

PRODUCTIVITY OF SOWS, GROWTH OF PIGLETS AND FATTENING QUALITIES OF PIGS AT DIFFERENT DURATIONS OF THE SUCKLING PERIOD

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Abstract

The article describes the results of studying the interdependence between indicators of reproductive qualities of sows, indicators of growth of pigs, during fattening. In addition, the results of the experiment determined the dependence of the level of fatness of piglets on the term of their suckling period. It was proven that when the duration of lactation is reduced by 7 days, their preservation improves, due to which their number in the nest before weaning increases. At the same time, in the case of premature weaning of piglets, no difference was found with sows with the traditional duration of the suckling period in terms of the total number of piglets born, multifertility, high fertility and litter weight of piglets at birth. While the shorter period of lactation of sows led to a decrease in the growth intensity of piglets in the post-weaning period and to a decrease in the absolute growth and individual weight of piglets and the weight of their nests at weaning. When piglets were weaned earlier from sows, they exhibited lower growth intensity during rearing, consumed relatively less feed, and had poorer payment for feed in the form of gain and consequently lower weight at the end of the rearing period compared to counterparts with a traditional duration of the suckling period. At the same time, no significant difference was found between piglets of the control groups in the parameters of piglet survival and absolute growth. The fattening qualities of pigs did not depend on the length of their suckling period. A 7-day reduction in the lactation period contributed to a reduction in the duration of the reproductive cycle from 150 to 143 days. This made it possible to obtain 0.12 more farrowings from each sow per year and to use each pen for farrowing sows 25.3% more often. What made it possible due to the intensification of the use of farrowing space, the intensification of the use of the sow and the reduction of the feed cost of her maintenance to obtain additional cost savings per sow during the year.

Key words: sow, piglet, suckling period, rearing, fattening, cost savings

INTRODUCTION

The importance of all the processes of the suckling period in piglets, during which the foundations of the future development of the pigs' organism are laid, is clearly very high. The technology of keeping suckling piglets should form a healthy and adapted herd of pigs for intensive rearing at the stages of rearing and fattening. One of the most important elements in the technological process of pork production is the weaning

period of piglets [29]. By managing the duration of the stay of new born piglets near the sow, pork producers influence both the litter itself and the sow at the farrowing stage, as well as the entire course of subsequent technological periods of the production cycle of the pig industry complex. This allows for the application of various management options in the process of raising pigs in order to obtain maximum profit [16]. World practice regarding the management of piglet holding periods in the group of suckling

sows includes both the use of a shorter period of 14-21 days and longer periods of 28 days and more indifferent countries [23]. The trend of changes in the length of the suckling period in the previous decade tended to decrease it first from 60 to 35 days [10, 13], and then to 28 and finally to 21 days before weaning. Reducing or increasing the length of time piglets stay with the sow has various consequences. The short duration of lactation reduces the average feed intake before weaning, which is why there is a trend in the US pig industry to increase the length of the suckling period [14] to improve the growth performance of piglets at rearing and fattening. In addition, it is prohibited in the EU countries to wean piglets from the sow under the age of 28 days [6]. Among the positive consequences of shortening the suckling period directly for piglets is the early preparation of piglets for the consumption of vegetable feed due to the adaptation and development of their digestive system and the increase in the intensity of their growth [17, 19]. At the same time, a shorter piglets stay in the farrowing group has a positive effect on sows, namely: the number of piglets born to a sow during the year increases [11], the number of udder diseases of the sow decreases [25], the intensity of use of the sow increases, the exhaustion of the sow's body decreases and its mass did not decrease [31]. As a general positive effect of shortening the duration of the suckling period, there was an increase in the efficiency of the use of the farm's production premises area. The consequence of more efficient use of the piggery working space was the increase in the overall profitability of the pigs enterprise's production [37].

