

## THE IMPACT OF COMMERCIAL MIXED FEEDS OF DIFFERENT PHYSICAL STRUCTURE ON REARING OF PIGLETS AND YOUNG PIGS

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**Abstract.** Experimental material consisted of 20 piglets from litters of 2 sows of wbp x pbz breed, crossed with the Pietrain x Duroc hybrid breed boar. The piglets were divided into two experimental groups of 10 animals. The experiment lasted 84 days, during which experimental group I received the feed in the form of a mash and group II in a pelleted form adapted to each of the rearing period. Analyzing ADFI rate between 5 and 28 days, a low, statistically significant ( $P \leq 0.01$ ) daily intake of feed was noticeable and amounted to 54.3 g for MS-1 mixed feed and 63.6 for MG-1 mixed feed. Daily gains were also statistically significant ( $P \leq 0.05$ ), favoring mash diet. Between days 29 and 50 no significant differences were observed in any of the tested parameters but the results speak in favor of pelleted mixed feed. A significant difference ( $P \leq 0.05$ ) was noted in average daily feed intake in the MS-3 ration between days 51 and 84, compared to the MG-3 mix, while the value of ADG did not show significant differences. Analyzing the whole testing period, i.e. from day 1 to 84 days after weaning, there was no significant difference in daily gains between mash and pelleted diets, feed consumption or final body weight.

**Key words:** feeding, feed intake, growth rate, physical structure of feed, piglets

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## INTRODUCTION

The efficiency of swine production is affected by many factors, one of the most important is feeding, which accounts for 50–70% of total costs. Much attention should be devoted to feeding piglets from birth through weaning period and up to the age of 9–10 weeks, which has an impact on the further production results during the fattening [Tywończuk and Lipiński 2001]. It is recommended to start to introduce solid feeds of high nutritive value already at 10 days of age [Nawrocki and Grela 2011]. The age of weaned pigs is also an important factor in the utilization of the feed [Konarkowski 2008]. Since 2003, according to EU Directive 91/630, piglets must be weaned at 28 days of age. Despite these recommendations of the government, the optimal age of sow feeding in relation to the welfare of young pigs is still under discussion. The effects of the behavior of weanlings are usually noticeable during the first few days and may contribute to a number of disorders related to the intake and utilization of feed [Weary et al. 1999]. According to Grudniewska [1998], a demand for protein changes most noticeably and dynamically in this period. At the age of 4 weeks the level of protein in the diet can be reduced to about 20% of the dry matter of feeds, and at the age of 8 weeks it can be reduced to 18% or even less. Cereals, as a frequent component of diet, and as a source of fiber are considered to be an important factor in diet palatability and consumption, which in turn is related to the fermentation of the feed and development of gastrointestinal tract [Montagne et al. 2003, Solá-Oriol et al. 2009] and probably predispositions to diarrhea in young pigs [Pluske et al. 2002]. According to Hanczakowska and Urbańczyk [2003], it is advisable to feed piglets *ad libitum* with the commercial diet mixes or self-prepared farm feeds, based on adequate nutrients.

Therefore, the aim of this study was to determine the effect of feeding young pigs with commercial mixes from 5 days of age, administered in the pelleted and mash form, on the rearing indicators of piglets and growing pigs.

## MATERIAL AND METHODS

### Animal experiments

The study was carried out on a farm in Strzeconie, Pomeranian Voivodeship. Experimental material consisted of 20 pigs from litters of 2 sows of wbp x pbz breed, crossed with the Pietrain x Duroc hybrid breed boar. Piglets were divided into two experimental groups of 10 individuals, which were kept to 28 days of age with the mother. From birth piglets has undergone standard care treatments and were raised in farrowing pens with bedding. After this period, they were trans-

ferred to piglet house to two separate pens equipped with automatic feeders and nipple drinkers.

