
ANALYSIS OF REPRODUCTION AND PRODUCTION
PARAMETERS OF MOTHER POPULATIONS AND GENEALOGICAL
BOAR POPULATIONS BY MEANS OF M BLUP-AM METHOD IN
SLOVAKIA¹

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Abstract: This paper evaluates all population averages of mother population concerning both reproduction and production parameters in Slovakia during the years 1996 – 2001.

The prediction of breeding value of the best boar populations WI, WM and L during the period 2000 - 2002 was carried out by means of M BLUP-AM method.

Based on the achieved total population averages, the best breeds in regard to reproduction efficiency were WI and WM in year 2001, total live born piglets WI 11,28, WM 11,34 and L 10,59; new live born WI 10,75, WM 10,78, L 10,18 reared piglets WI 9,96, WM 9,88 and L 9,68.

On the basis of total breeding value (TBV), the best genealogical populations of mother breeds were evaluated and included in the “top ladder”.

In Slovakia the best genealogical boar populations of WI breed were as follows: Pintos with 806 total breeding value (TBV), SUNAR with 784,1 (TBV) Faber with 771.8 (TBV) total breeding value.

The best results in genealogical boar populations (WM breed) were achieved in Don with 701.7 total breeding value (TBV), Rank with 636.7 (TBV) total breeding value and Norik with 614.5 (TBV) total breeding value.

In Landrace the best populations were as follows: Floppy with 730.6 (TBV) total breeding value (TBV), Damborek with 634.3 (TBV) and Don with 723.4 (TBV).

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M BLUP-AM method enables more precise evaluation of genetic value of individual animals and breeds and subsequently it provides more objective controlled selection and further breeding pig breeds.

Key words: pigs, Animal model, fattening and carcass value

Introduction and references

In recent years the main question of breeding and hybridization in Slovakia was how to improve meat efficiency at reduced feed consumption as well as how to maintain reproduction properties on a certain level. Further improvement in this area is impossible without optimization of breeding value prediction methods.

The more precise the breeding value is, the higher the breeding advancement can be expected. Therefore breeders are looking for the method of a precise prediction of values in pigs included in selection. Such precise prediction is enabled by BLUP method (Best Linear Unbiased Prediction). At present it is the most progressive method of breeding value prediction. The most optimum programme using M BLUP-AM method is PEST – *Groeneveld, Peškovičová (1999)*. This programme enables to achieve breeding values for the individual traits as well as multidimensional models and effects with more traits while respecting additive – genetic affinity.

Predictions by means of M BLUP-AM method include parameters of field test, fattening and carcass values from testing stations as well as reproduction parameters. The evaluation of mother populations emphasizes mainly the reproduction parameters since they have significant impact on breeding effectiveness and become an important part of breeding programmes. The problem of reproduction parameters has been dealt with by many authors – *Anderson, Karras (1994)*. Selection indices and prediction of breeding reproduction values were dealt with by *Flak et. al (1997)*, *Bobček et. al. (1991)*, *Matoušek et al. (1999)*, *Wolfová, Wolf (1997)*, *Peškovičová et al. (1997)*, *Bobček, Řeháček (1999)* and others.

Materials and Methods

The results of control of efficiency degree I in Slovakia as well as data provided by the State Centre of Information Technology in Žilina helped us to evaluate total reproduction and production breeding population averages in Slovakia during the period 1996 – 2002. Genealogical boar populations in the individual mother breeds White

Improved (WI), White Meat (WM) and Landrace (L) were evaluated by means of M BLUP-AM method. This method has been widely used in Slovakia since January 2000. Recently, a two-year result of efficiency of individual hybridization breeding has been evaluated.

In year 2001 there were 83 breeding herds in Slovakia. The representations of the individual breeds were as follows: mother population WI - 45 breeding (5002 sows), WM – 14 breeding (1337 sows) and L – 6 breeding (558 sows), which in total represents 65 breeding (6897 mother populations).

