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Izlaganje sa znanstvenog skupa

Conference paper

CORRELATION OF FEED INTAKE AND PRODUCTION CHARACTERISTICS OF BOARS IN A PERFORMANCE TEST

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Summary

This paper deals with the influence of the level of feed on the results of the performance test of Large White boars between 30 and 100 kg live weight. The test was performed through three years on three different farms including a total of 320 boars. The average production results were as follows: the age of boars at the beginning of the test was 87.07 days, the age at the end of the test was 165.61 days, daily weight gain 0.904 kg, daily feed intake 2.30 kg, conversion ratio 2.55 kg and the average thickness of bacon was 16.34 mm. To appraise of the influence of the systematic factors of the environment at the tested characteristics of the boars, the analysis of the variation according to the LSQ method was used. The production characteristics of the boars were reviewed for each farm separately. The phenotype affinity between the fattening indicators is determined by the correlation coefficients. The higher daily feed consumption on all three farms was connected with a shorter fattening period (r=-0.46**, -0.51**, -0.44**), with a higher daily weight gain (r=0.47**, 0.36*, 0.46*) and a higher feed conversion ratio (r=0.40*, 0.47**, 0.45*). The results show a significant influence of the level of feed intake to the phenotype declared indicators of boars production and could be used in the breeding.

Introduction

Improvement of economically important production characteristics in the population can be accomplished using the boars of breeding value above average. Determination of the breeding value is carried out by direct testing of the growing boars (performance test) at the age of 6-7 months, i.e. before their involvement in the reproduction. Relevant production traits, estimated in performance test are: average daily gain, feed conversion ratio and average backfat thickness. Although performance test is less accurate in evaluation of animal breeding values compared to combined, especially to progeny test, it is used more often because of many conveniences it has, compared to tests mentioned above. Thus, every bigger pigbreeding farm in Croatia has a station for the evaluation of production capabilities of pigs.

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This paper researches the production traits of Large White boars weight 30-100 kg in the testing stations of 3 pigbreeding farms (which will be referred as farm 1. 2 and 3 in further text) with special accent on influence of the food intake level on expression of phneotype characteristics and fattening indicators.

The great practical meaning for the selection work has a correlation between specific production indicators. Brandt et al. (1985) detected negative phenotype correlations between feed intake and meat share (r= -0.50, r= -0.40), and positive correlations between feed intake and meat/fat ratio (r= 0.50, r= 0.30) and backfat thickness (r=0.40, r=0.30). Bereskin (1986) found that genetic correlation between feed conversion efficiency (kg/kg), average daily gain, daily feed intake and backfat thickness were -0.52, -0.52 and -0.69, respectively, and that phenotype correlations were -0.24, -0.57, and 0.212. Genetic and phenotype correlations between average daily gain and average backfat thikness were 0.176 and 0.254, respectively. Senčić et al. (1989a) determined weak and negative connection between fattening duration and feed conversion in the first and second period of fattening (r= -0.266 and r= -0.330, respectively), strong and medium negative connection between fattening duration and daily gain (r= -0.88 and r= -0.682, respectively), as well as weak and positive connection between feed conversion and daily gain (r= 0.409 and r= 0.285, respectively).

Materijals and methods

The material for investigation is consisted of Large White boars, tested during three years in testing stations of 3 pigbreeding farms: farm 1, farm 2 and farm 3. Total of 376 boars were tested on 11 production indicators. Tested boars haven't had body weight less than 28 kg, nor over 32 kg entering the test. Test ended at body weight of 100 kg. For each animal was determined age at the beginning (A1) and at the end of the test (A2), body weight at the beginning (W1) and at the end of the test (W2), duration of the test (TD), total gain (TG), total feed intake (TFI), feed conversion ratio (CONV), average daily gain (ADG), daily feed intake (DFI), and average backfat thickness (ABT).

Regarding the fact that material came from different farms and considered several years of research, analysis of variance by the least square method (LSQ) described by Harvey (1960) was used for evaluation of the influence environmental system factors.

