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PRODUCTION PARAMETERS OF MOTHER POPULATIONS AND GENEALOGICAL BOAR POPULATIONS BY MEANS OF M BLUP-AM METHOD IN SLOVAKIA[1]

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Abstract: This paper evaluates all population averages of dam pig population concerning both reproduction and production parameters in Slovakia during the years 1996 – 2002.

The prediction of breeding value of the best sire populations Large White (LW), White Meaty (WM), Landras (L) during the years 2000 - 2002 was estimated by means of M BLUP-AM method.

Based on the achieved total population averages, the best breeds as far as reproduction efficiency were LW and WM in year 2002 number born piglets in total Large White 11.23, White Meaty 11.33 and Landras 10.70; live - born piglets LW 10.77, WM 10.65, L 10.42 reared piglets LW 9.82, WM 9.63 and L 9.82.

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

In Slovakia the best genealogical sire populations LW breed were as follows: Pintos with 806.2 total breeding value (TBV), Sunar with 784.1 (TBV) Faber with 771.8 (TBV) total breeding value.

In White meaty, the best results in genealogical sire populations 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 Landras 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).

M BLUP-AM method enables to make genetic value of individual animals and breeds more precise, and subsequently to provide more objective controled 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 the reduced feed consumption as well as how to

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maintain reproduction properties on a certain level. Further improvement in this area is impossible without optimization of breeding value prediction methods.

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 *Fľak et. al (1997), Bobček et. al. (1991), Matoušek et al. (1999), Wolfová, Wolf (1997), Peškovičová et.al. (1997), Bobček, Řeháček (1999)* and others.

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 enables 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 – genetical 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 dam pig populations emphasizes mainly the reproduction parameters since they have a significant impact on breeding effectiveness and become an important part of breeding programmes.

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 years 1996 – 2002. Genealogical sire populations in the individual mother breeds Large White (LW), 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, two-year investigation results of efficiency of individual hybridization breeding were evaluated.

In year 2002 there were 65 Nucleus Herds in Slovakia. The representations of the individual breeds were as follows: dam pig population LW - 45 nucleus herds (5144 sows), WM – 14 nucleus herds (1317 sows) and L – 6 nucleus herds (574 sows), which in total represents 65 nucleus herds (7035 dam pig populations).

In addition to, M BLUP-AM method was used in the evaluation of LW - 675 genealogical sire populations, WM - 243 genealogical sire populations, and L - 309 genealogical sire populations carried out from Years 2000 to 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 and Discussion

The evaluation of reproduction parameters in dam pig populations for the years 1996 – 2002 is given in Tab.1. As far as the individual reproduction trends are concerned, the results achieved were as follows: LW and WM trend to rise slightly in all born alive piglets, namely in LW numbers have risen from 10.7 (1996) to 11.2 piglets (2002), in WM from 10.9 (1996) to 11.3 piglets (2002). The same tendency was seen in the number of newborn alive piglets and reared piglets. Mortality had LW 0,8 - 0,9 piglets and WM 0,8 - 1,1 piglets. Landrace showed decreased reproduction efficiency in all parameters. The evaluation of dam pig populations carried out in the testing stations of fattening and carcass value based on all population averages during the years 1996 – 2002 is shown in Tab.2.

Table 1. Results of reproduction efficiency of dam pig populations in Slovakia during the years 1996-2002

Tabela 1. Reproduktivni rezultati odnosno efikasnost populacija krmača u Slovačkoj u periodu od 1996 do 2002. godine