In addition, M BLUP-AM method was used in the evaluation of WI - 675 genealogical boar populations, WM - 243 genealogical boar populations, and L - 309 genealogical boar populations carried out from January 2000 to January 2002.

Methodology of evaluation has respected valid standards STN 46 6464 and 46 6150 used in the control of efficiency of individual breeding. The calculations of genetic and environment trends were based on the multidimensional animal system M BLUP by *Peškovičová, Groeneveld et al. (1999)*.

Results

The evaluation of reproduction parameters in mother populations for the years 1996 – 2001 is given in table 1. As far as the individual reproduction trends are concerned, the results achieved were as follows: WI and WM tend to rise slightly in all new-born pigs (ABA), namely in WI numbers have risen from 10.7 (1996) to 11.2 piglets (2001), in WM from 10.9 (1996) to 11.3 piglets (2001). The same tendency was observed in the number of born alive (BA) and reared piglets (R). Mortality was as follows: WI 0,8 - 0,9 piglets and WM 0,8 - 1,1 piglets. Landrace showed decreased reproduction efficiency in all parameters. The evaluation of mother populations carried out in the testing stations of fattening and carcass value based on all population averages during the years 1996 – 2001 is shown in table 2.

Table 1. Results of reproduction efficiency of dam pig populations in Slovakia during the years 1996-2001

Tabela 1. Rezultati reproduktivne efikasnosti ženskih populacija u Slovačkoj tokom 1996-2001

Breed/ Rasa	Year/ godina	Number of Sows/ Br. krmača	Piglets/litter – Prasad/leglo						
			All born-alive piglets/ Živorodena prasad ABA		New born-alive piglets/ Nova živorođena prasad BA		Reared piglets/ Odgajena prasad R		Mortality/ Smrtnost M
			\bar{x}	di	\bar{x}	di	\bar{x}	di	
WI	1996	4602	10.75	-0.29	10.36	-0.17	9.53	-0.17	0.8
	1997	5428	10.93	-0.11	10.44	-0.09	9.62	-0.08	0.8
	1998	5477	11.04	0.00	10.56	+0.03	9.63	-0.07	0.9
	1999	5743	11.05	+0.01	10.58	+0.05	9.66	-0.04	0.9
	2000	5106	11.26	+0.22	10.63	+0.10	9.87	+0.17	0.8
	2001	5002	11.28	+0.24	10.75	+0.22	9.96	+0.26	0.8
APA 96/01			11.04	-0.29/+0.24	10.53	-0.17/+0.22	9.70	-0.17/+0.26	0.83
WM	1996	1348	10.95	-0.18	10.52	-0.13	9.71	-0.03	0.8
	1997	1542	11.07	-0.06	10.54	-0.15	9.58	-0.16	1.0
	1998	1580	11.11	-0.05	10.66	+0.01	9.66	-0.08	1.0
	1999	1508	11.09	-0.04	10.75	+0.10	9.82	+0.08	1.1
	2000	1338	11.32	+0.19	10.82	+0.17	9.88	+0.14	1.0
	2001	1337	11.34	+0.21	10.78	+0.13	9.88	+0.14	0.9
APA 96/01			11.13	-0.18/+0.21	10.65	-0.15/+0.17	9.74	-0.16/+0.14	0.98
L	1996	361	10.91	+0.17	10.81	+0.29	10.02	+0.24	0.8
	1997	520	10.68	-0.06	10.57	+0.05	9.78	0.00	0.8
	1998	538	10.83	+0.09	10.59	+0.07	9.92	+0.14	0.6
	1999	653	10.85	+0.11	10.58	+0.06	9.78	0.00	0.8
	2000	535	10.69	-0.05	10.39	-0.13	9.57	-0.21	0.8
	2001	558	10.59	-0.15	10.18	-0.34	9.68	-0.10	0.5
APA 96/01			10.74	-0.15/+0.17	10.52	-0.34/+0.29	9.78	-0.21/+0.24	0.75

