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Research on the influence of genetic structure and on the main morpho-productive and reproductive traits in Bazna swine breed, 157 and 001 strain

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Abstract. The aim of the present study is the phenotypic characterization of the lines 157 and 001 from the Bazna breed porcine population, breaded at SCDA Turda, for the main morpho-productive and reproductive traits: number of piglets born, number of alive piglets, lot weight at birth, lot weight at 21 days, weight at 21 days/idividual, weaning weight/idividual, initial test weight/idividual and final test weight/idividual. To achieve the goal of this study we have established the following objectives: the estimation of average values and dispersion indices for the analyzed traits in two lines and comparative analysis between phenotypic values of the two lines. The biological material used in the study is the offspring's of four boars, two belonging to strain 157 (boars 010-027 and 010-088) and two to strain 001 (boars 012-027 and 012-028) obtained from seven sows mating. At each sow we performed three successive births. By comparing the two lines in evolution weight traits from calving to test exit, it was found that 001 line is superior in all situations, and for the number of piglets born alive, the differences between average values are statistically insignificant.
Key Words: Swine, Bazna, lines, testing, calving, reproductive traits.

Introduction. There is a well known continuous development in all national economy branches, the trend of modernization and improvement of production processes in all departments had a great influence on various agriculture sectors, where an important role is played by the livestock compartment.

In livestock management, swine breeding is an important branch to ensure the meat consumption needs of the population. The main productions obtained from this specie are meat and fat, the secondary ones are skin and hair, and also blood, intestines, stomach, internal secretion glands, bones, hooves and manure.

In many countries, pork has a proportion of 20 – 50 % of total meat production, and in Romania is one of the most consumed meat (Ichim 2012; Iurcă 1998)). Swine growth is a continuous activity, ensuring permanent employment, with the possibility of workers specialization for a certain activity.

Due to the swine biological particularities (high precocity, fecundity up to 98 – 100 %, high prolificacy, short duration of gestation and a high forage capitalization) and a high labor productivity, pigs breeding proves to be profitable, having a high economic efficiency. All these advantages can be capitalized in a case of an adequate biosecurity management (Papatsiros 2013; Kataria & Kataria 2012), and providing optimum welfare conditions (Kataria et al 2013; Kataria & Kataria 2013; Untaru et al 2012).

The aim of this paper is the phenotypic characterization of 157 and 001 lines from Bazna breed, for the main morpho-productive and reproduction traits: the number of born piglets, the number of alive piglets, lot weight at birth, lot weight at 21 days, the

weight at 21 days/idividual, weaning weight/idividual, initial test weight/idividual and final test weight/idividual.

To achieve these goals we have set the following objectives:

- Estimation of the average and dispersion indices for the two lines analyzed traits;
- Comparative analysis of phenotypic values on the two lines;

The study was performed at Turda Agricultural Research and Development Station, Cluj.

Material and Method. For this study we observed four Bazna breeding boars, 2 from line 157 (boars 010-027 and 010-088) and two from line 001 (boars 012-027 and 012-028). Boars performances have been recorded after the analysis of offsprings obtained from 3 successive calving, from 7 sows. Piglets produced were counted and weighted at different ages: from birth to 21 days, at weaning (56 days), at testing start (90 days) and testing end (180 days) (Felvinti 2013).

The raw data were statistically processed, estimating: arithmetic average, variance, standard deviation, standard error of the average and variation coefficient (Cighi 2008).

To analyze the differences between average values and statistical significance we used the Student test ("t" test) (Vlaic & Oroian 2002).

Bazna breed belongs to the group of indigenous breeds formed in our country, as a result of crosses made between Mangaliţa and Berk breeds. In 1872 it was brought from England a number of Berk pure breed pigs. Boars were used to mate the Mangalita sows from Bazna, near Medias city. The individuals obtained are the origin of the current Bazna breed (Cornoiu 2004).

In its process of formation, Bazna pig underwent infusions with other breeds, like Mangalita from Fagaras area and York breed from Sibiu area (Ichim O 2012).

