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MODERN TRENDS IN LIVESTOCK PRODUCTION

2021

PROCEEDINGS

6 - 8 October 2021, Belgrade, Serbia

Institute for Animal Husbandry

Belgrade - Zemun, SERBIA

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ORAL PRESENTATION

POSTER PRESENTATION

Proceedings of the 13th International Symposium
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VARIABILITY OF THE NUMBER OF LIVE-BORN PIGLETS UNDER THE INFLUENCE OF FEMALE GENOTYPE, YEAR OF FARROWING AND PARITY

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Abstract: The aim of this study was to determine the influence of sow genotype, year of farrowing and parity on the number of live-born piglets. Fertility traits of sows were tested during fourteen years (from 2007 to 2020) in one pig herd/population. The study included 10159 sows, 4 genotypes: Landrace, large White, Landrace x large White and large White Yorkshire x Landrace. The sow fertility data set contained data on 36189 parities. Based on the obtained results, it was determined that the genotype of sows, year of farrowing and parity had a statistically highly significant (P <0.01) influence on the number of live - born piglets.

Key words: fertility, sows, genotype, parity, year.

Introduction

The achieved production results in pig breeding directly depend on a large number of economically important groups of traits. Two important traits, which affect the economic efficiency of pig production, are the reproductive and productive capacity of sows (*Wähner and Brüssow, 2009; Škorput et al. 2020*). The annual productivity of sows is determined by the size of the litter and the number of parities per sow per year. Increasing one parameter affects the increase in sow productivity (*Kosovac et al., 2005; Radojković et al., 2005; Popovac et al., 2012; Živković et al., 2018*).

The size of a sow litter can be described as the number of live-born, stillborn, total-born and weaned piglets. The number of weaned piglets is even more commercially important than the size of the litter at birth. However, due to the widespread technological procedure of uniforming-equalization of litters of

different sows that were farrowed at approximately the same time, this trait is second in importance, right after the number of live-born piglets. (*Luković, 2006; Radojković, 2007)*.

The number of live-born piglets is influenced by numerous external and genetic factors, as well as their interactions. There are reported data on farms on many effects that can be included in the models. Data on pig fertility, which are recorded on modern industrial farms, give a satisfactory description of the effects on the number of live-born piglets. The effects that can be included in the models are: parity, year of farrowing, mating or farrowing season, genotype, sire of the litter or sire breed, age at farrowing and different reproductive cycle intervals that affect the number of live piglets, and therefore the overall efficiency of pig production. Research in the direction of analysis of variability of fertility traits of sows was performed by: *Luković (2006); Luković et al. (2006, 2007); Radojković (2007); Radojković et al. (2005, 2014, 2018); Popovac et al. (2012); Luković and Radojković (2013); Škorput et al. (2016); Živković et al. (2018); Freyer (2018).*

Given the above, the aim of this study was to determine the influence of sow genotype, age and parity on the variation of fertility traits.

Material and Methods

Fertility traits of sows were tested during fourteen years (from 2007 to 2020) in one pig herd/population. The study included 10159 sows, 4 genotypes of Landrace, Large White and F1 crossbreeds of these breeds. The data set contained 36189 records on sow fertility and the following variables: animal identification number, genotype of the litter sire and dam, date of mating, date of farrowing, parity, and number of live-born piglets.

The values of statistical indicators for phenotypic expression and variability of the tested trait were calculated by the method of least squares using the GLM procedure of the software package SAS (*SAS Inst., Inc., Cary, NC*), using the following model:

Model:

$$Y_{ijkl}=\mu+S_i+P_k+G_l+e_{ijkl}$$

where:

Y_{ijkl} - observation vector for litter size,
S_i - fixed influence of the year of farrowing,
P_k - fixed influence of parity,
G_l - fixed influence of litter genotype,
e_{ijkl}- random error.

The choice of systemic influences in the model is based on the significance of the influences, the coefficient of determination and the degrees of freedom. The results are presented as mean values obtained by the method of least squares (LSMEAN) or as deviations of LSMEAN values from the population average in the form of a graph.