Legend: WI – White Improved/Bela oplemenjena, WM - White Meat/Bela mesnata, L – Landrace/Landras, APA - All Population Averages/prosek svih populacija

Table 2. Results of all population averages of mother populations concerning fattening and carcass parameters during the years 1996-2001

Tabela 2. Vrednosti proseka svih populacija kod majčinskih populacija a u vezi sa parametrima tovnosti i kvalitet trupa tokom perioda 1996-2001

Breed/Rasa		Daily weight gain in g/ Dnevni prirast težine u g	Consumption in ME/MJ/ Potrošnja hrane u ME/MJ	Feed mixture consumption/ Potrošnja hraniva, kg	Back fat in cm/ Debljina leđne slanine u cm	MLD in cm ² MLD u cm ²	Carcass loin in %/ Masno tkivo u trupu u %
WI n=5629	\bar{x}	811.9	37.19	2.95	1.92	45.51	52.13
	s	110.4	0.29	0.40	0.46	5.83	3.12
	di	-25.5/+29.1	-1.07/+1.07	-0.13/+0.14	-0.23/+0.17	-2.06/+1.61	-1.64/+1.22
WM n=1980	\bar{x}	801.6	38.46	3.09	1.96	44.90	51.80
	s	105.4	0.31	0.42	0.39	5.04	2.73
	di	-15.6/+30.5	-3.31/+1.57	-0.27/+0.14	-0.32/+0.19	-2.77/+1.61	-2.55/+1.29
L n=795	\bar{x}	840.7	37.0	2.93	1.79	47.86	52.08
	s	94.3	0.32	0.39	0.39	6.86	2.69
	di	-23.4/+31.3	-0.83/+1.35	-0.09/+0.12	-0.14/+0.17	-1.38/+1.47	-1.66/+1.62

Legend: di - difference interval of all population Averages of Mother population during the years 1996-2001/razlika intervala za proseke svih populacija majki tokom perioda 1996-2001

Landrace achieved the best evaluation as far as production parameters of mother populations are concerned. It also achieved an all population average from 30 to 100 kg, namely 847.7g, s 94.3 with difference min-max – 23.4g / +31.3g at consumption 37.0 ME / MJ, s 0.32, and feed mixture consumption / 1 kg gain – 2.93 kg, s 0.32.

The second best results were achieved in WI whose daily gain was 811.9 g, s 110.4, with difference min-max – 25.5g / + 29.1g at consumption 37.19 ME / MJ, s 0.29, and feed mixture consumption 2.95 kg, s 0.40.

Landrace also achieved the highest carcass value parameters, namely: back fat thickness – 1.79, s 0.39, difference min-max –0.14cm / + 0.17cm, *m.l.d.* 47.86 cm², s 6.86, and carcass loin value 52.18 %, s 2.69, and difference min-max –1.66 %/ + 1.62%

WI achieved the lowest values in all production parameters during the years 1996 - 2001 with respect to all population averages. The evaluation of the best genealogical boar populations based on mother breeds is shown in Table 3.

Table 3. Evaluation of the best boars of White Meat genealogical population based on total breeding values in top ladder during the years 2000-2002

Tabela 3. Ocena najboljih nerastova populacije bele mesnate svinje na bazi ukupnih priplodnih vrednosti na skali tokom perioda 2000-2002

