

Effect of Different Diets on Growth Performance and Feed Efficiency in Early Weaned Piglets

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Abstract: In this study the effects of different diets on the survival, growth performance, and feed efficiency of early weaned piglets were investigated. In this study, 96 crossbred piglets obtained from uncontrolled interbreeding of Bulgarian Large White, Large Black, and Turopolje for many years, which had weaned at the age of 28 days, were used and they were grouped equally to form one control and 2 experimental groups. Each group was fed with a different protein diet for 4 weeks: the first group was fed sunflower meal (SFM), the second group was fed soybean meal (SBM), and the control group was fed kitchen wastes. No significant difference ($P > 0.05$) was determined among the groups for survival rate and average daily feed intake with different diets. In the study, the first experimental group that was fed sunflower meal reached to the maximum value with regard to growth performance (5.298g) whereas the piglets in the control group had the minimum live weight value (4.252 g) ($P < 0.05$). Average daily gain and feed efficiency of the experimental groups were higher than the control group ($P < 0.05$). There was no significant difference in feed intake among the groups, yet feed efficiency, average daily gain (ADG), and growth performance values were higher for experimental groups compared to the control.

Key Words: Pig, early weaning, feed efficiency, weight gain

Erken Sütten Kesilen Domuz Yavrularında Farklı Rasyonlarla Beslenmenin Büyüme Performansı ve Yemden Yararlanma Üzerine Etkisi

Özet: Bu araştırma, erken sütten kesilen domuz yavrularında farklı rasyonlarla yapılan beslemenin yaşama gücü, büyüme performansı ve yemden yararlanma üzerine etkisini araştırmak amacıyla ele alınmıştır. Araştırmada, Bulgaristan Large White, Large Black ve Turopolje ırklarının uzun süre kontrolsüz birleşmesi ile elde edilen melez hayvanlardan 96 adet yavru domuz, 28 günlük yaşta sütten kesilerek, iki deney ve bir kontrol grubu olmak üzere üç gruba ayrılmıştır. Her grup dört haftalık yaştan itibaren protein kaynakları farklı rasyonlarla beslenmiştir. İlk deney grubundaki yavrular ayçiçeği küspesi (AÇK), ikinci gruptakiler soya küspesi (SK) ve kontrol grubundaki yavrular ise yemek artıkları ile beslenmiştir. Erken sütten kesilerek farklı rasyonlar ile beslenen domuz yavrularında yaşama gücü ve yem tüketimi bakımından gruplar arasında önemli bir farkın olmadığı ($P > 0,05$) belirlenmiştir. Araştırmada, büyüme performansı bakımından ayçiçeği küspesi ile beslenen ilk deney grubu (5,298 g) en yüksek değerine ulaşıırken; en düşük canlı ağırlık değerinin kontrol grubundaki yavrulara (4,252 g) ait olduğu belirlenmiştir ($P < 0,05$). Ayrıca, günlük ortalama canlı ağırlık kazancı ve yemden yararlanma, deney gruplarında kontrol grubuna oranla daha yüksek ($P < 0,05$) bulunmuştur. Sonuç olarak, deney gruplarında kontrol grubuna oranla yem tüketimi bakımından bir fark olmamasına karşın, her iki deney grubunun da kontrol grubuna oranla daha yüksek yemden yararlanma, canlı ağırlık kazancı ve büyüme performansına sahip oldukları belirlenmiştir.

Anahtar Sözcükler: Domuz, erken sütten kesim, yemden yararlanma, canlı ağırlık kazancı

Introduction

Recently, segregated early weaning (SEW) has been regarded as one of the more desirable methods for

improving performance of weaning pigs. However, to implement the SEW system successfully in terms of economics, digestibility, and palatability, more suitable

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diets should be prepared for piglets (1). SEW may result in growth advantages such as improved feed efficiency and growth rate. However, the reported disadvantages of early weaning management systems include inconsistent growth performance throughout the finishing phase (2), decreased postweaning weight gain, and abnormal feed intake that may affect metabolism (3). During the growing period, environmental factors, such as temperature, affect voluntary feed intake (VFI) (4). In addition, housing temperature (5) and nutrition (6) affect the survival of the piglets during the growing period.

Regarding growth, the effect of dietary protein source on the efficiency of feed utilization was similar to that observed for average daily gain (7). In addition, growth performance of early weaned pigs is improved by adding recently developed specialty protein from sources such as soy (8,9) and sunflower.

Pigs are reared on a limited scale under private commercial conditions in Turkey, mostly using crossbreds which are generally fed with kitchen waste. This feeding method is continued during pregnancy and lactation. Newborn piglets are only fed with mother’s milk until weaning which is generally around day 45.