Table 1. Chemical composition of experimental mixtures (%) (commercial information)  
Tabela 1. Skład mieszanek doświadczalnych (%) (dane producenta)

Ingredients Składniki	Rearing period – Okres odchowu					
	1–28 days 1–28 dni		29–50 days 29–50 dni		51–84 days 51–84 dni	
	MS–1	MG–1	MS–2	MG–2	MS–3	MG–3
ME, MJ · kg <sup>-1</sup>	17.0	16.0	14.0	13.7	13.5	13.3
Crude protein Białko ogólne	20.0	18.0	16.5	18.0	16.0	18.0
Crude fat Tłuszcz surowy	11.5	6.4–8.4	3.5	3.8–5.8	3.5	3.2–5.2
Crude ash Popiół surowy	7.0	3.6–5.6	5.3	4.3–6.3	5.5	4.5–6.5
Crude fibre Włókno surowe	1.5	4.0	3.0	4.20	–	5.4
Lysine Lizyna	1.40	1.23	1.50	1.20	1.15	1.13
Methionine+cysteine Metionina+cysteina	1.00	0.77	0.80	0.75	0.75	0.70
Tyrosine Tyrozyna	1.00	0.79	0.80	0.76	0.75	0.69
Tryptophan Tryptofan	0.25	0.25	0.25	0.25	0.22	0.23

In the first experimental group, from 5 to 84 days of age the pigs were given three types of commercial mixed feeds in accordance with the manufacturer's instructions. From 5 to 28 days of age (to weaning) sucking pigs received mixed feed MS–1 (mash mix for the first period). From day 28 to 50 growing pigs were fed with a mixed feed MS–2. For the first 2 days, MS–1 feed mixed with MS–2 feed in a 1:1 ratio was applied. From 50 to 84 days of age, feeding was based on the mixed feed MS–3 administered ad libitum. In the second experimental group feeding regime of pigs was similar to the first group, and the feeds consisted of commercial mixed feeds in a pelleted form, designated as MG–1, MG–2 and MG–3. The chemical composition of all the feeds is shown in Table 1.

The experiment lasted 84 days and pigs were weighed at 1, 28, 50 and 84 day of age. Individual identification of animals was based on the permanent marking on the left ear. Feed was provided daily and the feed intake and health status of the animals was also monitored on the daily basis.

### Statistical analysis

In order to determine significant differences between the groups, the F-test and Duncan's multiple range test was used ( $P \leq 0.01$ ,  $P \leq 0.05$ ). All calculations were performed using the STATISTICA® software (StatSoft 2009).

## RESULTS AND DISCUSSION

Values obtained on average daily feed intake, daily growth and feed conversion per 1 kg of growth are shown in Table 2. Analyzing the average daily feed intake per individual (ADFI) during the period from day 5 to 28 a low, statistically significant ( $P \leq 0.01$ ) food intake was noticeable and amounted to 54.3 g in MS-1 feeding group while in MG-1 group it was 63.6 g. In the study by Kuller et al. [2010], a 90% higher intake was obtained when compared to our results. Grudniewska and colleagues [1994] reported that a low solid feed intake may be caused by a satisfactory yield of sow milk, and therefore a slower adaptation of piglets to solid feeds. Despite the higher consumption of pelleted feed, daily gains were significantly higher ( $P \leq 0.05$ ) in mash diet group, characterized by a lower value of the FC ratio (Table 2). According to Edge et al. [2005] at a time when the piglets still suck their mother and additionally get a solid feed of diversified sizes, there is no significant impact on the daily weight gain. Aforementioned group claimed that those individuals who have received a small diameter pellets spent significantly less time at the feeders than those who received larger pellets.

