The Influence of Genotype and Production Conditions on the Fertility of Sows in Outdoor System

Marija UREMOVIĆ
Zvonimir UREMOVIĆ
Zoran LUKOVIĆ
Miljenko KONJAČIĆ

SUMMARY

The aim of investigation was detected effect of genotype and climate conditions on fertility of sows kept in the outdoor system. The fertility of Black Slavonian breed, F_1 – Black Slavonian x Duroc and F_1 Swedish Landrace x Large White were proveded in conditions of continental climate and German Landrace in conditions of Mediterran climate. The number of live born piglets per litter was: 7.42, 8.54, 9.80 and 10.35 ($P<0.01$) and reared piglets per litter was: 6.62, 7.66, 8.03 and 9.45 ($P<0.01$).

Higher death rates of piglets of F_1 – Swedish Landrace x Large White by 7.28% in relation to the Black Slavonian and by 7.70% in relation to F_1 Black Slavonian x Duroc results from higher death rates of this combinations (23.67%) during a colde part of the year.

The research shows that resistant genotypes: Black Slavonian breed and F_1 Black Slavonian x Duroc are suitable for keeping in outdoor in conditions of the conetinetal climate. German Landrace breed provided to be suitable for keeping in the outdoor system of production in conditions of Mediterran climate. That confirm low mortality of piglets of 8,7%.

KEY WORDS

fertility, genotype, outdoor system of production, sow, death

Faculty of agriculture University of Zagreb, Department for animal production
Svetošimunska 25, 10000 Zagreb, Croatia
E-mail: muremovic@agr.hr

Received: June 20, 2003

INTRODUCTION

Pig keeping in outdoor system in the extensive conditions has been a traditional way of pig keeping around the world and in Croatia, too. The production in outdoor system was based on lower productive resistant pig genotypes. Recently, keeping in the open of high productive pig genotypes has been spread. Edwards (1994) mentions that pig keeping in outdoor system is a European perspective. The reason for that are savings of capital requirement for buildings and requests of consumers for products produced in more natural conditions. Saving in pig pen building vary from 25-40% according to Whittemore (1998).

In most countries, breeding pigs are kept in outdoor system. According to Hendricks et al. (1998), England leads in the number of sows kept in outdoor system with 20%, followed by France, Portugal, and Spain with 10%. The number of pigs kept in outdoor system in EU is about 2%. Obstacles in spreading of pig keeping in the open according to Thornton (1988), Mortensen et al. (1994.) and Senesi et al. (2000) are unfavourable climate conditions, increased food consumption and high share of human work. According to mentioned authors, the food consumption per a sow is 8-15% higher, and of human work for about 30%.

The choice of pig genotype for keeping in the open depends on climate conditions. Hein Van der Sten (1994.) mentions that in England, the following can be kept in the open, durok breed, hybrids between Duroc and Landrace and Saddleback and among line hybrids, a hybrid Camborough 12. According to Thornthon (1988.), Hein Van der Sten (1994.) and Mortensten et al. (1994.) there are almost no differences in the number of reared piglets between sows kept in outdoor and indoor. According to authors, 21.2 to 22.3 piglets are reared per a sow in the open and in closed, 21.5 to 22.8. Unlike this, Le Denmat et al. (1995) mentioned that 1-2 piglets per a sow are reared less in the open annually. In conditions of a continental climate in Hungary, according to Hazas et al. (2000) sow hybrids among a Large White, Landrace, Hampshire and Duroc reared 13-17 pigletss per year.

In order to check the possibility of pig keeping in outdoor system, the fertility of sows in continental and Mediterranean climate in Croatia have been followed.

MATERIALS AND METHODS

The research was carried on three family farms out of which two were in the area of the continental climate and one in the area of the Mediterranean climate. The fertility of Black Slavonian breed (BS), F_1 generation between the Black Slavonian breed and Duroc (F_1 – BS x D) and F_1 generation between the Swedish Landrace and Large White (F_1 – SL x LW) was followed in the area of the continental climate. In the area of the Mediterranean climate, the fertility of the German landras (GL) sow was followed.

In the area of the continental climate, sows were kept in pens for farrowing littered with straw in eaves closed on three sides, 6-7 days before farrowing and after farrowing to weaning. During low temperatures piglets were heated by infra-red lamps. After the weaning, sows were kept in the open with the possibility of entering eaves. The number of sows per ha of surface area was from 20-23.