Number/Broj	Boar population/ Populacija nerastova	Registration number/ Matični broj	Range (TBV)/Opseg(UPV)	Breeder/Odgajivač
WI				
			min - max	
1	Pintos	1857 - 4015	554.3 - 806.2	Agro Insemas,s.r.o, Ratka
2	Sunar	1342 - 3001	570.2 - 784.1	AC Sol'
3	Faber	1398 - 4003	633.5 - 771.8	ISK Kružno
4	Amulet	1818 - 4016	618.2 - 708.5	AC Agrospol, Bolkovce
5	Tyrsk	1951 - 4005	521.6 - 660.5	ISK Hurbanovo
WM				
1	Don	884 - 4103	550.6 - 701.7	AC Hontianske Moravce
2	Rank	884 - 4114	570.0 - 636.7	AC Krakovany-Stráže
3	Norik	1479 - 4005	576.9 - 614.5	AC Senica
4	Calesh	1430 - 1024	498.8 - 617.6	AC Mojmirovce
5	Ossi	1433 - 4014	480.4 - 538.9	AC Uhrovec
L				
1	Floppy	1917 - 4015	300.9 - 730.6	AC Kovařov
2	Damborek	1470 - 4012	612.7 - 634.3	AC Krakovany - Stráže
3	Don	884 - 4038	563.6 - 723.4	ISK Hurbanovo
4	Deniso	1837 - 2001	513.9 - 514.9	Agrofarma, s.r.o. Kysuca
5	Filan	1466 - 4003	274.0 - 508.0	ISK Rybničky-Dolná Krupá

The evaluation of individual genealogical populations in Slovakia during 2000- 2002 was based on the estimation of a total breeding value. The best values for WI breed were achieved by Pintos 1857 / 4015 ranging

min. - max. from 554.3 to 806.2 (TBV) total breeding value from Agro Insemas in Ratka. Further best values were achieved in the following populations: Faber 1398 / 4003 – 4004 – 4005 – 4006 ranging from 633 to 771.8 (TBV) total breeding value from ISK Kružno, Amulet 1818/ 4016 ranging from 618.2 to 708.5 (TBV) total breeding value from AC Agropol in Bolkovce.

WM breed the best genealogical boar populations ranked as follows: Don 884 / 4103 – 4114 ranging from min. – max. 550.06 – 701.7 (TBV) total breeding value from the agricultural cooperative (AC) Hontianske Moravce, Rank 1692 / 1010 ranging from 570.1 – 636.7 (TBV) total breeding value from the AC in Krakovany- Stráže, Norik 1479 / 4005 – 4006 – 4007 ranging from 576.9 to 614.5 (TBV) total breeding value from the AC in Senica.

L breed the best Floppy 1917 / 4015 – 4013 – 4003 ranging min. – max. from 300.9 to 730.6 (TBV) total breeding value from the AC in Koval'ov, Damborek 1470 / 4012 ranging from 612.7 to 634.3 (TBV) from the AC Krakovany-Stráže, Don 884/ 4038 ranging from 563.6 – 723.4 (TBV) from ISK Hurbanovo. The distribution of breeding values of traits according to M BLUP-AM based on extreme limits for boar populations and total breeding value in the “top ladder” are shown in table 4.

Table 4. Economical factors for prediction of breeding values M BLUP-AM based on extreme limits according to the individual boars of mother population

Tabela 4. Ekonomski faktori za ocenu priplodne vrednosti M BLUP-AM na bazi ekstremnih granica prema pojedinačnim nerastovima iz majčinske populacije

