

# THE ANALYSIS OF SEVERAL FACTORS THAT INFLUENCE THE BREASTFEEDING CAPACITY AT THE PIC SOWS

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## Abstract

*Because of the technological, nutritional and sanitary-veterinary conditions which are provided nowadays, the number of piglets has increased significantly at parturition and to a lesser extent at the weaning. In the last three decades, it has been achieved an increase of only 0,5 piglets weaned/sow/reproductive cycle, and the main losses were recorded due to the insufficient consumption of milk. Our study is based on the context of the data described above and it was conducted on a batch of lactating sows with suckling piglets in a PIC multiplication farm. It was used an experimental protocol based on the logistics and the recording systems that were already existing in that unit farm, a component of the EUROHYB intensive system. The essence of the study consisted of the evaluation of the sows breastfeeding capacity, on the basis of a score which was given at the weaning and at the end of the previous lactation and it was finally analysed in correlation with fecundity and fertility. The researches were organised under the form of regular investigations, focused on monitoring the “nests” of the lactating sows with suckling piglets, the statistical analysis of the recorded data and the evaluation of the influence of the genotypic, phenotypic and environmental factors over the sows breastfeeding capacity and the growth and health indices at suckling piglets. The statistical analysis of the influence of genetic, phenotypic and environmental factors revealed significant correlation between the weight of the batch at parturition and at 21 days ( $r_{fxy}=0,494$ ), respectively between the number of living piglets and the size of the batch at weaning ( $r_{fxy}=0,487$ ), respectively between the number of weaned piglets and the weight of the batch at weaning ( $r_{fxy}=0,593$ ). We have ascertained that there is a strong phenotypic correlation ( $r_{fxy}=0,767$ ) between the total number of functional nipples and the number of weaned piglets. We have also observed that the frequency of the requested pairs of nipples has decreased in the order 1 to 8, indicating a positive correlation between the weight of the piglets batch and the quantity of the milk consumed ( $r_{xy}=0,686$ ). Therefore, according to the regression  $b_{xy}=5,055$ , to a functional additional nipple corresponds an extra piglet/batch and an increase of the weight of the batch with 5 kilograms at weaning. The optimization of the morpho-productive features, of the genetic and health indices at PIC sows determined the increase of the milk production level and implicitly, the increase of the breastfeeding capacity, which had led to the reduction of the losses caused by milk subnutrition at suckling piglets.*

**Keywords:** lactation, PIC sows, suckling piglets

According to the current estimates, the performances of reproductive sows can reach up to 2,5 parturitions / year, with 41 weaned piglets (Ognean L. *et al.*, 2015). It is noticed that the achievement of high productive and reproductive performances of the sows are due to both high level of feeding and maintaining standards, which are applied, and the implementation of several standards with great relevance, regarding the management of gestation, breastfeeding and weaning stages (Vlasiu A. *et al.*, 2012). All these things lead finally, to the increase of the milk production and implicitly, to the increase of the sows breastfeeding capacity, respectively the increase of the number and weight of weaned piglets (Mabry J. W. *et al.*, 1996). Regarding the lactating sows, the establishment of the energy and nutritive requirements is mainly based on the milk production level, because of the enhancement of the metabolism, with the predominance of the catabolic processes (Olmos-Hernandez A. *et al.*, 2010).

Therefore, the lactating sows suffer important weight losses that commonly reach 13-15% during an 8 week lactation. The poor feeding conditions cause much more significant losses, that can reach up to 40%, with devastating consequences on the productive

performances of the sows (Sarandan H. *et al.*, 2009). As it is well known, highly productive sows can produce 350-400 L milk in an 8 week lactation, requiring both adequate feeding and watering (Ognean L. *et al.*, 2015). The water consumption of the sows during the lactation period is much higher than during other physiological states, reaching up to 25-30 L/day (Sarandan H. *et al.*, 2009). From the latest studies, focused on the increase of the milk production at sows, a major impact had those which were based on using porcine somatotropin or on stimulating the secretion of prolactin hormone at sows (Olmos-Hernandez A. *et al.*, 2010).