Considering our data on the growth rate of piglets (ADG), animals that were administered MS-1 mixed feed tend to have a better ADG ratio ( $P \leq 0.05$ ) compared to animals fed with a pelleted mixture (MG-1) and the values obtained are substantially higher than those obtained in the studies of Mikołajczak et al. [2004] and Hanczakowska and Urbańczyk [2001]. This may be caused by the higher quality and quantity of proteins in the feed mix (Table 1), the components necessary for this period [Grudniewska 1998]. It should be noted that the initial body weight of the piglets in the above studies coincided with the weight of piglets used in our study, and varied from 1.54 to 1.59 kg. Higher daily gains in the group treated with a mash diet translated into a higher weight on the weaning day as compared to the pelleted diet and ranged from 8 to 8.29 kg in favor of a mash form. This result corresponds to data obtained by Kuller et al. [2010], however in the work by Abraham et al. [2004], who used farm mixed feeds of similar chemical composition compared to our feeds, the weight of piglets they obtained at day 28 was 65% lower than in our study. In the study by Colson et al. [2006] piglets weaned at 28 days of age were heavier than piglets weaned at 21 days (9.41 and 7.94 kg, respectively), which was statistically significant ( $P \leq 0.05$ ).

Table 2. The results of pigs production in three periods of rearing  
Tabela 2. Wyniki produkcyjne prosiąt w trzech okresach odchowu

Ingredients Składniki	Rearing period – Okres odchowu							
	1–28 days 1–28 dni		29–50 days 29–50 dni		51–84 days 51–84 dni		1–84 days 1–84 dni	
	MS–1	MG–1	MS–2	MG–2	MS–3	MG–3	MS	MG
Initial b.w., kg Początkowa m.c., kg	1.59	1.57	8.29	8.00	17.63	17.7	1.59	1.57
Final b.w., kg Końcowa m.c., kg	8.29	8.00	17.63	17.70	35.51	35.1	35.51	35.1
ADFI	54.3 <sup>A</sup>	63.6 <sup>B</sup>	507	500	1082 <sup>a</sup>	993.2 <sup>b</sup>	740	692.5
ADG	248 <sup>a</sup>	230 <sup>b</sup>	450	452.4	541	524.2	409	402
FC	219.1 <sup>A</sup>	276.5 <sup>B</sup>	1127	1105	1999.1 <sup>a</sup>	1894.5 <sup>b</sup>	1800	1723.8

ADFI (g/animal and day) – average daily feed intake; (g/osobnika/dzień) – średnie dzienne spożycie paszy.

ADFI (g/animal and day) – average daily gain; (g/osobnika/dzień) – średnie dzienne przyrost.

FC (g feed/g gain) – feed conversion; (g paszy/g przyrostu) – wykorzystanie paszy.

The numbers in lines for each of the period indicated by different letters differ significantly; capital letters at P < 0.01; lower case letters at P < 0.05.

Liczby w wierszach dla każdego z okresów oznaczone różnymi literami różnią się istotnie; litery duże przy P < 0,01; litery małe przy P < 0,05.

In the course of the experiment, between days 29 and 50, no statistically significant differences were observed in any of the tested parameters but the results are better for pelleted mixed feed. The average daily values of the feed intake in the group receiving mash feed (MS–2) were not higher than those in the group eating pelleted diet (MG–2) (507 and 500 g/individual, respectively) and overall were lower than the values obtained by Araújo et al. [2010]. Similar values or both feed intake and daily weight gains were observed in the study of Edge et al. [2005]. FC ratio in the current study (Table 2), for the period from day 29 to day 50, is lower for both animal groups compared to data obtained by Edge et al. [2005], where it reached values from 1.21 to 1.26 kg. It should be noted that weanlings in the first week consumed less feed than in the following weeks of the period. Similar tendency was also observed by Colson et al. [2006] and Hermes et al. [2010]. The advantage in daily gains that was observed for the mash feed (MS–1) in the first rearing period has not been retained in the second period, and the reason for this may lie in the lower protein content in this mixture (Table 1) or incomplete intake of the mash mixture, and thus reduction of the efficiency of the feed. In studies on pigs at the age of 56 days, and 17 kg of body weight Solá-Oriol et al. [2009] noticed better intake of the experimental mixes in a pelleted form compared to mash feeds, which main components were cereals.