Considering the established hypothesis, following model of the mentioned method was applied in the research:

$$Y_{ijkl} = \mu + F_i + G_j + RKH_k + e_{ijkl}$$

where:
Y_{ijkl} = value of the investigated trait of ijklth boar in kth class of food intake, jth year, ith farm
μ = mean of the model
F_i = influence of the ith farm (i = farm 1; farm 2; farm 3)
G_j = influence of the jth year of the test (j = 1. 2. and 3. year)
RKH_k = influence of the kth class of the feed intake (k = 1 = < 2 kg; 2 = 2.10-2.20 kg; 3 = 2.21-2.40 kg; 4 = 2.41-2.60; 5 = 2.61- 2.80 kg; 5 = 2.81 and more kg
e_{ijkl} = accidental error

Share of explained variance was evaluated by the coefficient of determination (R^2). Testing of the differences was performed by t-test. Connection between specific traits of the boars was investigated by phenotype correlation coefficients. Regression analysis of the connection between feed intake and other production indicators in test was obtained by linear regression coefficient (b).

Results of the research

The mean values of the indicators on farms are shown as LSQ-mean values in Table 1. It is visible from the data that boars from the testing station of the farm 2 entered the test first (79.37 days), and boars from the testing station of the farm 1 were last to enter the test (91.42 days). They end the test by the same order. However, test lasted the shortest time in the test station of the farm 1, in which boars gained the highest daily gain, the best feed conversion ratio and the lowest feed intake as well as daily feed intake.

Table 1. - MEAN VALUES (LSQ) OF FATTENING INDICATORS OF LARGE WHITE BOARS IN PERFORMANCE TEST ACCORDING TO TESTING STATIONS

Production indicators	Testing stations			Means for 3 testing stations
	farm 1	farm 2	farm 3	
A1	168,98	159,26	168,58	165,61
A2	91,42	79,37	90,43	87,07
W1	30,06	29,37	30,19	29,87
W2	100,49	100,06	100,00	100,18
TD	77,29	79,79	78,14	78,41
ADG	0,918	0,892	0,902	0,904
CONV	2,32	2,64	2,69	2,55
ABT	17,00	16,03	16,00	16,34
TG	70,42	71,47	69,88	70,59
TFI	163,13	189,08	187,45	179,89
DFI	2,12	2,38	2,41	2,30

The highest daily gain was obtained for boars from the testing station of farm 1 (0.918 kg), and lowest for the boars from farm 2 (0.892 kg). The smallest feed conversion ratio was noted for the boars from farm 1 (2.32 kg), than follow the boars from farm 2 (2.64 kg) and farm 3 (2.69 kg). Statistically significant differences was found between boars from the testing stations of farm 1 and farm 2 as well as between boars from farm 1 and farm 3.

The lowest backfat thickness had the boars from the testing station of farm 3 (16.00 mm) followed by the boars from farm 2 (16.03 mm) and farm 1 (17.00 mm). The boars from farm 1 had significantly thicker backfat than the boars from farm 2 and farm 3. The lowest feed intake had the boars from farm 1 (2.12 kg) followed by the boars from

farm 2 and farm 3 (2.38 kg and 2.41 kg, respectively). The boars from farm 1 signficantly lower feed intake than the boars from the testing stations of farm 2 and farm 3.

Differences among farms were tested by "t-test" regarding the production indicators. The results are presented in Table 2. Analyzing the age at the beginning of the test, statistically significant difference occurred between testing station of farm 1 and farm 2 as well as between farm 3 and farm 2 ($P<0.01$). The same results occurred for initial body weight and age at the end of the test. Difference in duration of the test was statistically significant only between boars from the testing stations of farm 1 and farm 2. Statistically significant differences between testing stations were not found in daily gains.

Table 2. - DIFFERENCES (D-VALUES) BETWEEN TESTING STATIONS IN AVERAGE VALUES OF PRODUCTION INDICATORS OF THE BOARS IN PERFORMANCE TEST AND SIGNIFICANCE OF THE DIFFERENCES (T-TEST)

Production indicators	farm 1 / farm 2		farm 1 / farm 3		farm 2 / farm 3	
	d	t	d	t	d	t
A1	12,05	6,06**	0,99	0,85	11,06	9,94**
W1	0,70	3,77**	0,12	1,49	0,81	8,96**
A2	9,72	4,35**	0,39	0,22	9,33	5,88**
W2	0,42	2,30*	0,00	0,00	0,00	0,00
TD	2,50	2,08*	0,15	0,70	1,65	1,61
ADG	0,03	1,88	0,02	1,14	0,01	0,89
CONV	0,32	7,68**	0,37	8,74**	0,05	1,35
ABT	0,96	2,35*	1,00	2,34*	0,04	0,10
TG	1,05	2,20*	0,54	3,41**	1,59	7,12
TFI	25,96	9,32**	24,32	8,30**	1,63	0,64
DFI	0,26	7,04**	0,29	8,35**	0,03	1,02

* $P<0,05$; ** $P<0,01$

The level of the food intake (feed intake class) significantly influenced the particular production indicators of the boars in performance test as it is shown by the F-values in the Table 3.