The present research subscribes the theoretical framework described above and it underlines the correlative analysis of the breastfeeding capacity and of the main productive and reproductive indices, in a batch of breeding sows from a PIC multiplication farm.

### **Materials and Methods**

The study was focused on investigating a batch of lactating breeding sows (n=205) from a PIC multiplication farm and the suckling piglets (n=3955), which had resulted from the total annual parturitions (n=430). The conducted investigations and researches were focused on monitoring the evolution of the genotypic, phenotypic and environmental factors with major impact over the reproduction and lactation at PIC sows, respectively over the growth and health of the suckling piglets. In addition, we have also evaluated the influence of several risk factors over the productive performances of the sows and the piglets.

The research was conducted through several investigations, which were made in the nests of lactating sows and suckling piglets and it was focused on the evaluation of the growth index at suckling piglets ( by measuring their weight), the health surveillance and on monitoring the risk factors that may occur during the stages of the maternity: parturition, breastfeeding and weaning. In order to realise this survey, we have implemented a protocol based on the logistics, the materials and monitoring systems which were already existing in the investigated farm, a component of the EUROHYB intensive system.

The main goal of our research was to implement a program used in PIC farms for the evaluation of the sows breastfeeding capacity, quantified through the correlation between weight losses (established by means of a maintenance score, which was given at weaning and at the end of the previous lactation) and milk production (estimated by converting the suckling piglets rate into the consumed milk). At the same time, a correlative analysis was made between the evolution of the prolificacy and productive longevity indices of the sows from the breeding batch. Finally, all data resulted from the conducted investigations and the BLUP index of the sows were the basis of the statistical analysis of the influence of several phenotypic, genotypic and environmental factors over the main couple of characters that influence the breastfeeding capacity, including some indices regarding the growth and the health of the suckling piglets.

The use of this genetic study program allowed us to realise a relevant statistical analysis concerning the correlative action of the genetic, phenotypic and environmental factors, based on the evaluation of the milk production and quantifying into the capacity of breastfeeding.

### **Results and Discussions**

The analysis of the influence of the genetic, phenotypic and environmental factors over the sows breastfeeding capacity and the main biometric and health indices in the lots of suckling piglets offered the required data, in order to evaluate the risk factors that may affect these parameters. The correlative action of the several genetic, phenotypic and environmental factors was evaluated by means of programs used in the genetic study, regarding the sows milk production and it revealed the existence of various factors, which influence directly the

breastfeeding capacity. In this regard, we correlated the breastfeeding capacity with several genetic, phenotypic and environmental factors due to the monitoring activity, which was performed over a long period of time.

Therefore, as it is presented in Table 1, the statistical analysis revealed strong correlations between the weight of the piglets batch at parturition and its weight at 21 days ( $r_{fxy} = 0,494$ ), between the number of living farrowed piglets and the size of the batch at 21 days ( $r_{fxy} = 0,487$ ) and also, between the number of piglets from the batch at 21 days and the weight of the batch at 21 days ( $r_{fxy} = 0,593$ ). A great impact over the breastfeeding capacity had the couple of characters, represented by the total number of functional nipples and the number of piglets from the batch at 21 days and moreover, between the last two, it was confirmed a significant phenotypic correlation ( $r_{fxy} = 0,767$ ). Thus, according to the regression ( $b_{xy} = 5,055$ ), an additional functional nipple materializes into an extra piglet/batch and a heavier weight of the batch at 21 days with more than 5 kg. We have also noticed that an important correlation was made between the total number of piglets at parturition and the number of piglets at weaning due to the corroboration of the collected data from the investigated farm with the data collected from 16 other populations ( $r_{fxy} = 0,660$ ).

Table 1.