Because of the infusions there is a great variability in Bazna breed from different breeding centers. In Fagaras area where was practiced intense infusion with Mangalita breed, there is a rustic Bazna type, with more abundant pilose production, with big and bent ears, while in the Medias area, Bazna breed has more Berk blood and is a precocious type, with less hair and shorter ears (Cornoiu 2008).

Starting with 1859, the experimental station Jucu-Bonţida, from Cluj County, in Bazna breed there were made infusion crosses with ameliorative purpose, with a morphologically similar breed (Sattelschwein), but bigger, more prolific and precocious.

The conformation of Bazna breed is typical to mixed production type, with body length and chest perimeter almost equal (Mireşan 2001).

In normal growth conditions, Bazna breed can be breded at the age of 10 - 11 months, when it reaches 70 – 75 % of adult development, as the dimensions of its body and 60-65 % by weight. The fecundity percentage is a breed characteristic (95 – 98 %). Piglet production is good, averaging 10.2 at birth and 8.6 at weaning, with an average weight of 14.6 kg at weaning (8 weeks).

Results and Discussion

Analysis of average values and dispersion indices for the followed traits in 157 strain boars. The performances of 010-027 boar is showed in Table 1, were is the results recorded in the offspring analysis obtained from mating with seven sows, after three successive calving.

Regarding the average values for born piglet's trait, we found that the average of the three calving traits is 8.71 ± 0.50 heads. We observed a close level to this value at the number of live born piglet's trait, where the trait average of the three births is 8.43 ± 0.46 heads. Regarding the variability of these two traits, expressed as the variation coefficient (V%), it appears that on the three births is 26.20 % for born piglets trait and 25.05 % for alive born piglets traits. These values are within the normal variability established in the literature of this breed and for these traits (Oroian et al 2012; Oroian & Vlaic 2001).

Table 1

Averages and dispersion indices for 010-027 boar lineage

Specification	*X ± sx*	s^2	*S*	*V%*
Number of born piglets	8.71 ± 0.50	5.21	2.28	26.20
Number of alive piglets	8.43 ± 0.46	4.46	2.11	25.05
Lot weight at birth (kg)	8.98 ± 0.50	5.19	2.28	25.36
Lot weight at 21 days (kg)	46.84 ± 2.61	143.16	11.96	25.54
Piglet weight at 21 days (kg)	5.55 ± 0.27	1.56	1.25	22.50
Weaning weight/capita (kg)	14.54 ± 0.71	10.45	3.23	22.22
Initial weight/individual (kg)	24.37 ± 1.23	31.90	5.65	23.18
Final weight/capita (kg)	72.95 ± 3.75	295.08	17.18	23.55

Regarding the batch weight at birth, the average value measured in 010 - 027 boar from 157 line, on the three calving is 8.98 ± 0.50 kg.

Lot weight at 21 days recorded the average value of 46.84 ± 2.61 kg. Weaning weight of the total calving is 14.54 ± 0.71 kg. The same small differences between calving were observed in the two analyzed traits: initial test weight and final test weight. On total births, the boar 010 - 027 from 157 line realized for those traits average values of 24.37 ± 1.23 kg, respectively 72.95 ± 3.75 kg.

The variability of phenotypic traits related to the weight registered at the fallowing, at 21 days, at weaning, at test start and test exit, expressed as the variation coefficient (V%), takes values between 22.22 % for weaning weight and 25.54 % for weight lot at 21 days. The value of this coefficient indicates an average level of variability and has values comparable with the literature for this trait.

The value of variation coefficient indicates that we are dealing with a population over which was intervened in the development the amelioration, by selection and mating management.

Average performances and dispersion indices for the analyzed traits at the boar 010-088 from 157 line descendants, obtained from three successive calving as a result of mating with seven sows are shown in Table 2.

