing and finishing periods by 6 and 5%, respectively, in comparison with control treatment (Table 1), whereas the animals receiving diets with Avotan (treatment 2) had significantly higher (by 5%) daily gains only in the growing period. Only a slight positive influence of the antibiotic was noted in the finishing period. The herb mixture additive caused an even stronger improvement in the feed utilization by the animals – the feed conversion ratio in treatment 3 was about 10% lower ($P < 0.05$) compared with the control treatment. Urbańczyk and Hanczakowska (1997), who added a commercial plant herbage extract, Aromex-Solid, to the diet, noted similar positive influences on daily gains and feed utilization. That supplement improved daily gains and feed conversion by 3 and 3-5%, respectively. The Avotan additive in our experiment had half the influence on feed utilization compared with the herb mixture supplement.

A similar influence of the two additives was noted upon backfat thickness (average of 5 measurements; Table 2), which increased ($P < 0.05$) by 0.7 mm and 0.9 mm, respectively, when Avotan and the herb mixture supplement were added to

TABLE 1

Growth performance and feed conversion

| Item | Treatment | | | Sex | | SEM ¹ |
|--|-------------------|--------------------|-------------------|-------|---------|------------------|
| | 1 – control | 2 – Avotan | 3 – herbs | gilts | barrows | |
| Initial body weight, kg | 25.4 | 25.5 | 25.4 | 25.5 | 25.4 | 0.7 |
| Slaughter body weight, kg | 105.3 | 105.9 | 105.4 | 106.2 | 104.4 | 1.5 |
| Days on trial | 101.0 | 98.4 | 95.8 | 98.9 | 97.2 | 1.6 |
| Daily gains, g | | | | | | |
| growing period | 778 ^a | 816 ^b | 825 ^b | 818 | 795 | 34 |
| finishing period | 804 ^a | 818 ^a | 845 ^b | 814 | 830 | 44 |
| whole fattening period | 791 ^a | 817 ^{ab} | 835 ^b | 816 | 813 | 40 |
| Feed conversion ratio, kg kg ⁻¹ | | | | | | |
| growing period | 3.38 ^a | 3.12 ^b | 3.08 ^b | 3.21 | 3.17 | 0.11 |
| finishing period | 3.74 ^a | 3.66 ^{ab} | 3.35 ^b | 3.50 | 3.66 | 0.18 |
| whole fattening period | 3.56 ^a | 3.39 ^{ab} | 3.22 ^b | 3.36 | 3.41 | 0.17 |

¹ standard error of the mean of treatments

TABLE 2

Carcass traits and intramuscular fat content of the muscles of fattening pigs

| Item | Treatment | | | Sex | | SEM ¹ |
|-------------------------------------|-------------------|--------------------|--------------------|-------------------|-------------------|------------------|
| | 1 – control | 2 – Avotan | 3 – herbs | gilts | barrows | |
| Dressing, % | 78.6 | 79.0 | 79.3 | 8.5 | 79.4 | 1.3 |
| Length of carcass, cm | 82.3 | 82.8 | 83.4 | 82.4 | 83.2 | 2.0 |
| Backfat thickness, mm | | | | | | |
| over the shoulder | 26.4 | 27.6 | 27.8 | 25.7 ^a | 28.9 ^b | 2.4 |
| on the midback | 17.3 ^a | 18.1 ^{ab} | 18.8 ^b | 17.3 ^a | 18.9 ^b | 1.3 |
| on the rump, mean of 3 measurements | 21.2 | 21.8 | 21.8 | 21.3 | 22.1 | 1.9 |
| average of 5 measurements | 21.5 ^a | 22.2 ^b | 22.4 ^b | 21.3 ^a | 22.8 ^b | 1.6 |
| Loin weight, kg | 8.96 ^a | 9.32 ^b | 9.45 ^b | 9.28 | 9.20 | 0.32 |
| Loin "eye" area, cm ² | 42.3 | 43.9 | 43.6 | 43.7 | 42.9 | 3.1 |
| Intramuscular fat in loin, % | 1.46 | 1.49 | 1.51 | 1.46 | 1.52 | 0.10 |
| Ham weight, kg | 9.26 | 9.24 | 9.26 | 9.26 | 9.25 | 0.36 |
| Lean of ham, % | 66.6 ^a | 67.2 ^b | 67.9 ^b | 67.3 | 66.9 | 3.1 |
| Subcutaneous fat of ham, % | 19.4 ^a | 20.9 ^b | 20.2 ^{ab} | 19.2 ^a | 21.1 ^b | 1.4 |
| Intramuscular fat in ham, % | 1.53 | 1.59 | 1.55 | 1.46 ^a | 1.63 ^b | 0.09 |
| Weight of right side leaf fat, kg | 0.95 | 1.02 | 1.05 | 0.97 | 1.05 | 0.12 |

¹ standard error of the mean of treatmentsa, b – $P \leq 0.05$

the diets. A higher subcutaneous fat content of the ham (plus 1.5 percentage units) in the carcass of the animals of treatment 2 ($P < 0.05$) was also recorded, in comparison with the controls. The herb mixture had a smaller, non significant influence on this characteristic.

The addition of Avotan or the herb mixture to the diets also had a positive influence on the loin weight, increasing it by 4.0 and 5.5% ($P < 0.05$), respectively. It was also noted that the ham was significantly leaner under these experimental treatments.

The barrows had 7% thicker backfat (an average of 5 measurements) than the gilts. Finally, the levels of subcutaneous and intramuscular fat in the ham were respectively 10 and 11.6% higher in the barrows than in the gilts carcasses.

CONCLUSIONS

The mixture of three herbs (herb of *Urtica dioica*, bulbs of *Allium sativum* and rhizomes of *Agropyron repens*) used as a feed supplement (50 g kg^{-1}) to the growing pigs diets significantly improved daily gains and feed conversion of fattening pigs. In contrast, Avotan additive (20 mg kg^{-1}) also improved the pigs' performance, but by only half as much. Both growth promoters used in this experiment had a similar effect on the amount of fat in the carcass (backfat thickness taken from 5 measurements, subcutaneous fat of ham), which they considerably increased. They also increased carcass leanness (leanness of ham). Herb mixtures can therefore be safely used as natural growth promoters an alternative to the chemitherapeutics.

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