Results and Discussion

Based on the obtained research results (Table 1), a high number of live-born piglets is observed, which indicates a high average fertility of sows in the analysed population. The high coefficient of variation for the analysed trait is a consequence of large differences in litter size of different sows. The presented result of the average value of the number of live-born piglets (16.16) is higher compared to the results presented by *Luković (2006) and Radojković (2007).*

Table 1. Descriptive statistics of the number of liveborn piglets in the analysed population

N	$\bar{x}$	SD	Min	Max	CV
36189	16.16	3.59	0.00	31.00	22.20

N- Number of litters, ***$\bar{x}$***- mean value, ***SD***-standard deviation, ***Min***- minimum, ***Max***-maximum, ***CV***-coefficient of variation

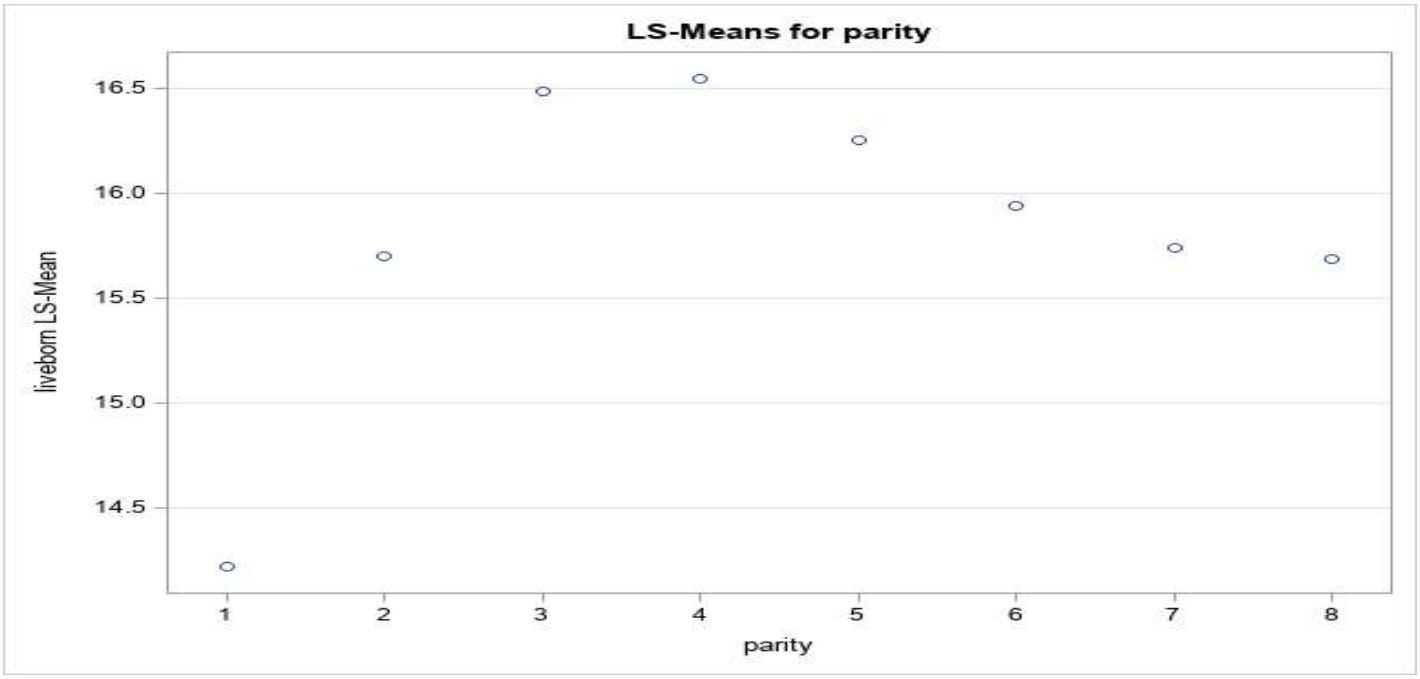
The influence of genotype on the number of live-born piglets was highly statistically significant (Graph 2 and Table 2). Also, the parity and the year of farrowing had a highly statistically significant (P<0.01) influence on the size of the sow litter.