Table 2

Averages and dispersion indices for 010-088 boar lineage

Specification	*X ± sx*	s^2	*s*	*V%*
Number of born piglets	9.00 ± 0.53	5.85	2.42	26.87
Number of alive piglets	8.43 ± 0.45	4.26	2.06	24.48
Lot weight at birth (kg)	9.07 ± 0.48	4.92	2.22	24.46
Lot weight at 21 days (kg)	46.39 ± 2.52	133.85	11.57	24.94
Piglet weight at 21 days (kg)	5.69 ± 0.31	2.02	1.42	24.99
Weaning weight/capita (kg)	14.57 ± 0.71	10.59	3.25	22.34
Initial weight/capita (kg)	23.89 ± 1.16	28.08	5.30	22.18
Final weight/capita (kg)	72.71 ± 3.49	255.56	15.99	21.98

Regarding the born piglets trait, we observed that the average value is 9.00 ± 0.53 individuals. The variability of this trait, expressed as the coefficient of variation, has a value of 26.87 %. Analyzing live born piglet's trait, we found that the average performance of this trait is 8.43 ± 0.45 individuals.

For batch weight at birth trait, the average is 9.07 ± 0.48 kg. The lot weight at 21 days has an average of 46.39 ± 2.52 kg. The variability of this trait, expressed as the variation coefficient is 24.94 %. Weaning weight has a total calving average of 14.57 ± 0.71 kg.

Initial test weight trait has an average value of 23.89 ± 1.16 kg, the variability of this trait is 22.18 %, while for the final test weight trait, the average value is 72.71 ± 3.49 kg and variability of 21.98 %.

Further to complete the analysis made on each boar from 157 line, shown in Table 3, the data represent average values and dispersion indices studied traits for lines 157.

Table 3

Averages and dispersion indices for the 157 line offspring's

Specification	*X ± sx*	s^2	*s*	*V%*
Number of born piglets	8.86 ± 0.21	1.88	1.37	15.49
Number of alive piglets	8.43 ± 0.16	1.13	1.06	12.61
Lot weight at birth (kg)	9.02 ± 0.19	1.56	1.25	13.82
Lot weight at 21 days (kg)	46.42 ± 0.97	39.27	6.27	13.44
Piglet weight at 21 days (kg)	5.62 ± 0.08	0.26	0.51	9.00
Weaning weight/capita (kg)	14.56 ± 0.04	0.08	0.28	1.92
Initial weight/capita (kg)	24.13 ± 0.18	1.33	1.15	4.78
Final weight/capita (kg)	72.83± 0.23	2.22	1.49	2.05

From the data's presented in the Table 3 can be observed that for the traits: born piglets and live piglets, the average values are 8.86 ± 0.21 individuals, respectively 8.43 ± 0.16 individuals. The variability of these traits is 15.49 % and 12.61 %, indicating a relatively good uniformity that can be found in the breeding line, providing good purposes for ameliorative interventions, both by selection and crossing.

Lot weight at birth and at 21 days, 9.02 ± 0.19 kg, respectively 46.62 ± 0.97 kg, and values for the variation coefficients of 13.82 % and 13.44 %, are between the limits referred to the literature for this breed at this age.

Also, the weaning weight is 14.56 ± 0.04 kg, the weight at the test start is 24.13 ± 0.18 kg and at the final of the test is 72.83 ± 0.23 kg, and the coefficients of variability in related analyzed traits is 1.92 %, 4.78 % respectively 2.05 %, are in normal limits, showing a good homogeneity of the line for these traits.

Analysis of average values and dispersion indices for measured traits in boars of 001 strain. As in the case of 157 line boars, the performances of 001 line boars were monitored at the offspring's obtained from mating with 7 sows in three successive calving. Below, in Table 4 are showed the values for the analyzed traits at 012-027 boar from line 001.