In addition to the positive impact of a shortened suckling period, scientists also highlight some of its negative consequences for pork production. In particular, it was established that piglets that were weaned earlier were under severe stress [9, 36], and as a result, for sometime during rearing, they refused to consume feed, slowed down growth [4] and were pro neto diarrhea [7]. In addition, the initial weight of piglets weaned earlier (3 weeks) was lower compared to counterparts

weaned at the age of 4 weeks, which subsequently led to lower growth intensity during rearing. Greater weight of piglets at weaning guarantees effective adaptation after transferring them to rearing [24, 38]. According to published data, piglets that were kept in the farrowing group 28 days, during this additional week, gained more strength, energy and acquired a higher physiological adaptation of the body for better adaptation and growth at the stage of rearing [12]. And the piglets with a shortened suckling period, which at weaning were less prepared for new housing conditions, feeding conditions and hierarchical struggle, had a lower ability to adapt and, as a result, during the first week of rearing showed a deterioration in growth [35] and higher morbidity [5, 30]. Also, according to some scientists, sows from which piglets were weaned at the age of 3 weeks, due to more intensive use of their body, were earlier eliminated from the herd, which required the availability of additional resources of repair young [3, 15]. It should be taken into account that when piglets are weaned too early, the involution of the sow's reproductive system is delayed, and as a result, the length of the service period increases [34].

In general, scientists claim that increasing the duration of the suckling period up to 4 weeks is a method of increasing the productivity of piglets both before weaning [2] and after weaning in rearing [33]. However, a number of scientists hold the opposite opinion [18, 20, 28] that shortening the suckling period to 3 weeks will lead to improved reproductive characteristics of sows and increase the intensity of their growth piglets.

Considering that the term of weaning piglets from the sow has a fundamental impact on both the efficiency of rearing and the efficiency of fattening and the quality of pig carcasses, and most scientists show the opposite vision of approaches to its application, the study of this is sure remains relevant.

The aim of our work was to establish the influence of the duration of the suckling period of piglets on the reproductive qualities of sows, the intensity of growth of pigs during rearing and their fattening qualities.

MATERIALS AND METHODS

In order to carry out research on the basis of LLC "NVP "Globinsky Pig Complex", Poltava region, Ukraine by the method of pairs of analogs, two groups of sows were formed, which came from Great White sows and boars of the Landrace breed of English selection (genetic company PIC), which were inseminated with boars of the synthetic line PIC 337. Each group included 60 sows identical in age, weight and fatness (Table 1).

Table 1. Scheme of the experiment on the study of the dependence of the reproductive and fattening qualities of pigs for different durations of the suckling period

Indicator	Group I	Group II
Breed combinations of sows	♀LW×♂L	
Genotype of boars	PIC-337	
The duration of the sucking period	28 days	21 days
Number of sows, heads	60	60
Number of piglets in rearing, heads	140	140
Number of fattening pigs, heads	110	110

Source: own calculations.

In 3-5 days, the animals of both groups were transferred to the farrowing room, where they were kept in individual pens with fixation. Feeding of sows was carried out with dry complete feed for suckling sows. Feeding was ad libitum using the Sov Max feed do sing system from Hog Slat (USA). Feeding of piglets started from the seventh day of their life with granular starter feed. All veterinary and technological procedures throughout the experiment were conducted out according to the same protocol for both experimental groups.

During the weaning period, the total number of piglets at birth, multiple fertility, weight at birth, weight of the piglets nest at birth, survival of piglets until weaning, individual piglets live weight and weight of the piglets nest at weaning were studied. For identification, a clip with an individual number for the control group was put on the right ear of the piglets on the 3rd day after birth, and green for the piglets of the experimental group. When the piglets were

weaned and weighed individually, an additional 140 piglets from 10 sows with average productivity from both experimental groups were given labels of the same color and with the same numbers.

Weaning of piglets of the experimental group was carried out on 21 day of the third week of lactation with an average age of piglets of 21.3 days. After that, the piglets were transferred to rearing, where they were kept in pens on a completely slotted floor measuring 18 m², including 55 heads in each.

Feeding piglets during this period was carried out with liquid full-ration kibbles using the Schauer feed kitchen (Switzerland) in the ratio of 2.7 liters of water per 1 kg of feed. Feed was supplied to the feeder 12 times a day. Feed accounting in each of the pens was carried out automatically using the feed kitchen management program.