Table 2. Analysis of the significance of the influence in the model for the number of liveborn piglets in the analysed population

Source of variation	d.f.	MS	F	Pr>F
Genotype	3	778.23	79.89	<0.0001
Year	13	4905.91	503.60	<0.0001
Parity	7	3945.29	404.99	<0.0001

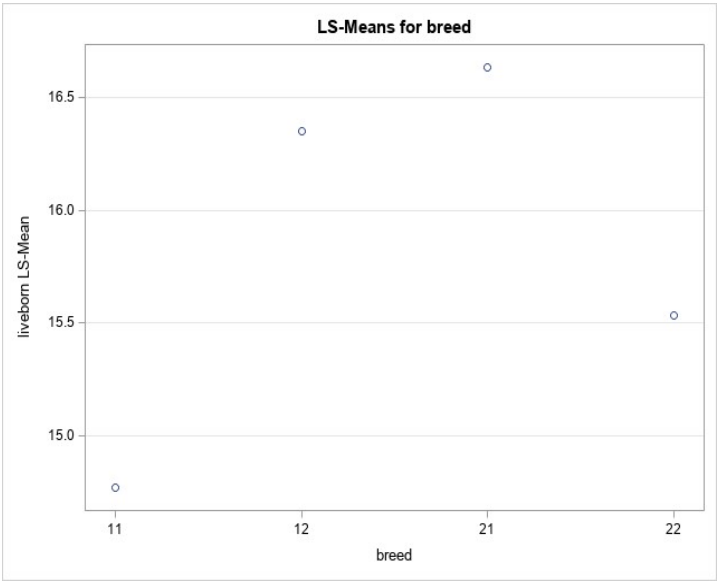
The highest number of live-born piglets in sow litters is observed in the third and fourth parity, after which a slight decline is observed (Graph 1). This is in accordance with reports by number of authors (*Kosovac et al., 2005; Luković and Radojković, 2013; Popovac et al., 2012; Škorput et al., 2016; Freyer, 2018)* who state that the highest numbers live-born piglets are achieved in the interval between

the third and sixth farrowing, and after reaching maximum fertility in subsequent parities the value of this parameter slowly decreases. Such a result is based on the influence of sow age on litter size. Females grow until the end of the second year, when they reach their final size, and the size of their reproductive organs increases in that period, which leads to an increase in fertility.



Graph 1. Influence of parity on the number of live-born piglets

In the examined litter, the average number of live - born piglets varied between sow genotypes from 14.77 to 16.63 (Table 3). Differences in the average number of live-born piglets were highly statistically significant between all genotypes included in the analysis. The number of live-born piglets in a sow's litter can also be affected by whether the sows are purebred or are the result of crossbreeding (*Radojković, 2007*). When crossing different breeds, a heterosis effect can be manifested in a larger number of live-born piglets, which is confirmed in this analysis. Purebred sows had a lower number of live-born piglets compared to crossbreeds (Graph 2).