Breed/ Rasa	Year/ god.	Number of Sows/ Broj krmača	Piglets/litter – Prasad/leglo						
			Born piglets total/ Ukupno rođene prasadi		Live – born piglets/ Živorođena prasad		Reared piglets/ Odgajena prasad		Mortality/ Smrtnost
			$\bar{x}$	di	$\bar{x}$	di	$\bar{x}$	di	
LW	1996	4602	10.75	-0.32	10.36	-0.22	9.53	-0.19	0.8
	1997	5428	10.93	-0.14	10.44	-0.14	9.62	-0.10	0.8
	1998	5477	11.04	-0.03	10.56	-0.02	9.63	-0.09	0.9
	1999	5743	11.05	-0.02	10.58	0.00	9.66	-0.06	0.9
	2000	5106	11.26	+0.19	10.63	+0.05	9.87	+0.15	0.8
	2001	5002	11.28	+0.21	10.75	+0.17	9.96	+0.24	0.8
	2002	5144	11.23	+0.16	10.77	+0.19	9.82	+0.10	0.8
APA 96/02			11.07	-0.32/+0.21	10.58	-0.22/+0.19	9.72	-0.19/+0.24	0.82
WM	1996	1348	10.95	-0.22	10.52	-0.15	9.71	-0.02	0.8
	1997	1542	11.07	-0.10	10.54	-0.17	9.58	-0.15	1.0
	1998	1580	11.11	-0.09	10.66	-0.01	9.66	-0.07	1.0
	1999	1508	11.09	-0.08	10.75	+0.08	9.82	+0.09	1.1
	2000	1338	11.32	+0.15	10.82	+0.15	9.88	+0.15	1.0
	2001	1337	11.34	+0.17	10.78	+0.11	9.88	+0.15	0.9
	2002	1317	11.33	+0.16	10.65	-0.02	9.63	-0.10	0.8
APA 96/02			11.17	-0.22/+0.17	10.67	-0.17/+0.15	9.73	-15/+15	0.94
L	1996	361	10.91	+0.16	10.81	+0.31	10.02	+0.23	0.8
	1997	520	10.68	-0.07	10.57	+0.07	9.78	-0.01	0.8
	1998	538	10.83	+0.08	10.59	+0.09	9.92	+0.13	0.6
	1999	653	10.85	+0.10	10.58	+0.08	9.78	-0.01	0.8
	2000	535	10.69	-0.06	10.39	-0.11	9.57	-0.22	0.8
	2001	558	10.59	-0.16	10.18	-0.32	9.68	-0.11	0.5
	2002	574	10.70	-0.05	10.42	-0.08	9.82	+0.03	0.9
APA 96/02			10.75	-0.16/+0.16	10.50	-0.32/+0.31	9.79	-0.22/+0.23	0.74

Legend: LW – Large White, WM - White Meat, L - Landrace, APA - All Population Averages during the Years 1996-2002

Legenda: LW – Velika bela, WM – Bela mesnata, L - Landras, APA – Proseci svih populacija za period 1996-2002

Table 2. Results of all population averages of dam pig populations concerning fattening and carcass parameters during the years 1996-2002
Tabela 2. Prosečne vrednosti svih populacija krmača za tovne i klanične parametre za period 1996-2002

Breed/ Rasa		Daily weight gain in g/ Denvni prirast, g	Consumption in ME/MJ/ Konzumacija u ME/MJ	Feed mixture consumption/ kg/ Potrošnja smeše, kg	Back Fat in mm/ Leđna slanina, mm	MLLT in mm^2/ MLLT, mm^2	Carcass loin in %/ Masno tkivo trupa u %
LW n=5629	$\bar{x}$	811.9	37.19	2.95	19.2	455.1	52.13
	s	110.4	0.29	0.40	4.6	5.83	3.12
	di	-25.5/+29.1	-1.07/+1.07	-0.13/+0.14	-2.3/+1.7	-20.6/+16.1	-1.64/+1.22
WM n=1980	$\bar{x}$	801.6	38.46	3.09	19.6	449.0	51.80
	s	105.4	0.31	0.42	3.9	5.04	2.73
	di	-15.6/+30.5	-3.31/+1.57	-0.27/+0.14	-3.2/+1.9	-27.7/+16.1	-2.55/+1.29
L n=795	$\bar{x}$	840.7	37.0	2.93	17.9	478.6	52.08
	s	94.3	0.32	0.39	3.9	6.86	2.69
	di	-23.4/+31.3	-0.83/+1.35	-0.09/+0.12	-1.4/+1.7	-13.8/+14.7	-1.66/+1.62

Legend: di - difference interval of all population averages of dam pig population during the years 1996-2002
Legenda: di – interval razlika kod svih proseka populacija krmača tokom perioda 1996-2002

Landrace achieved the best evaluation as far as production parameters of dam pig 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 LW 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.

Landras also achieved the higbest carcass value parameters, namely: back fat thickness – 1.79, s 0.39, difference min-max –0.14cm / + 0.17cm, m.l.l.t. 478.6 mm^2, s 6.86, and carcass loin value 52.18 %, s 2.69, and difference min-max –1.66 %/ + 1.62%

LW 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 sire populations based on dam pig populations are shown in Tab. 3.

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

Tabela 3. Ocena nerastova genealoških populacija rasa velika bela, bela mesnata i landras koja se bazira na ukupnoj priplodnoj vrednosti i rangu tokom perioda 2000-2002

Number/ Broj	Sire population/ Populacija nerasta	Registration number/ Registarski broj	Range (TBV)/ Opseg	Breeder/ Odgajivač
LW				
			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 Soľ
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 Mojmírovce
5	Ossi	1433 - 4014	480.4 - 538.9	AC Uhrovec
L				
1	Floppy	1917 - 4015	300.9 - 730.6	AC Kovaľov
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. LW breed the best values achieved 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: Sunar 1342/3001 from 570.2 – 784.1 AC Soľ Faber 1398 / 4003 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 Agrospol in Bolkovce.

WM breed the best genealogical sire populations ranked as follows: Don 884 / 4103 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 ranging from 576.9 to 614.5 (TBV) total breeding value from the AC in Senica.