Table 4

Averages and dispersion indices for 012-027 boar offspring's

Specification	*X ± sx*	s^2	*s*	*V%*
Number of born piglets	9.29 ±0.50	5.16	2.27	24.47
Number of alive piglets	9.05 ± 0.49	5.00	2.24	24.71
Lot weight at birth (kg)	10.65 ± 0.59	7.28	2.70	25.34
Lot weight at 21 days (kg)	56.11 ± 2.98	186.89	13.67	24.37
Piglet weight at 21 days (kg)	6.20 ± 0.30	1.89	1.38	22.19
Weaning weight/capita (kg)	16.16 ± 0.79	12.98	3.60	22.29
Initial weight/capita (kg)	26.34 ± 1.33	37.16	6.10	23.14
Final weight/capita (kg)	80.06 ± 3.94	326.01	18.06	23.55

The average value of born piglet's trait is 9.29 ± 0.50 individuals. At a close level to this value we encountered at the number of live born piglets, where we noted that the average on the three calving traits is 9.05 ± 0.49 individuals.

Regarding the variability of these two traits, expressed by variation coefficient, it appears that on the three births are 24.47 % for the number of born piglets and 24.71 % for the number of live born piglets. These values of the variability coefficient are the same with the literature data regarding the breed and for these traits.

Regarding the lot weight at birth, the average value recorded at 012-027 boar, is 10.65 ± 0.59 kg. Lot weight at 21 days recorded the average value of 56.11 ± 2.98 kg. Weaning weight had values close to the three observed births, their average being of 16.16 ± 0.79 kg. In the case of initial test weight and final test weight, on total calvings, the offspring's of 012-027 boar line 001, achieved average values of 26.34 ± 1.33 kg, and 0.06 ± 3.94 kg respectively.

The phenotypic variability for birth weight, recorded at 21 days, at weaning, at test start and finish, expressed in percentage of variability is between 22.19 % for weight at 21 days/individual and 25.34 % for lot weight at calving. The value of this coefficient indicates an average level of variability.

In Table 5 there are shown the average values and dispersion indices for measured traits in our study, for the offspring's of 012-028 boar from line 001.

Table 5

Averages and dispersion indices for 012-028 boar offspring's

Specification	*X ± sx*	s^2	*s*	*V%*
Number of born piglets	8.67 ± 0.45	4.33	2.08	24.02
Number of alive piglets	8.43 ± 0.42	3.71	1.93	22.84
Lot weight at birth (kg)	9.81 ± 0.49	5.14	2.27	23.13
Lot weight at 21 days (kg)	52.54 ± 2.63	145.54	12.06	22.96
Piglet weight at 21 days (kg)	6.22 ± 0.30	1.89	1.38	22.11
Weaning weight/capita (kg)	16.11 ± 0.80	13.50	3.68	22.81
Initial weight/capita (kg)	26.43 ± 1.33	37.18	6.10	23.07
Final weight/capita (kg)	79.87 ± 3.85	311.36	17.65	22.09

Regarding the born piglets trait, we found that the average value was 8.67 ± 0.45 individuals. The variability of this trait, expressed as the coefficient of variation, has a value of 24.02 %.

Looking at the average on three births, the live born piglet's trait, we found that it is 8.43 ± 0.42 individuals and the variability is 22.84 %.

For batch weight at birth trait, the differences between average values are small, the total calving performance traits had the value 9.81 ± 0.49 kg. The same small differences between average values were found at lot weight at 21 days trait, the average of total births being 52.54 ± 2.63 kg.

The variability of this trait, expressed as the variability coefficient, is 22.96 %. Weaning weight is 16.11 ± 0.80 kg. The average performance of the initial test weight trait is 26.43 ± 1.33 kg, the variability of this trait is 23.07 %, while for the final test weight trait the average value is 79.87 ± 3.85 kg and variability of 22.09 %.

In Table 6, are found the average values and variability indices related to the analyzed traits at the offspring's of 001 line boars.