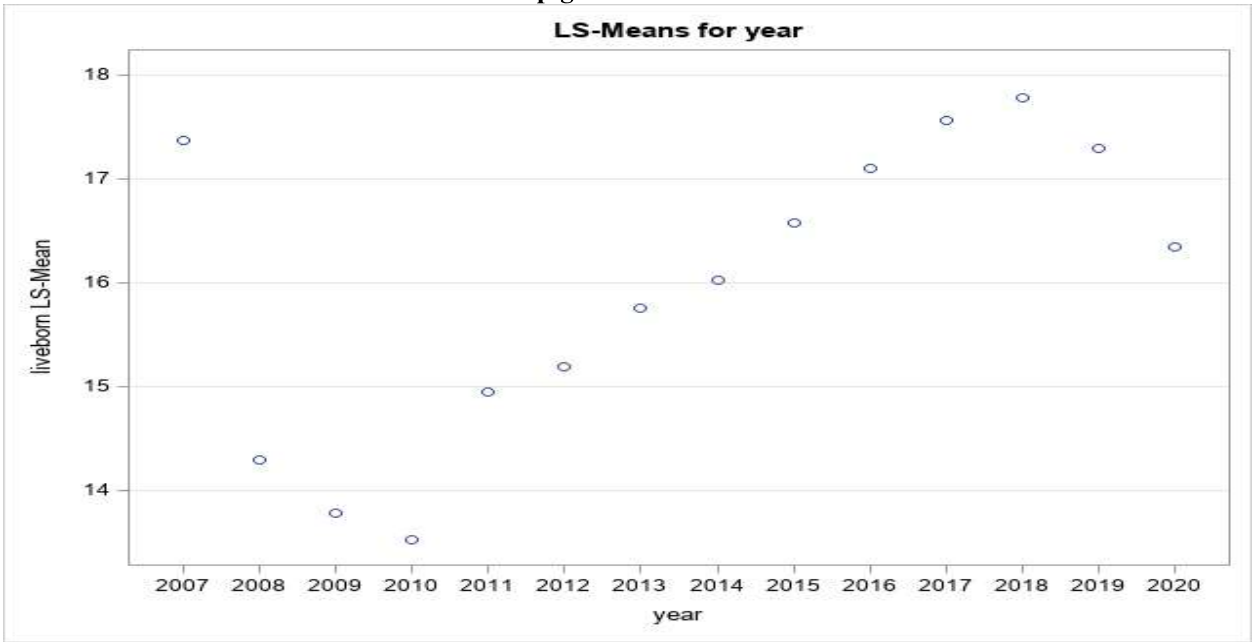
Graph 2. Influence of genotype on the number of live born piglets for the number of liveborn
11-Large White, **22-**Landrace, **12-** Large White x Landrace, **21-** Large White x Landrace

Breed	Live born	Pr > |t|
11	14.77±0.14	<0.0001
12	16.35±0.04	<0.0001
21	16.63±0.05	<0.0001
22	15.53±0.10	<0.0001

Table 3. LSM ± S.E.value piglets

The influence of the year on the number of live-born piglets of sows and gilts is shown in Graph 2. Great variability in the number of live-born piglets between years was observed, which is contrary to *Savić et al. (2011*). The mentioned authors have not determined a statistically significant influence of the year of farrowing on the number of liveborn piglets. The influence of the year of farming usually explains the effect of environmental factors that prevailed in certain years, such as nutrition and various technological procedures during the rearing of females (*Radojković, 2007; Popovac, 2016)*. Also, this influence can include the effects of selection in successive overlapping generations, producing at the same time. This usually happens when the study is conducted for many years.

Graph 3. Influence of the year on the number of liveborn piglets



Conclusion

Based on the results obtained in this study, we can conclude that the genotype of sows, age and parity have a statistically highly significant ($P<0.01$) influence on the number of live-born piglets.

In the analysed population, the number of live-born piglets of large White sows was 14.77, Landrace 15.53, Landrace x Large White 16.63 and Large White x Landrace 16.35. Purebred sows had a smaller number of live-born piglets compared to crossbreeds. The highest number of live-born piglets in sow litters is observed in the third and fourth parity, after which a slight decline is observed. The variability in the number of live-born piglets between years is a consequence of the action of external factors and partly of the selection effect that is carried out over many years.

Varijabilnost broja živorođene prasadi pod uticajem genotpa plotkinja, godine prašenja i pariteta

Nenad Stojiljković, Dragan Radojković, Čedomir Radović, Marija Gogić, Vladimir Živković, Zoran Luković, Dubravko Škorput

Rezime

Cilj ovog istraživanja je bio da se utvrdi uticaj genotipa krmače, godine prašenja i pariteta - rednog broja prašenja na broj živorođene prasadi. Osobine plodnosti krmača ispitivane su tokom četrnaest godina (od 2007. do 2020. godine) u jednom zapatu svinja. Istraživanjem je obuhvaćeno 10159 krmača, 4 genotipa: Landras, Veliki Jorkšir, Landras x Veliki Jorkšir i Veliki Jorkšir x Landras. Set podataka o plodnosti krmača sadržao je podatke o 36189 prašenja. Na osnovu dobijenih rezultata utvrđeno je da genotip krmača, godina prašenja i paritet statistički visoko značajno ($P<0,01$) utiču na broj živorođene prasadi.

Ključne reči: plodnost , krmače, genotip, paritet, godina.

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