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IMPACT OF HYPERPROLIFIC LINE ON LITTER SIZE IN MULTIPLICATION HERD

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Abstract

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The hyperprolific line is considered to be maximally effective in pursuit of progress in sow's reproduction. Hyperprolific line efficiency is commonly evaluated in regard of breeding herd progress. We decided to study how effective it is with respect to increasing of litter size in multiplication herd. Our study is specific by using the data from practice, concretely it is based on the information about the ancestor of sows in multiplication herd. The ancestors could be the member either hyperprolific line or normal line. The information about performances of sows breed in multiplication herd was known. The mixed linear models in SAS for Windows 9.1.2. were conducted to statistical analysis. Our results indicated that no significant effect on litter size was achieved by selection criteria used in the hyperprolific line creation. In studied population no differences between TNB, NBA or NW were found on the 1st as well as on the 1st–5th litters. As we have mentioned above, the study is specific by using the data from practice. Therefore the studied population size is limited. It is necessary to take into consideration when the results are applied. Nevertheless, the results shown that other studies with larger population should be done to reevaluate the selection criteria.

pigs, selection, reproduction, hyper prolific line

The increasing of reproduction, particularly increasing of the litter size, by means of conventional breeding methods as well as modern methods based on the molecular genetics has not desired effect. It is caused mainly by the low heritability and not achieving of intense selection in practice as well as complexity of reproduction (Rothschild and Bidanel, 1998). Recently, the creation of hyper prolific line combined with the selection based on the evaluation of breeding value is believed to be very effective. In sows, the success of direct selection based on the evaluation of breeding value on litter size has been confirmed for instance by Holl and Robinson (2003). In recent years, the large number of studies on QTL and gene markers influencing the reproduction was carried out. Progress in QTL mapping and gene markers´ study is purveyed in publication of Rothschild et al. (2007). The objective of this study was to estimate the effect of creation of hyper prolific line in breeding herd on the litter size of sows in multiplication herd.

MATERIALS AND METHODS

Population and Data Collections

The study is based on the data collected from the breeding herd and mainly from commercial multiplication herd. From breeding herd the information about the ancestor membership in hyperprolific line were known. Studied population consists of 176 purebred Czech Large White sows originated from one breeding herd from which they were moved at age of 6 months to one multiplication herd. All sows included in the study were breed under the same living and breeding conditions. The ancestors of this sows could be the member either hyperprolific line or normal line. The data about their performance were collected during last fifth seasons. As the litter size is considered as most important trait in Czech Large White sows, we focused on the total number of piglets born (TNB) defined as the number of all fully formed fetuses expelled at farrowing, dead or alive; number of piglets born alive (NBA) defined as the number of piglets alive immediately af-

ter birth and by the number of piglets weaned (NW) defined as the number of piglets available on the day post weaning.

Animal Management

All sows included in the study were breed under the same living conditions. The inseminations were performed in the individual pen (1.47 m^2). When the standing reflex became quit, the sows were moved to the naturally ventilated house in range of 8 to 4 sows per pen (1.2 m^2). In these groups, the sows were reared until 10 days before the supposed parturition day. To parturition, the stab lings of 2.1 m length and 0.7 m width (30 cm area for piglets were separated on both side) with heated mattress (33 °C) were intend. Only the total inseminations in the herd were performed. The inseminations were carried out twice a day with 10 hours interval / intervals always with attendance of the boar.

Statistical Analyses

The mixed linear models, in SAS for Windows 9.1.2. were conducted to estimate the differences. Independent analyses in the 1st and in the 1st–5th litter independently were carried out for each of studied trait. To get the most appropriate model the following factors were used: the affiliation of the ancestor to the hyperprolific or normal line; the year and season of litter; type of mating – natural mating of artificial insemination; and the order of litter. The boars were used as the random effects. Furthermore, the back-fat thickness and age at first farrowing was included as linear regression in some models. Individual models are defined in the table I.