Table 6

The average and dispersion indices for 001 line offspring's

Specification	*X ± sx*	s^2	*s*	*V%*
Number of born piglets	8.98 ± 0.17	1.19	1.09	12.18
Number of alive piglets	8.74 ± 0.17	1.17	1.08	12.40
Lot weight at birth (kg)	10.23 ± 0.21	1.83	1.35	13.24
Lot weight at 21 days (kg)	54.32 ± 1.06	47.29	6.88	12.66
Piglet weight at 21 days (kg)	6.21 ± 0.03	0.03	0.17	2.77
Weaning weight/capita (kg)	16.14 ± 0.06	0.15	0.38	2.38
Initial weight/capita (kg)	26.39 ± 0.13	0.71	0.84	3.19
Final weight/capita (kg)	79.97 ± 0.16	1.07	1.03	1.29

From the data shown in Table 6 we can observe that the number of born piglets and alive born piglets, the average values are 8.98 ± 0.17 individuals, and 8.74 ± 0.17 individuals respectively. Relatively low variability for these traits 12.18 % and 12.40 %, indicating a good uniformity in the existing line, providing solutions to various ameliorative interventions, both by selection and by crossing.

Batch weight at birth and at 21 days is 10.23 ± 0.21 kg, and 54.32 ± 1.06 kg respectively, and the values of the variability coefficients are 13.24 % and 12.66 %, being between the limits presented by literature.

Also the weaning weight is 16.14 ± 0.06 kg, the initial test weight is 26.39 ± 0.13 kg and the final test weight is 79.97 ± 0.16 kg, and the variability coefficients: 2.38 %, 3.19 % and 1.29 % are within normal limits indicating a good homogeneity.

All these reproductive traits performances couldn't be achieved without a rigorous assessment of semen parameters, which is absolutely necessary to obtain adequate reproductive traits (Parlapan et al 2013; Hettig et al 2012).

In Table 7 are shown the differences between the average values observed in the offspring's of two boars of line 157 (010-027 and 010-088) and statistical significance for the traits included in the study.

Table 7

The differences between averages and their significance for the observed traits in strain 157

Specification	*Boar*	*n*	*X*	s^2	*d*	s_d	*t*	*Significance*
No. of born piglets	010-027	183	8.71	5.21	-0.29	0.24	-1.19	ns
	010-088	189	9.00	5.85				
No. of alive piglets	010-027	177	8.43	4.46	0.00	0.22	0.00	ns
	010-088	177	8.43	4.26				
Batch weight at birth (kg)	010-027	177	8.98	5.19	-0.09	0.24	-0.37	ns
	010-088	177	9.07	4.92				
Batch weight at 21 days (kg)	010-027	177	46.84	143.16	0.45	1.25	0.36	ns
	010-088	177	46.39	133.85				
Weight of piglets at 21 days/capita	010-027	177	5.55	1.56	0.14	0.14	-0.98	ns
	010-088	177	5.69	2.02				
Weaning weight/capita (kg)	010-027	177	14.54	10.45	-0.03	0.34	-0.08	ns
	010-088	177	14.57	10.59				
Initial weight/capita (kg)	010-027	177	24.37	31.90	0.48	0.58	0.82	ns
	010-088	177	23.89	28.08				
Final weight/capita (kg)	010-027	177	72.92	295.08	0.24	1.76	0.13	ns
	010-088	177	72.71	255.56				

n – no. of piglets, ns – not significant.

For the analyzed traits, the difference between the average values recorded in the two boars of 157 line are very small and statistically insignificant. We conclude that between the two boars of 157 line there are no statistical coverage thresholds of significance of 5 %, 1 % and 0.1 %.

In Table 8 are shown the differences between the average values observed in the two boars of line 001 (012-027 and 012-028) and statistical significance for the observed traits included in the study.

For the analyzed traits, the differences between the average values in the two boars of strain 001, have different statistical significance: for the number of born piglets, number of alive born piglets, lot weight at birth and lot weight at 21 days, the differences are statistically distinct significant. For weight at 21 days/individual, at weaning and at test start, the differences are insignificant, and the final test weight is statistically significant.