German landrace sows in the area of the Mediterranean climate were kept in wooden houses before farrowing and during the lactation. Ten days after the farrowing, sows could go out on a pasture. From the weaning till the next farrowing sows were kept on the pasture (15 per ha of surface area) with the possibility of entering a house. During gravidity, in a vegetation period, their meal was based on pasture with the addition of 1.5 kg of concentrate. During winter pregnant sows got 2.5 kg concnetrate. A kg of mixture had 12.20 MJME and 12.60% CP. In lactation, sows were fed by a mixture with 13.10 MJME and 15.20% CP. The basis for determining the mixture quantity was the number of pigs in the litter. Sows got 1,5 kg of concentrate for basic needs and 0.5 kg of a concentrate for each piglet in the litter.

In order to analyse the sow fertility, the following was followed:

- the litter size and mass, farrowing index and the number of piglets per a sow annually.
- the number of piglets per litter in cold (10-3 month) and warm (4-9 month) part of the year,
- causes of piglet's death.

The production at all three farms started at the same time buying pregnant gilts, so the relation of sows according to the farrowing order, was almost the same. GSM, method SAS-1989. was used for the statistical-mathematical data procession.

RESULTS AND DISCUSSION

The table 1. shows the fertility of sows of various genotypes in three family farms.

In conditions of continental climate and economies of the same production technology, the sow genotypes had a significant influence on the litter size. The litter size of BS breed obtained in this research matches the earlier data (Ritzoffy, 1935, Hrasnica et al. 1958; Jančić 1971.) In the recent research, Marija Uremović et al. (2000. i 2001.) established lower fertility of this breed. The number of liveborn and reared piglets per litter was lower by 0,6 and 0,5 than in this reserach. Crossing of a BC breed with D-breed resulted in a significant increase of a litter by 1.04 of

Table 1. Fertility of sows kept in outdoor system

	Family farms				Significance
	I		II	III	
	Genotype of sows				
	1.BS	2. F_1-BS xD	3. F_1-SLxLW	4. GL	
Number of sows	60	18	55	15	P < 0,01
Number of litters	292	104	299	95	P < 0,01
Properties	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	
Born live / litter	$7,42 \pm 0,34^{bd}$	$8,54 \pm 0,40^{b}$	$9,80 \pm 0,31^{c}$	$10,35 \pm 0,21^{a}$	P < 0,01
Reared / litter	$6,62 \pm 0,30^{bd}$	$7,66 \pm 0,26^{b}$	$8,03 \pm 0,26^{bc}$	$9,45 \pm 0,28^{a}$	P < 0,01
% Mortality	10,78	10,30	18,06	8,70	
Weight of litter 21days, kg	$25,68 \pm 0,45^{bde}$	$35,29 \pm 0,53^{bd}$	$41,67 \pm 0,67^{bc}$	$54,81 \pm 0,43^{a}$	P < 0,01
Indeks of parturition	1,82	1,90	1,81	2,10	P > 0,05
Bornlive/sow/year	$13,52 \pm 0,62^{bd}$	$16,23 \pm 0,74^{bc}$	$17,74 \pm 0,56^{bc}$	$21,73 \pm 0,45^{a}$	P < 0,01
Reared/sow/year	$12,05 \pm 0,58^{bd}$	$14,55 \pm 0,50^{bc}$	$14,53 \pm 0,48^{bc}$	$19,85 \pm 0,59^{a}$	P < 0,01

Table 2. Fertility of sows in outdoor system to the other investigation

Authors	Country	Born alive/ litter	Reared/ litter	% Mortality	Index of porturition
Thornton (1988)	UK	10,67	8,96	11,03	2,23
Le Denmat i sur. (1995.)	France	10,80	9,10	15,74	-
Hein Van der Sten (1994)	UK	10,82	9,67	10,60	2,19
Mortensen i sur. (1994)	Denmark	11,40	9,60	15,80	-
Hazas i sur. (2000)	Hungary	10,00	8,00	20,00	1,80
		9,66	7,72	20,09	2,00

Table 3. Effect of climate conditions on the fertility of sows

	Family farms							
	I				II		III	
	Genotype of sows							
	1		2		3		4	
	Oct l. March 31	April 1 Sept. 30	Oct l March 31	April 1 Sept. 30	Oct l. March 31	April 1 Sept. 30	Oct l. March 31	April 1 Sept. 30
Number of parturitions	139	153	41	63	116	183	39	56
Born alive / litter	7,35	7,57	8,41	8,62	9,59	9,93	10,20	10,45
Reared / litter	6,41	6,81	7,48	7,81	$7,32^{a}$	$8,48^{b}$	9,38	9,50
% Mortality	12,79	17,21	11,06	9,40	23,67	13,04	8,04	9,09

live born piglets and 0.88 reared piglets. The number of live born piglets of F_1 generation SL x LW was approximately the same with the number of piglets in farms with closed keeping. From 1999 to 2001, according to the Report of CLSC, sows F_1 SL x LW farrowed from 9.58 to 9.82 of live born piglets per a litter. The number of reared piglets in this research (8.03) was smaller in relation to keeping in door system of production (8.21 do 8.53). In continental climate conditions, higher mortality of piglets F_1 – SL x LW was probably the result of lower resistance of this genotype in relation to BS and F_1 BS x D. In the third economy in the Mediterranean climate, the satisfying fertility of GL has been achieved.