This study investigated the effects of diets containing different protein sources on survival, growth performance, and feed efficiency in early weaned piglets.

Materials and Methods

This study was carried out on 96 piglets in a commercial piggery belonging to an İstanbul based company. All were crossbreds of Bulgarian Large White, Large Black and Turopolje, which had interbred without control for many years. Without changing the farm conditions, piglets were kept at 7 °C in 6 different pens with dimensions of 2 × 2.20 m.

In this study, 96 piglets of 15 sows that had given birth for the first time at the age of 12-month and with equal litter size were used. For the first 21 days, piglets were kept with their mothers and fed with maternal milk. Between days 21 and 28, each piglet received 50 g feed per day from the type determined for each group to get accustomed to the diets. On day 28, the piglets were separated from their mothers and divided into 3 groups, each with 2 replicates. Thus the study was performed in 6 boxes consisting of 3 groups each with 2 replicates. The first experimental group was given a diet containing

sunflower meal (SFM) as the protein source and the second group was given a diet containing soybean meal (SBM) as the protein source; the control group was fed kitchen wastes for 4 weeks postweaning under constant farm conditions (Table 1). Because kitchen wastes were supplied weekly in the farm, composition of the kitchen wastes fed to the control group varied weekly. To calculate growth performances of the groups, weekly weighing of the piglets for 28 days postweaning was performed. Body weights were recorded before feeding and piglets were fed at the rate of 3% of their live weight (1). To calculate survival rates, deaths were recorded in each group.

In this study, the chi-square test was used to test for significant survival differences between the groups. For growth performance, weight gain (ADG), average daily feed intake (ADFI), and feed efficiency in the postweaning piglets, one-way analysis of variance (ANOVA) was used. Duncan’s Multiple Range Test was used to test for differences among the means of the groups (10).

Table 1. Experimental diet compositions.

Ingredients	SFM (%)	SBM (%)	Control*
Soybean meal	-	26	-
Sunflower meal	21	-	-
Barley	20	10	-
Maize	40	50	-
Whole meal	5.2	3.5	-
Meat-bone meal	3.3	5.0	-
Wheat	5.0	-	-
Dicalcium phosphate	1.5	1.5	-
Salt	1.0	1.0	-
Vit. and min. premix ^a	1.5	1.5	-
Lysine	1.0	1.0	-
Methionine	0.5	0.5	-
Calculated analysis			
Crude protein (%)	23.0	22.2	8
ME, kcal/kg	3.200	3.180	2.460

^aComposition of premix/kg: Vitamin A 1,000,000 IU, vitamin D₃ 1,500,000 IU, vitamin E 400,000 IU, vitamin K₃ 3000 mg, vitamin B₁ 2200 mg, vitamin B₂ 4500 mg, niacin 30,000 mg, vitamin B₆ 3000 IU, vitamin B₁₂ 15 mg, folic acid 1500 mg, biotin 100 mg, vitamin C 12,000 mg, Mn 80,000 mg, Zn 60,000 mg, Fe 30,000 mg, Cu 5000 mg, I 1000 mg, Co 200 mg, Se 150 mg.

SFM: sunflower meal. SBM: soybean meal

*Average values of the weekly analyze results of kitchen wastes fed to the control group were considered.

Results

Survival rates of the groups are summarized in Table 2. The differences between the postweaning groups in terms of survival were not significant ($P > 0.05$). The highest survival rate was 71.9% for SBM and the lowest was 59.4% in the control.

The effect of feeding on the postweaning growth performances (Table 3) of the experimental and control groups was not significant ($P > 0.05$) from day 0 to 22. In contrast, it was seen that the groups fed with SFM and SBM achieved higher growth performance compared to the control group from days 23 to 28 and the difference was significant ($P < 0.05$). The difference between SFM and SBM groups was not significant ($P > 0.05$).

As for the average daily gain of the piglets (Table 4), the SBM group had a greater average weight gain from day 0 to 7 compared to the other groups ($P < 0.05$). Between days 8 and 14, a decrease in the average weight gain for all 3 groups was determined and the difference

between the experimental groups and the control group was significant ($P < 0.05$). Average daily gain of SFM and SBM groups from day 15 to 28 were significantly greater ($P < 0.05$) compared to the control group, while there was no significant ($P > 0.05$) difference between SBM and SFM groups. The SFM and SBM groups had a greater total average daily gain compared to the control group. Although the difference between all groups regarding feed intakes during all periods was not significant ($P > 0.05$), feed efficiency improved after the first week in favor of the experimental groups and the differences of the feed efficiency means were significant ($P < 0.05$).