All growing piglets were fed full-rational balanced compound feed of their own production, according to the scheme adopted in the farm, from the 7th to the 41st day, pre-starter compound feed and from the 42nd day to the 77th day, starter feed.

After 7 days, animals of the control group, whose age at the time of weaning was 28.3 days, were transferred to the same rearing section. Piglets of both experimental groups were kept in this section until they reached the age of 77 days. Thus, the duration of rearing piglets of the control group was traditionally 49 days, and the experimental group was 56 days. In growing farms, the growth intensity of piglets was studied according to such indicators as absolute, average daily and relative live weight gains. The preservation of their piglets was also investigated. Based on the data on the amount of feed fed in each pens and the weight of the piglets when they were placed and transferred to fattening and based on the number of feeding days of the piglets in each pen, daily feed consumption and their costs per kilogram of growth were calculated. At the age of 77 days, at the end of rearing, the piglets of both experimental groups were transferred to the fattening pig complex after individual weighing. For fattening, they were kept 50 heads in identical

adjacent pens on a completely slotted floor with a size of 4.1 by 10.0 m.

The pigs of the experimental groups were fed with liquid feeding, using Weda equipment (Austria). Liquid feed in the ratio of 2.8 kg of water per 1 kg of dry feed was delivered to the feeders in equal portions 12 times a day. Data from the feed kitchen management program were used to record the eaten feed.

Upon completion of fattening, the animals of both experimental groups were individually weighed, and, the fattening qualities of the experimental animals were calculated according to generally accepted methods. The age of reaching 100 kg live weight, absolute, average daily and relative growth, average daily feed consumption and its consumption per 1 kg of growth were calculated.

A comprehensive, multifaceted assessment of the maternal qualities of sows was determined using the evaluation index of reproductive qualities (I) [22]:

$$I = B + 2W + 35G \dots\dots\dots(1)$$

where:

- B—number of piglets at birth, heads;
- W—number of weaned piglets, heads;
- G—average daily growth of piglets before weaning, kg.

The selection index of reproductive qualities of sows (SIRQS) was used to study the breeding value [32]:

$$(SIRQS) = 6X_1 + 9.34 \left(\frac{X_2}{X_3} \right) \dots\dots\dots(2)$$

where:

- SIRQS is the selection index of reproductive qualities of sows;
- X₁—multifertility, heads;
- X₂—weight of the piglet nest at weaning, kg;
- X₃—duration of weaning period, days;
- 6 and 9.34 are clarifying coefficients.

According to the results of the study, the index of fattening qualities was calculated [1]:

$$I = (A * A) : (B * C) \dots\dots\dots(3)$$

where:

- A - total weight gain, kg;

- B - duration of the fattening period, days;
- C - the amount of feed spent on gaining 1 kg of weight, kg.

The results of the experiment were calculated in the Microsoft Office Excel environment. The statistical reliability of the difference in indicators was recognized for the significance levels $p \leq 0.05$, $p \leq 0.01$ and $p \leq 0.001$.

RESULTS AND DISCUSSIONS

As shown in Table 2, no statistically valid differences in the indicators of the number of piglets born alive and multifertility were observed between sows at different times of the suckling period in the experiment. On the contrary, the weight of piglets at birth was 1.7% higher in sows with a traditional lactation period than in sows with a lactation period shorter by seven days.

There was also no significant difference in litter weight of piglets at birth between sows of group I and group II. At the same time, a 1.7% higher survival rate of piglets was observed in the sows of the experimental group ($p < 0.05$). This resulted in a higher number of piglets at weaning. With a shortened duration of lactation, it was 0.3 heads or 2.7% ($p < 0.05$) higher compared to analogues with a traditional duration of lactation.

Considering the longer time the piglets stayed with the sows and the greater amount of milk they received, the piglets with the traditional lactation period had an average daily gain 32.3 g or 14.5% ($p < 0.001$) higher than the piglets that had a lactation period seven days shorter.

This factor and the lower number of days in the suckling period also resulted in a significantly lower absolute gain of the animals at early weaning by 2.2 kg or 35.8% ($p < 0.001$).