Table 8

Differences between averages and their significance for the observed traits in strain 001

Specification	*Boar*	*n*	*X*	s^2	*d*	s_d	*t*	*Significance*
No. of born piglets	012-027	195	9.29	5.16	0.62	0.22	2.76	**
	012-028	182	8.67	4.33				
No. of alive piglets	012-027	190	9.05	5	0.62	0.21	2.85	**
	012-028	177	8.43	3.71				
Batch weight at birth (kg)	012-027	190	10.65	7.28	0.84	0.26	3.23	**
	012-028	177	9.81	5.14				
Batch weight at 21 days (kg)	012-027	190	56.11	186.89	3.57	1.34	2.65	**
	012-028	177	52.54	145.54				
Weight of piglets at 21 days/capita	012-027	190	6.20	1.89	-0.02	0.14	-0.14	ns
	012-028	177	6.22	1.89				
Weaning weight/capita (kg)	012-027	190	12.98	10.45	-0.52	1.14	-0.45	ns
	012-028	177	13.50	10.59				
Initial weight/capita (kg)	012-027	190	37.16	31.90	-0.02	1.50	-0.01	ns
	012-028	177	37.18	28.08				
Final weight/capita (kg)	012-027	190	326.01	295.08	14.65	2.62	5.58	***
	012-028	177	311.36	255.56				

n – no. of piglets, ns – not significant, ** - distinct significant, *** - very significant.

Table 9 shows the differences between the means observed in the two strains (157 and 001) and its statistical significance.

The difference between the number of born piglets in the two lines is in favor of strain 001, but statistically is not significant. For all other analyzed traits, the differences are in favor of line 001, and statistically are very significant.

The results presented in this table allow us to state with certainty that for the analyzed traits, strain 001 is superior to the strain 157, which entitles us to recommend boars from this line to be used more intensively for reproduction, to induce in the population a significant genetic progress.

Table 9

Differences between averages and their significance for the observed traits in the two strains

Specification	*Strain*	*n*	*X*	s^2	*d*	s_d	*t*	*Significance*
No. of piglets born	157	372	8.86	1.88	-0.12	0.09	-1.32	ns
	001	377	8.98	1.19				
No. of alive piglets	157	354	8.43	1.13	-0.31	0.08	-3.88	***
	001	367	8.74	1.17				
Batch weight at birth (kg)	157	354	9.02	1.56	-1.21	0.09	-12.48	***
	001	367	10.23	1.83				
Batch weight at 21 days (kg)	157	354	46.42	39.27	-7.7	0.50	-15.75	***
	001	367	54.32	47.29				
Piglets weight at 21 days/ capita	157	354	5.62	0.26	-0.59	0.03	-20.65	***
	001	367	6.21	0.03				
Weaning weight/capita (kg)	157	354	14.56	0.08	-1.55	0.19	-8.05	***
	001	367	16.11	13.50				
Initial weight/capita (kg)	157	354	24.13	1.33	-2.26	0.07	-29.95	***
	001	367	26.39	0.71				
Final weight/capita (kg)	157	354	72.83	2.22	-7.14	0.09	-74.49	***
	001	367	79.97	1.07				

n – no. of piglets, ns – not significant, *** - very significant.

Conclusions. Differences between the two analyzed strain 157 and 001, from Bazna swine breed population, breaded at Turda Agricultural Research and Development Station, are statistically not significant for the number of born piglets (8.86 individuals in strain 157 and 8.98 individuals in strain 001).

Comparing the performances of the two lines for the traits like the evolving weight from calving to test exit, we found that line 001is superior in all situations.

The variability of the measured traits in the two lines is between the normal limits provided in the literature for this breed.

Bazna swine breed phenotypic performances and meat organoleptic traits, recommend this breed as a pool of genes that can be used in practice at the same time improving the species and a source of material for traditional quality products.

To improve morpho-productive performances we recommend a pure breed rearing, based on the strains, as working tools to induce genetic progress, selection and crossbreeding between lines.

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