Breed/ Rasa	Top Ladder/ Skala	Number of boars/ Br. nerastova	Field test/Test na terenu		Station test/Test u stanici			Reproduction/Reprodukcija		TBV/ UPV (Sk)
			Average daily gain/ Prosečni dnevni prirast, g	Average backfat in cm/ Prosečna debljina leđne slanine, cm	Average daily gain/ Prosečni dnevni prirast, g	Valuable carcass loin in %/ Vredni slabinski deo trupa, %	Average backfat in cm/ Prosečna debljina leđne slanine, cm	New-born/ Novorođen a prasad, BA ₁ alive/živa - 1	New-born/ Novorođena prasad BA ₂ alive/živa - 2	
WI	01	6	52.2	-0.26	88.4	3.59	-0.58	1.07	0.99	741.4
WI	05	30	44.0	-0.18	71.2	2.68	-0.41	0.80	0.78	528.8
WI	10	59	37.3	-0.14	57.6	2.26	-0.35	0.70	0.64	470.9
WI	20	118	30.1	-0.10	45.8	1.82	-0.25	0.54	0.49	382.3
WI	50	296	18.1	-0.02	19.8	0.89	-0.12	0.23	0.23	252.2
WM	01	2	54.9	-0.25	101.2	3.67	-0.47	1.30	1.03	660.7
WM	05	9	43.3	-0.23	69.2	3.03	-0.40	1.02	0.79	545.4
WM	10	18	34.8	-0.18	59.6	2.65	-0.34	0.92	0.73	483.2
WM	20	35	29.1	-0.14	51.6	2.19	-0.30	0.70	0.56	408.0
WM	50	89	15.6	-0.04	24.8/	1.08	-0.14	0.31	0.20	241.4
L	01	3	58.6	-0.23	105.2	3.90	-0.51	1.04	0.79	654.4
L	05	13	45.0	-0.17	80.4	3.04	-0.36	0.75	0.58	520.6
L	10	53	28.2	-0.09	49.4	1.65	-0.23	0.38	0.29	324.6
L	20	53	28.2	-0.19	49.4	1.65	-0.23	0.38	0.29	324.6

Legend: TBV/UPV - total breeding value/ukupna priplodna vrednost, Sk - Slovak piece

The breeding values for each trait express a predicted genetic deviation of the animal in question with respect to the average value of a particular mother breed expressed in total breeding value and/or in Sk.

The highest total breeding value in the “top ladder” by Jun 30, 2002 was achieved in WI – 741.4 (TBV) total breeding value (top 01). The same value was achieved by 6 boar populations.

The second best value was achieved in two boar populations WM with 660.7 (TBV) total breeding value (top 01). The lowest values were found in three boar populations L with 654.4 (TBV) total breeding value (top 01). The low values achieved in reproduction parameters resulted markedly in the low values of total breeding values.

ANALIZA REPRODUKTIVNIH I PROIZVODNIH PARAMETARA
ŽENSKIH POPULACIJA I GENEALOŠKE POPULACIJE
NERASTOVA M BLUP-AM METODOM U SLOVAČKOJ

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Rezime

U ovom radu se ocenjuju proseci svih maj;inskih populacija koji se odnose na reproduktivne i proizvodne parameter u Slovačkoj u periodu 1996-2001.

Priplodna vrednost populacija nerastova rasa WI-bela oplemenjena, WM-bela mesnata i L-landras tokom perioda 2000 - 2002 je ocenjivana metodom M BLUP-AM.

Na osnovu dobijenih ukupnih proseka populacija, najbolje rase u pogledu reproduktivne efikasnosti su bile WI-bela oplemenjena i WM-bela mesnata.

Na osnovu ukupne priplodne vrednosti (TBV/UPV), najbolje genealoške ženske populacije su ocenjene i uključene u “skalū”.

U Slovačkoj, najbolje genealoške populacije rase WI-bela oplemenjena su bile sledeće: Pintos sa 806 (TBV/UPV) ukupne priplodne vrednosti, Sunar sa 784,1 (TBV/UPV) i Faber sa 771.8 (TBV/UPV) ukupne priplodne vrednosti.

Najbolji rezultati za genealoške populacije nerastova (rase WM-bela mesnata) su postignuti kod Dona sa 701.7 (TBV/UPV) ukupne priplodne vrednosti, Ranka sa 636.7 (TBV/UPV) ukupne priplodne vrednosti i Norika sa 614.5 (TBV/UPV) ukupne priplodne vrednosti.

Najbolje populacije rase landras su bile sledeće: Floppy sa 730.6 (TBV/UPV) ukupne priplodne vrednosti, Damborek sa 634.3 (TBV/UPV) i Don sa 723.4 (TBV/UPV) ukupne priplodne vrednosti.

M BLUP-AM metoda je omogućila precizno određivanje genetske vrednosti pojedinačnih životinja i rasa i obezbedila objektivnije kontrolisanu selekciju i dalje oplemňivanje rasa svinja.

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