The correlations of several phenotypic, genotypic and environmental factors with the main couples of characters which influence the breastfeeding capacity at PIC sows

Couple of characters	Correlation			Regression
	Phenotypic	Genotypic	The environmental	
Total no. of nipples	0,463	0,459	0,469	0,696
No. of functional nipples				
No. of functional nipples	0,767	0,169	0,826	1,046
No. of piglets/batch at 21 days	0,451	0,360	0,443	5,055
No. of functional nipples				
Weight / batch at 21 days	0,494	0,551	0,529	3,158
Weight / batch at calving				
Weight / batch at 21 days	0,487	0,764	0,526	0,889
No. of living piglets at calving				
No. of piglets/batch at 21 days	-0,336	-0,247	-0,317	-0,613
No. of piglets/batch at 21 days				
Individual weight at 21 days	0,630	0,439	0,321	1,412
Daily consumption of food				
Weight / batch at 21 days				

The prolificacy is a productive index, extremely useful for the evaluation of the reproductive sows and according to that, the number of breastfeeding piglets can influence the milk production even more than the quantity of the food. This correlation is reflected by the results of our study and in accordance with it, the sows with 12-15 suckling piglets can produce with 25-35% more milk than those with 8-10 piglets. The data also show that in the first 3-4 days of life, the small lots of piglets can not consume the entire amount of milk, which is produced by the sow, and as a consequence, the milk retention is the main factor that decreases the stimulation of alveolar tissue. Taking into consideration this principle, in the investigated farm, the new-born piglets are re-located in order to standardize and enlarge the batches.

The productive longevity indicates the limit age up to which the reproduction of sows is profitable and evolves in linked correlation with the body structure of the animal and

considerably influences the milk production. Regarding our investigated farm, it is required that the majority of sows to be reformed after the fourth lactation (over the fourth rank of parturition), as it is shown in the genetic criteria established by the BLUP index. We can also notice that in our investigated farm, this index is updating after each parturition in order to improve the genetic heritage by using substituted gilts and to highlight the genetic progress in the farm. Therefore, several females (after the sixth rank of parturition) were maintained in the batch and in the previous parturitions, they have achieved performances situated at the level or above the average population. The increase of breastfeeding capacity has been highlighted by the evolution of the lactation curve, which consists of an upward phase (7-10 days), a plateau phase, of about 10 days and a downward phase, with a sudden decrease around the weaning.

Summarizing all the results obtained from the investigated farm, we can confirm the existence of a high level of milk production, positively correlated with the prolificacy and the breastfeeding capacity of the PIC sows. The analysis of productive and reproductive indices has emphasized an increase of the parturition rate (85%; 2,2 births/year), of the number of births of piglets /sow/year (27,1) and the achievement of the average weight of piglets at birth (1,7 kg) and at weaning (7,5 kg). The overall analysis correlated with achieving first fertile mating at the optimum age (233-238 days), respectively, at the 348-353 days, at first parturition have contributed in ensuring a high level of milk production (7,9 L/sow/day).

In this PIC farm, the batch consisted of 2463 swine and the annual evolution of mortalities underlined 360 cases of deaths; if we reported the recorded mortalities to the total number of born piglets, it would represent 10,2 %. The losses had the following percentage distribution on different categories, such as: suckling piglets (45%), growing youth (40%), youth in testing (7%) and commercial pigs (8%). After analysing the causes of mortality regarding the suckling piglets we were able to determine the following hierarchy, consisting of the major technological and pathological factors involved in producing those deaths: piglets crushed by the mother sows (55%), diarrhea syndromes (35 %), starvation (7%) and other causes (3%).

The investigations concerning the breastfeeding behavior of the new-born piglets (the first 72 hours) from 20 nests revealed that those piglets, with the body weight below the average of the lot have achieved smaller gains than the average bodyweight of the lot. This thing indicates that they had the competition for the most milk productive nipples and thereby, the consumption of both colostrum and milk has decreased. Regarding the usage of the nipples, depending on their anatomical position, we have found out that there is a directly proportional correlation and the nipples with a lower milk production are less preferred by the piglets. Actually, the usage of the nipples has decreases proportionally with the decline of milk production from the first toracal pair to the inguinal one. Therefore, the underweight piglets manage to feed themselves only from the nipples with a lower production of milk, and so, a relevant correlation ( $r_{xy} = 0,686$ ) was observed between the body weight of the piglets and the quantity of the consumed milk. Another studies from the same field showed that the most vigorous piglets took hold of the toracal nipples, with the highest milk production (Rada *et al.*, 2010).