L breed the best Floppy 1917 / 4015 ranging min.–max. from 300.9 to 730.6 (TBV) total breeding value from the AC in Kovaľov, 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 sire populations and total breeding value in the "top ladder" are shown in Tab. 4.

Table 4. Economical factors for prediction of breeding values M BLUP-AM based on extreme limits according to the individual sires and dam population
Tabela 4. Ekonomski faktori za ocenu priplodne vrednosti M BLUP-AM koje se baziraju na ekstremnim graničnim vrednostima prema pojedinačnim populacijama nerastova i krmača

Breed/ Rasa	Top Ladder/ Rang	Number of sires/ Broj nerastova	Field test/ Test na terenu		Station test/ Test u stanici			Reproduction/ Reprodukcija		TBV (Sk)
			Average daily gain g/ Prosečni dn. prirast,g	Average backfat in cm/ Prosečna leđna slanina, cm	Average daily gain g/ Prosečni dn. prirast,g	Valuable carcass loin in %/ Vredni delovi trupa, %	Average backfat in cm/ Prosečna leđna slanina, cm	Live-born, piglets 1/ Živorođena prasad 1	Live born piglets 2/ Živorođena prasad 2	
LW	01	6	52.2	-0.26	88.4	3.59	-0.58	1.07	0.99	741.4
LW	05	30	44.0	-0.18	71.2	2.68	-0.41	0.80	0.78	528.8
LW	10	59	37.3	-0.14	57.6	2.26	-0.35	0.70	0.64	470.9
LW	20	118	30.1	-0.10	45.8	1.82	-0.25	0.54	0.49	382.3
LW	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/Legenda: TBV - total breeding value/ukupna priplodna vrednost, Sk - Slovak crown/slovačka kruna

The breeding values for each trait express a predicted genetical 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 values in the "top ladder" by December 2002 were achieved in LW – 741.4 (TBV) total breeding value (top 01). The same value was achieved by 6 sire populations.

The second best values were achieved in two sire populations WM with 660.7 (TBV) total breeding value (top 01). The lowest values were found in three sire 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.

Conclusion

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

The prediction of breeding value of the best sire populations LW, WM and L during the years 2000 - 2002 was estimated by means of M BLUP-AM method.

Based on the achieved total population averages, the best breeds as far as reproduction efficiency were LW and WM.

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

In Slovakia the best genealogical sire populations LW breed were as follows: Pintos with 806.2 (TBV) total breeding value, Sunar with 784.1 (TBV) Faber with 771.8 (TBV) total breeding value.

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

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

M BLUP-AM method enables to make genetic value of individual animals and breeds more precise, and subsequently to provide more objective controled selection and further breeding pig breeds.

PROIZVODNI PARAMETRI POPULACIJA MAJKI I GENEALOŠKE POPULACIJE NERASTOVA KORIŠĆENJEM M BLUP-AM METODE U SLOVAČKOJ

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Rezime

U ovom radu se ocenjuju prosečne vrednosti populacija krmača i to reproduktivni I proizvodni parametri u slovačkoj tokom 1996 – 2002.

Predviđanje priplodne vrednosti najbolje populacije nerastova rase velika bela (LW), bela mesnata (WM), landras (L) tokom perioda 2000 - 2002 je izvršeno korišćenjem M BLUP-AM metode.

Na bazi dobijenih proseka populacija, najbolje vrednosti za reproduktivnu efikasnost utvrđene su kod LW i WM u 2002.godini: broj rođene prasadi kod velike bele 11.23, bele mesnate 11.33 i landrasa 10.70; živorođene prasadi LW 10.77, WM 10.65, L 10.42; odgajene prasadi LW 9.82, WM 9.63 i L 9.82.

Na bazi ukupne priplodne vrednosti (TBV), utvrđivane su najbolje genealoške populacije rasa krmača I uključivane u rang.

U slovačkoj, najbolje genealoške populacije nerastova su bile LW rasa, i to: Pintos sa 806.2 ukupnom priplodnom vrednošću (TBV), Sunar sa 784.1 (TBV), Faber sa 771.8 (TBV).

Kod bele mesnate rase, najbolji rezultati u pogledu genealoških populacija nerastova utvrđeni su kod Dona sa 701.7 ukupnom priplodnom vrednošću (TBV), Ranka sa 636.7 (TBV) i Norika sa 614.5 (TBV).

Kod landrasa, najbolje populacije su bile: Floppy sa 730.6 (TBV) ukupnom priplodnom vrednošću (TBV), Damborek sa 634.3 (TBV) i Don sa 723.4 (TBV).

M BLUP-AM metod omogućava dobijanje preciznije genetičke vrednosti pojedinačne životinje i rasa, kao i objektivniju selekciju i dalji odgoj rasa svinja.

Ključne reči: svinje, animal model, tovne i klanične vrednosti.

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