Also, piglets that were weaned later differed from their counterparts by 29.6% (2.3 kg) ($p < 0.001$) lower live weight of one head and 27.7% (26.0 kg) ($p < 0.001$) lower weight of the nest of piglets at the time of weaning.

Table 2. Reproductive indicators of sows and growth dynamics of their piglets (n = 60)

Indicator	Group I	Group II
The number of piglets were born, heads	15.4±0.09	15.5±0.08
Multifertility, heads	14.4±0.08	14.5±0.08
Nest weight of piglets at birth, kg	19.9±0.11	19.7±0.10
Piglet weight at birth, kg	1.38±0.03	1.36±0.02
Number of piglets at weaning, heads	12.3±0.06	12.6±0.05**
Preservation of piglets, %	85.5±0.33	87.2±0.29**
Weight of weaned piglet, kg	7.6±0.11***	5.4±0.09
Weight of the nest of piglets at weaning, kg	93.9±1.54***	67.9±0.96
Absolute growth, kg	6.3±0.09***	4.0±0.07
Average daily increase, g	223.0±0.27**	191.5±0.23
Relative growth, %	141.3±1.13**	119.70±1.06
Index of reproductive qualities (I), points	46.5	46.1
Selection index of reproductive qualities of sows(SIRQS), points	114.2	113.4

*** – p<0.001

Source: own calculations.

Evaluation of the results showed the relative growth in piglets weaned at the age of 28 days was by 21.6% (p<0.001) higher than in their counter parts from the experimental group. This pattern is explained by the 7-day longer stay of piglets of the control group under sows and, accordingly, longer consumption of mother's milk.

But regardless of the difference in the length of the suckling period, the comprehensive indicators of reproductive capacity calculated using the selection index of reproductive qualities (SIRQS) and the evaluation index of reproductive qualities (I), no significant difference between sows of the control and experimental groups was found. The difference between the animals of these groups according to the index (I) was only 0.9%, while according to the index (SIRQS) the difference was only 0.7%.

Thus, it was found that when the duration of lactation was shortened to 7 days, no difference was observed between the sows in the I and II groups in terms of total number of

piglets born, multiple fertility, piglet weight at birth, and litter weight of piglets at birth. In contrast, during early weaning of piglets, their maintenance improved, increasing their number in the nest before weaning. The shorter duration of the suckling period resulted in a decrease in the growth intensity of the piglets during the suckling period and a decrease in the absolute growth and individual weight of the piglets and in the weight of their nests at weaning.

The process of weaning piglets and their rearing is a very important stage of rearing, where they are exposed to a large number of stressful factors, such as the weaning process itself, the formation of new hierarchical relationships in the group, a change of location, etc.

These questions are especially relevant for prematurely weaned piglets. Therefore, we investigated the intensity of growth and the payment of feed by increments of piglets weaned from sows with different durations of lactation during their rearing for different durations.

As shown in Table 3, despite the extension of the rearing period by seven days, the weight of piglets at early weaning at the end of this period was 2.2 kg or 7.14% (p<0.01) lower than in animals with traditional duration of the suckling period.

In our opinion, this is due to the lower growth intensity of the animals in the II group during the growing period. Thus, the average daily growth of piglets in II group was 63.0 g or 133.25% lower than in the I group (p<0.01). The relative growth rates of the animals in this group were 8.6% lower.

At the same time, the absolute gains of the animals of both groups were almost equal due to the longer duration of the growing period. The preservation of piglets in both groups was practically equal, despite the different duration of the rearing period itself.

Piglets that were weaned early from sows consumed 7.4% less feed during rearing, but due to lower growth intensity during the rearing period, they showed 0.11 kg (6.75%) worse feed payment in increments.