The MMA syndrome (mastitis–metritis–agalactiae) is incriminated as a pathological factor that influences significantly and directly the breastfeeding capacity; regarding our farm situation, only three cases of MMA syndrome were diagnosed from the entire batch of lactating sows. Some researches have ascertained that this syndrome can lead to a decrease of milk production up to 40% at the sows in the first three days of lactation and it can also double the percent of mortalities and produce important decreases of the daily average rate (Rada *et al.*,

2010). One of the most severe effects of this syndrome is the production of lipopolysaccharides and their release from the fetal circulation into the colostrum (Klaver J. *et al.*, 1981).

The losses regarding the young growing piglets appeared after their weaning (usually after 6-10 days), mainly because of the mistakes which had been done in the weaning procedure and the technological measures that had been implemented since the first week of life. The individual sheets of animals had a major influence on ensuring the efficacy standards in this farm, that are used for monitoring the morpho-productive and reproductive indices at the sows from the breeding batch and the substituted gilts.

According to the consulted references, an essential index, used for monitoring the risks that can affect the lactation of the sows is the lactation curve with its particularities. The major risks occur more often during the upward phase and the plateau phase, even though the milk production increases all along these phases and it decreases around weaning. Another noteworthy researches have underlined, just like we did, that the small lots of piglets did not consume the entire amount of milk produced in the first 3-4 days and therefore, it will be produced an adversely impact on the galactopoiesis at sows (King Rh., 2000).

The correlation between the genetic breed characteristics and the maintenance and feeding standards provided on the farm was the basis of the significant achieved performances at gilts from the line L03, that are also known for the superior level breastfeeding capacity.

Some researches show that the cumulative action of several risk factors badly influence the milk consumption during the first days of life, leading to the decrease of the energetic and plastic intake, with morphological and functional changes which affect the integrity of the mucosa of the small intestine, responsible for producing the diarrhea syndromes (King Rh., 2000). Quite often, the new-born piglets may be affected by the hypoxic syndrome, that is characterised: by the decrease of vitality, because of the subnutrition determined by disrupting the mother-piglet relationship; the energetic and plastic intake, the capacity of feeding and morpho-functional integrity of the digestive tube and annex glands are also affected (Vlasiu A. *et al.*, 2012).

## Conclusions

1. The implementation of several reducing measures of the action of the risk factors has determined considerable increases of the milk production, prolificacy and breastfeeding capacity in PIC sows;
2. Providing the optimal zoo-hygienic and the feeding conditions led to increased parturitions (85%), prolificacy (12,7 %), number of births/year (2,11%), number of piglets/year/sow (27%);
3. The statistical analysis of the action of the genetic , phenotypic and environmental factors revealed significant correlations between the weight of the lot at parturition and the weight of the lot at 21 days ( $r_{fxy}=0,494$ ), respectively between the number of living piglets and the size of the lot at 21 days ( $r_{fxy}= 0,487$ );
4. The mortalities prevailed in suckling piglets (45%), followed by growing youth (40%), youth in testing ( 7%) and commercial pigs (8%);
5. The frequency of the usage of the nipples pairs decreased in the order 1-8, resulting a positive correlation between the body weight of the piglets and the amount of consumed milk ( $r_{xy}= 0,686$ );
6. The decrease of milk production in “ over 6 parturition rank” confirmed the fact that the advanced age is one of the risks factors, justifying the efficacy of the sows capitalization during the fifth lactation;

7. It was proved that the increase of the piglets number in the batch has stimulated the galactopoiesis and the sows with 12-15 piglets produce with about 25% more milk than those with 8-10 piglets;
8. The productive longevity in PIC sows was assessed at four lactations, and after that, most of the reforms occurred due to the genetic, productive and health criteria;
9. The mortalities of suckling piglets occurred mainly because of crushing the piglets by the mother sows (55%), diarrhea syndromes (33%) and they were less caused by starvation (7%);
10. The smaller gains made by new-born piglets with the weight below the lot indicated that they had lost the competition for the high milk productive nipples and implicitly, the decrease of the milk consumption.

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