The fertility of various genotypes kept in the open in relation to other researchers is shown in the table 2.

The comparison of results in tables 1 and 2 shows that the second and the third farm had approximately the same number of live born piglets per litter as the majority of mentioned countries. The smaller number of reared piglets per litter in the second farm and the death of piglets 18.06% is similar to the Hazas et al. (2000) data for similar climate conditions.

The litter size in a colder and warmer part of the year is shown in the table 3.

The difference in the number of live born piglets per litter during the year is small and insignificant in all three farms. In a colder part of the year, a significantly smaller number of reared piglets is achieved in second economy compared to the warmer one. The death of piglets per cause is shown in the table 4.

Table 4. Cause of death in piglets

		Family farms		
		I	II	III
Number of death piglets	234	92	529	86
Crushed,%	46,39	50,00	44,80	42,35
Weak development, %	16,35	18,10	19,09	24,71
Digestive disorders, %	18,25	22,0	23,44	20,00
Other, %	9,89	10,00	6,99	7,06
Unknown, %	9,12	8,00	5,68	5,88

There is little data on causes of pig death in keeping in the open. Mortensen et al. (1994.) mention that 54% of piglets died due to crushing and 17.3 and 15.1% due to weak development and digestive disorders.

CONCLUSIONS

In continental climate conditions, more resistant pig genotypes: Black Slavonian and F_1 Black Slavonian x Duroc proved to be better for keeping in the out door system of production in relation to F_1 Swedish Landrace x Large White. It is the result of lower percentage of dead piglets. German Landrace had a satisfying fertility in Mediterranean climate conditions.

LITERATURE

Edwards, S., A. (1994): Outdoor pig production : The European perspective. Pig News and Production. Vol. 15, No 4. 111N-112N.

Hazas, Z., Horn, A., Katalin Arnayi (2000): The Effects of outdoor keeping on Reproductive Traits in Pigs. Agiculturae Conceptus Scientificus. Vol. 62. No 1-2, 142-144.

Hein Van der Steen, A., M. (1994): Genotypes for outdoor production. Pig News and Information. Vol. 15, No 4, 129N-130N.

Hendriks, H., J., M., Pedersen, B,. K., Vermeer, H., M. and Wittmann, M. (1998): Pig housing system in Europe: Current distributions and trends. Pig News and Information. Vol. 19, No 4., 97N-103N

Hrasnica, F., Stančić, D., Pavlović, S., Rako, A., Šmalcelj, A. (1958): Specijalno stočarstvo. Poljoprivredni nakladni zavod. Zagreb

Jančić, S. (1971): Svinjogojstvo. Poljoprivredni fakultet Sveučilišta u Zagrebu

Le Denmat, M., Dagorn, J., Aumaitre, A., and Vandelet, J., C. (1995.): Outdoor Pig Breeding in France, Pig News and Information, Vo. 16, No. 1 13N-17N

Mortensen, B., Ruby, V., Pedersen, B., K., Smith, J., Aarestup Larsen, V. (1994): Outdoor pig production in Denmark. Pig News and Information. Vol. 15. No 4, 117N-120N.

Report of Croatian Livestock Selection Centre (1999–2001).

Ritzoffy N. (1935): Uzgoj svinja, s. 76, Zagreb

Senesi, S., I., Vietes C., M., Basso C., P., De Caro A. (2000): A study of an outdoor pig farm in Argentina: productivity and economic indeks. Pig News and Information. Vol. 21, No, 4. 127N-131N.

Thornton, K. (1988): Outdoor Pig Production. Farming Press Limited, United Kingdom.

Uremović, M., Uremović, Z., Luković, Z. (2000): Production properties of the Black Slavonian Pig Breed. Zbornik Biotehniške Fakultete Univerze v Ljubljani. Vol. 76., No 2, 131-134.

Uremović, M., Uremović, Z., Luković, Z. (2001): Stanje u autohtonoj crnoj slavonskoj pasmini svinja. Zbornik radova Biološka raznolikost u stočarstvu Republike Hrvatske, 123-129.

Whittemore, C., T. (1998): Outdoor system for breeding sows. In The Science and Practice of pig production. 502-506.

acs68_42