Table 3. Growth, preservation and payment of feed by increments of young pigs during the traditional and shortened suckling period (n=110)

Indicator	Group I	Group II
Average live weight at the beginning of rearing, kg	7.5±0.05	5.5±0.17
Average weight at the end of rearing, kg	30.8±0.85	28.6±1.35**
Preservation of piglets, %	98.2	97.9
Duration of rearing, days	49	56
Absolute growth, kg	23.3±0.88	23.1±1.18
Average daily increase, g	476±6.2	413±10.2**
Relative growth, %	122.0	113.4
Feed conversion, kg	1.63	1.74
Feed consumption per head, kg	0.78	0.72

** – p< 0.01

Source: own calculations.

Thus, piglets with earlier weaning from sows and reared piglets had a lower growth intensity, relatively consumed less feed and had a worse pay for feed in increments and, as a result, a lower weight at the end of the rearing period compared to their counter parts with a traditional duration of the suckling period. In addition, no statistically confirmed difference was found in terms of indicators of piglet survival and absolute growth.

The feeding qualities of pigs depend not only on their genotype, but also significantly on par atypical conditions in the previous stages of their breeding. Therefore, we investigated the dependence of fattening indicators of pigs on different durations of their suckling period.

As follows from Table 4 different terms of weaning of piglets and different duration of their rearing did not significantly affect the realization of the genetic potential of productivity during fattening.

Thus, no significant difference was found between the animals of the control and experimental groups in terms of live weight when placed on fattening, the duration of fattening, and the weight of animals when removed from fattening.

Table 4. Feeding parameters of young pigs raised for different lengths of suckling period, (n=100)

Indicator	Group I	Group II
Average live weight at the beginning of fattening, kg	29.8±0.50	29.3±1.23
Average weight at the end of fattening, kg	115.1±1.10	114.6±2.1
Duration of fattening, days	102	101
Age at the end of fattening, days	179	178
Preservation of piglets, %	98.4	97.9
Absolute growth, kg	85.3±1.23	85.3±2.16
Average daily increase, g	836±13.2	845±8.0
Relative growth, %	117.7	118.6
Feed conversion, kg	2.89	2.86
Feed consumption per head, kg	2.42	2.42
Age of reaching 100 kg live weight, days	160.9	160.7
Comprehensive index of fattening qualities, points	19.3	19.9

Source: own calculations.

There were also no differences in the indicator of preservation of pigs during fattening period. In terms of growth intensity, pigs weaned 7 days earlier had a advantage of 9.0 g, or 0.7%, over those with the 28-length of suckling period. Whereas, the absolute increase in animals of both groups was the same, and the relative increase was slightly higher by 0.8% in the animals of the experimental group.

Every day, during fattening, pigs of both groups consumed the same amount of feed, while feed conversion was 0.03 kg or 1.0% better in pigs with a shortened suckling period.

The age at which a weight of 100 kg was reached was almost the same in pigs of both groups, as was the comprehensive indicator of fattening qualities.

Thus, the fattening performance of pigs did not depend on the duration of the suckling period in piglets.

The economic efficiency of shortening the suckling period in sows was calculated according to generally accepted methods, as the difference of indicators of feed costs, maintenance costs and productivity of sows

with traditional and 7 days shortened suckling period.

Thus, the duration of the reproductive cycle decreased from 150 to 143 days in the animals of the group II with a 7-day shorter lactation period. This made it possible to obtain 0.12 more farrowings from each sow per year. Also, due to a 7-day reduction in the lactation period, each individual pens for farrowing sows was used 25.3% more often.

From sows of the control group, 12.4 piglets were obtained for farrowing at weaning. As a result, 30.1 piglets with an average weight of 7.6 kg were obtained per year from an average sow. Thus, piglets with a live weight of 229.0 kg were obtained from one sow per year. At the same time, during the shortened suckling period, 12.6 heads were weaned from one sow per farrowing. Then, in one year, 32.13 piglets were obtained from her with an average live weight of 5.4 kg at weaning. So, the weight of piglets for the year was 173.5 kg. The market value of piglets at the age of 21 days was 4.60 EUR/kg in the farm, while at the age of 28 days it was 3.80 EUR/kg.

In this way, the cost of offspring obtained in a year from sows with reduced duration of lactation amounted to EUR 799.78. While the cost of the annual weaned offspring for the traditional duration of the suckling period amounted to EUR 872.43. That is, the cost of the obtained products at the prices of 2022 was EUR 68.26 less for the shortened term of the suction period compared to the traditional one.