Abraham et al. [2004] weaned piglets at day 28 weighing 5.32 kg and acquired the weight of 10.8 kg at the start of the fattening period. In our study piglets weaned at the same time had a higher body weight ranging from 8 to 8.29 kg and

weighed 35 kg at first day of the fattening period (Table 2), indicating a significantly better effects of rearing in comparison with the work of Abraham et al., who obtained comparable weight only at day 140 of the fattening. Statistically significant difference ( $P \leq 0.05$ ) was observed for ADFI rate for the MS-3 mixed diet between day 51 and 84 compared to MG-3 diet, while daily gains between the two groups showed no significant variation. Similar results were also obtained by Hong et al. [2009], who fed liquid diet, whereas in the case of solid feed ADFI was lower by 21%, and ADG by 16% when compared with our results. Pelleted diet promoted faster growth ( $P \leq 0.05$ ), which corresponds with the results of Van Den Brand et al. [2007]. According to the latter study the differences in the intake of feed and growth, and thus its utilization vary depending on the gender of individuals in the group and the protein content in the feed. Gilts are likely to consume feed with higher protein content but grow slower, whereas young boars prefer high-energy feeds and grow better.

## CONCLUSIONS

To conclude, despite the worse intake of the mash mixed feed by the piglets in the first experimental period, there were greater daily gains and lower feed consumption per kilogram of growth compared to the feed in the form of pellets. The results of the experiment between days 29 and 50 after weaning, indicate the advantage of a pelleted mixture. Analyzing the whole testing period, i.e. from day 1 to 84 days after weaning, there was no significant difference in daily gains between mash and pelleted diet, feed consumption or final body weight. In conclusion it can be said that the structure of the feed used for feeding pigs and piglets does not affect their production results.

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## WPLYW MIESZANEK PRZEMYSŁOWYCH O RÓŻNEJ STRUKTURZE NA ODCHÓW PROSIĄT I WARCHLAKÓW

**Streszczenie.** Materiał badawczy stanowiło 20 prosiąt pochodzących z miotów od dwóch loch rasy wbp x pbz kojarzonych z knurem mieszańcem rasy Pietrain x Duroc. Prosięta podzielono na dwie grupy doświadczalne po 10 osobników. Doświadczenie trwało 84 dni, w trakcie którego I grupa doświadczalna otrzymywała paszę w formie sypkiej zaś druga w formie granulowanej dostosowaną do każdego z okresów odchowu. Analizując wskaźnik ADFI w okresie od 5. do 28. dnia zauważalne było niskie, różniące się statystycznie ( $P \leq 0,01$ ), pobranie dzienne paszy, które wynosiło 54,3 g dla mieszanki MS-1 i 63,6 g dla mieszanki MG-1, a dzienne przyrosty różniły się statystycznie ( $P \leq 0,05$ ) na korzyść mieszanki w formie sypkiej. Między 29. a 50. dniem nie zauważono istotnych różnic w żadnym z badanych parametrów lecz wyniki przemawiają na korzyść mieszanki granulowanej. Zanotowano istotną różnicę ( $P \leq 0,05$ ) średniego dziennego spożycia paszy w dawce pokarmowej MS-3 między 51. a 84. dniem w porównaniu z mieszanką MG-3, podczas gdy wartość ADG nie wykazała istotnych różnic. Analizując cały okres doświadczenia, tzn. od 1. do 84. dnia po odsadzeniu, nie stwierdzono istotnych różnic między mieszanką sypką a granulowaną dla dobowych przyrostów, zużycia paszy czy też końcowej masy ciała.

**Słowa kluczowe:** dokarmianie, pobranie paszy, prosięta, przyrosty, struktura fizyczna paszy

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