Discussion

In this study, there was no significant effect of different diets on survival rate in early weaned piglets. Furthermore, survival in the control and experimental groups were lower compared to previous studies on different pig breeds (6,11-14). This low survival rate

Table 2. Effects of different diets on the survival of early weaned piglets.

Period	SFM		SBM		Control		χ^2^*
	n	%	n	%	n	%	
N Litters	32		32		32		
Days 0 to 7	31	96.9	32	100.0	31	96.9	1.02
Days 8 to 14	27	84.4	28	87.5	27	84.4	0.16
Days 15 to 22	23	71.9	25	78.1	22	68.8	0.73
Days 23 to 28	21	63.6	23	71.9	19	59.4	1.13

*: $P > 0.05$, SFM: sunflower meal; SBM: soybean meal

Table 3. Effects of different diets on the growth performance of early weaned piglets (g).

Period	SFM		SBM		Control	
	Mean	SE	Mean	SE	Mean	SE
N Litters	32		32		32	
Initial weight	3.426	0.25	3.487	0.19	3.685	0.18
Week 1	3.614	0.25	3.826	0.23	3.928	0.18
Week 2	3.356	0.27	3.456	0.20	3.836	0.18
Week 3	4.656	0.24	4.278	0.20	4.162	0.17
Week 4	5.298 a	0.19	4.987 a	0.21	4.252 b	0.15

a, b: Means with different superscript in the same row are significant at 0.05 level ($P < 0.05$), SFM: sunflower meal; SBM: soybean meal

Table 4. Effects of different diets on average daily gain, feed intake¹, and feed efficiency

Parameter	SFM	SBM	Control
n, Litters	32	32	32
Days 0 to 7			
ADFI, g/d	109.30	100.73	111.64
ADG, g/d	-0.80 ^b	41.78 ^a	12.50 ^b
Gain: feed, g/g	-0.07 ^c	0.41 ^a	0.11 ^b
Days 8 to 14			
ADFI, g/d	114.03	105.70	115.39
ADG, g/d	-87.80 ^a	-108.66 ^a	-46.32 ^b
Gain: feed, g/g	-0.76 ^{ab}	-1.02 ^b	-0.40 ^a
Days 15 to 22			
ADFI, g/d	110.88	94.50	105.32
ADG, g/d	96.81 ^a	84.32 ^a	14.16 ^b
Gain: feed, g/g	0.87 ^a	0.89 ^a	0.13 ^b
Days 23 to 28			
ADFI, g/d	141.66	127.29	123.86
ADG, g/d	49.58 ^a	74.84 ^a	-23.05 ^b
Gain: feed, g/g	0.34 ^a	0.58 ^a	-0.18 ^b
Total Days 0 to 28			
ADFI, g/d	102.40	107.68	112.10
ADG, g/d	27.05 ^a	28.66 ^a	9.05 ^b
Gain: feed, g/g	0.26 ^a	0.27 ^a	0.08 ^b

¹Least squares means, ^{a, b, c}: Means with different superscript in the same row differ ($P < 0.05$), SFM: sunflower meal; SBM: soybean meal

may be attributable to the suboptimal temperature of the housing unit. The average temperature in the experimental pens was 7 °C after the post weaning stage with the optimum temperature for newborn piglets being approximately 30 °C. By the end of the nursery period, the optimum temperature ranged between 22 and 24 °C (15).

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The growth performance of piglets weaned at the age of 28 days showed that the group given SFM as a protein source reached a higher average body weight. Experimental and control groups reflected very close values regarding the growth performance for 2 weeks after weaning. However, the growth performance of the piglets in the experimental groups was higher compared to the control group after the second week (16). This could be attributed to the adaptation period, from mother's milk to solid feed (17). There was a reduction in growth performance from day 8 to 14, which may have been due to the sudden temperature decrease in the experimental pens from 7 °C to 1 °C. Although the experimental groups had a greater ADG and feed efficiency than the control group, the values for all groups were lower compared to the ADG and feed efficiency values of the weaned piglets of different breeds (1,2,7,18-20). The lower ADG and feed efficiency of all groups may be attributable to breed characteristics and lower efficiency in the conversion of feed intake due to a decrease in the environmental temperature (4).

In conclusion, there was no significant difference in feed intake among the groups, yet feed efficiency, average daily gain (ADG), and growth performance values were higher than control. Further studies on pure bred piglets housed at optimal temperature and fed a range of protein supplements may prove beneficial.

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