RESULTS AND DISCUSSION

Although the enormous advances in lean growth traits has almost achieved an optimal point (Webb, 1998) the development in litter size have not reached the desired level. It is due to litter size is quantitative traits controlled by several genes, along with environmental factors, and the correlations between them. Although generally the low response on the selection on the litter size is considered, the results of some studies show considerable litter size increasing as an outcome of selection (Lamberson et al., 1991; Johnson et al., 1999; Bolet et al., 2001 and Robinson, 2003). Based on the experience from other countries, the hyperprolific line seemed to be promising method for litter size increasing. The goal of are study was to evaluate if the hyperprolific line creation have desired effect not only in breeding herd but in multiplication herd so. Our assumption was that descendents of hyperprolific sows should have higher number of piglets per parturition. This is in according with breeding goal of hyperprolific line which is primarily focused on the litter size, teat number and average daily gain. In contrast to our assumption no considerable effect was observed in our population. No differences between TNB, NBA or NW were found on the 1st as well as on the 1st–5th litters (Table II). When our results are assessed the small number of sows included in the study is necessary to take into account. It can negatively bias the results. On the other hand the results outlined that the breeding goal of hyperprolific line should be reevaluate in context of results in multiplication herds. In last decade many studies about the possible incorporation of molecular data into breeding scheme or specifically into selection criteria were published. Since the effects of gene markers observed in breeding herd or some special crossbreeding populations should not correspond to effects in commercial herd, the special studies on this should be performed.

I: *Specification of used models*

	Litters	Line	YS	Mat	OL	AFF	Boar	BF
TNB	1st	F	F	F	-	L	R	-
	1st–5th	F	F	F	F	L	R	-
NBA	1st	F	F	F	-	L	R	-
	1st–5th	F	F	F	F	L	R	-
NW	1st	F	F	F	-	-	R	L
	1st–5th	F	F	F	F	-	R	-

F – fixed effect
R – random effect
L – linear regression
TNB – total piglets born
NBA – piglets born alive
NW – number of piglets weaned
LINE – HP or N line
YS – year and season of litter
MAT – mating or artificial insemination
OL – order litter
AFF – age at first farrowing
DAM – dam of sows
SIRE – sire of sows
BOAR – mating boar
BF – back-fat thickness

II: *Differences of litter size between the sows with ancestor originated from hyper prolific line (HP) and normal line (N)*

	N	HP
	1st litters	
TNB	10.88 ± 0.49	11.69 ± 0.61
NBA	10.22 ± 0.48	10.97 ± 0.58
NW	10.02 ± 0.29	10.21 ± 0.31
	1st–5th litters	
TNB	12.39 ± 0.38	12.41 ± 0.41
NBA	11.79 ± 0.36	11.91 ± 0.38
NW	10.42 ± 0.29	10.61 ± 0.31

Note: TNB – total number of piglets born; NBA – number of piglets born alive, NW – number of piglets weaned; Values with the different superscripts show significance level within rows: $P \leq 0.01$ (^{A}, ^{B}); $P \leq 0.1$ (*, **).

IMPLICATIONS

The aim of our study was to found the real impact of hyperprolific line selection on the litter size in multiplication herd. The study was performed under the commercial conditions and the results outlined the usefulness of creation of hyper prolific line. The results of our study indicate that major accent should be put on the prolificacy, mainly on the litter size. Otherwise the emphasis aimed to improve the production traits should be lesser.

SOUHRN

Vliv tvorby superplodných linií na velikost vrhu v rozmnožovacích chovech

Využití super plodných linií je v posledních letech považováno za vysoce efektivní možnost zvyšování reprodukčních parametrů prasnic. Většina prací se však zabývá jejich vztahem k reprodukci přímo ve šlechtitelských chovech. Velkým přínosem naší práce je studium dopadu tvorby superplodných linií na užitkovost v rozmnožovacích chovech, které jsou důležitou součástí produkčního systému v ČR. Do studie byly zahrnuty informace o užitkovosti prasnic v rozmnožovacích chovech a jejich matek v chovech šlechtitelských s přihlédnutím k zařazení do superplodné linie. K vyhodnocení vlivu superplodné linie jsme využili smíšený lineární model. Výpočet byl proveden v programu SAS for Windows, verze 9.1.2. Žádný statisticky významný rozdíl nebyl nalezen u žádného ze studovaných reprodukčních ukazatelů. Při vyhodnocení je nutné mít na zřeteli relativně nízký počet jedinců zahrnutých ve studii. I přes neprůkaznost nalezených rozdílů považujeme za důležité, aby na tuto práci navázali další práce, které budou zahrnovat větší počet jedinců a více studovaných znaků. Za splnění těchto podmínek bude možné postihnout komplexnost vztahů mezi jednotlivými produkčními znaky.

selekce, reprodukce, super plodná linie.

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