At the same time, the intensity of use of the farrowing pens increased by 25.3% in sows with a shortened suckling period due to a 7-day shorter duration of lactation. For sows with reduced lactation, it was 13.03 times, while for sows with traditional lactation, it was 10.4 times. The difference was 2.63 times or 25.3%. The cost of equipment for one pen for farrowing a sow for the enterprise was EUR 2,420.89 in 2022. Taking into account the planned period of its use, which is 5 years, its annual depreciation cost amounted to EUR 484.17. Increasing the efficiency of its use by 25.3% will provide additional cost savings in the amount of EUR 122.48.

Also, with a reduced duration of lactation, due to a smaller amount of feeding more expensive feed for suckling sows, the feed cost of keeping one sow per year is reduced by EUR 20.24.

In this way, the seven-day reduction in the duration of the suckling period of sows will contribute to the saving of EUR 142.73.

Hence, taking into account the lower cost of annual production from sows with a reduced lactation duration, the additional savings per head will amount to EUR 74.46. With the average annual number of commercial sows per year of 12,500 heads, the savings will amount to EUR 930.79.

Our conclusions regarding the lack of a relationship between the duration of the suckling period before weaning and the fattening quality of pigs are in contradiction with the data [8]. The data [8] demonstrated a reliable influence of the term of the suckling period on the success of fattening pigs. The correlation coefficients between the weight of piglets at birth and the growth rate of pigs during fattening did not refute the negative effects of the low weight of suckling piglets on weaning time caused by the short stay of piglets with the sow before weaning.

Similar to the results [26], we cannot claim that pigs with a shortened suckling period outweighed pigs with a shortened suckling period in litter weight of piglets at birth by 1.81 and 2.21 kg ($p < 0.001$), as the author of the indicated manuscript says, because piglets in our experiment did not differ in this indicator.

We also observed the discrepancy with this work in the expression of the indicator of the number of piglets at weaning. In our study, the number of piglets at weaning increased when the lactation length of sows decreased to 21 days, while in the opposite experiment [26], the number of piglets at weaning increased when the lactation length increased to 28 days. However, we obtained some similarity of the results with the mentioned data in terms of the index of piglet survival rate, which increased both in our work and in the mentioned data with the shortening of the suckling period (21 days) compared to the

analogues with the traditional term of the suckling period (28 days).

It is possible to agree with the data of other scientists [27], according to which the duration of the suckling period before weaning had a significant influence on the indicators litter weight of piglets at weaning (73.0%), average weight of piglets at weaning (64.4%), absolute growth of piglets in the post-weaning period (63.0%) and average daily growth during this period (8.4%). At the same time, the duration of the suckling period did not affect the total number of piglets at birth and multifertility of sows. According to the result of our experiment, a reliable difference in the mentioned indicators was confirmed.

We also obtained results that are contrary to other reports [21], which indicated that piglets at early weaning had a 2.90–11.35% lower growth intensity at the time of rearing and the beginning of fattening, worse at 0.83% retention and 0.03 kg feed payment in increments. On the contrary, we found that shortening the suckling period increased the intensity of growth of piglets during rearing and did not affect the growth of pigs during fattening.

CONCLUSIONS

It was established that when the duration of lactation was reduced by 7 days, the preservation of piglets improved and their number in the nest before weaning increased, while the absolute growth and individual weight of piglets and the weight of their nest at weaning decreased.

No difference was found between sows with the traditional duration of lactation and reduced lactation in terms of the total number of piglets born, multifertility, piglet weight at birth, and litter weight of piglets at birth.

Piglets weaned from sows and previously reared had lower growth rates, consumed proportionally less feed, and had poorer feed conversion with lower weight gain at the end of the rearing period compared to their littermates with traditional weaning periods.

At the same time, there was no statistically significant difference in piglet survival rates and absolute growth rates.

The length of the suckling period in the piglets had no effect on the fattening characteristics of the pigs.

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