The level of the feed intake had significant influence on fattening duration, daily gain, feed conversion ratio and backfat thickness of the boars on all three farms. Except the effect on mentioned indicators, the level of feed intake significantly influenced the total gain of boars from farm 2, age at the end of the test of the boars from farm 3, total feed intake of the boars from the testing stations of farm 2 and farm 3, but it had no influence on total feed intake of the boars from farm 1.

Table 3. - F-VALUES OF VARIANCE ANALYSIS OF FOOD INTAKE CLASS INFLUENCE ON INDICATORS OF BOARS IN PERFORMANCE TEST

Indicators	F values		
	farm 1	farm 2	farm 3
A1	1,505	0,246	1,334
A2	1,188	1,030	6,612**
TD	4,288**	5,768**	12,482***
ADG	5,779**	2,736*	13,264***
CONV	3,069*	4,892**	12,541***
ABT	3,191*	2,795*	3,003*
TG	1,225	2,810*	0.460
TFI	2,411	10,469***	15,531***
W1	1,798	0,745	0,673
W2	0,509	0,385	0,000

*P<0,05; **P<0,01; ***P<0,001

The influence of the feed intake class on the production traits of Large White boars in all of the analyed testing stations is presented in Table 4. By the increase of the daily feed intake, duration of the fattening decreased (84.6 days in the 1. class and 71.8 days in the 6. class), daily gain increased from 0.842 kg in class 1. to 0.972 kg in classes 5. and 6. whilst feed conversion ratio increased from 2.37 in class 1 to 2.96 in class 6.

Table 4. - THE INFLUENCE OF FEED INTAKE CLASS ON PERFORMANCES OF BOARS

Indicators	Feed intake classes						μ
	1	2	3	4	5	6	
	n=17	n=75	n=130	n=98	n=40	n=16	
A1	82,5	87,1	88,2	86,9	87,0	86,5	86,4
W1	29,9	29,9	29,9	29,9	29,8	29,9	29,9
A2	167,1	168,8	166,6	162,1	159;5	159,1	163,9
W2	100,3	100,1	100,2	100,1	100,2	100,1	100,2
TD	84,6	81,5	78,3	75,2	72,6	71,8	77,3
ADG	0,842	0,867	0,903	0,940	0,972	0,972	0,916
CONV	2,37	2,46	2,54	2,63	2,75	2,96	2,62
ABT	15,8	15,6	16,3	17,3	16,8	16,7	16,4
TG	70,7	70,8	70,5	70,3	70,5	70,4	70,5
TFI	165,1	172,6	180,4	186,5	195,4	209,9	185,0

Singificant connection between feed intake level and some production indicators is also denoted by the correlation and regression coefficients showed in the Table 5. Increase of feed intake level was followed by shorter duration of the fattening period (r = -0.463**, r = -0.445**, r = -0.508**), increased daily gain (r = 0.474**, r = 0.457** and r = 0.357**) and increased feed conversion ratio (r = 0.397**, r = 0.447** and r

= 0.468**). The connection between level of feed intake and backfat thickness differed among testing stations. Increase of feed intake level was followed by weak and insignificant decrease of backfat thickness of the boars from the testing station of farm 1 (r = 0.294), weak and insignificant increase of the same indicator of the boars from farm 2 (r = 0.111) as well as weak and significant increase of backfat thickness of the boars from farm 3 testing station (r = 0.186**).

Table 5. - CORRELATION (R) AND REGRESSION (B) COEFFICIENTS BETWEEN DAILY FEED INTAKE (DFI) AND INVESTIGATED PRODUCTION INDICATORS OF BOARS IN PERFORMANCE TEST FOR THE FARMS AND AVERAGE FOR ALL FARMS

Indicators	Farm						All farms togather		a
	farm 1		farm 3		farm 2				
	r	b	r	b	r	b	r	b	
A1	0,345*	18,538	-0,055	-1,725	0,005	0,285	0,022	-0,858	90,76
W1	-0,086	-0,325	0,094	-0,200	0,103	0,564	0,011	-0,035	30,12
A2	-0,014	-0,860	0,341**	-16,844	-0,202	-11,973	-0,262**	-13,072	198,06
W2	-0,169	-0,949	-	-	-0,016	-0,078	0,148**	-0,333	100,86
TD	-0,463**	-19,271	-0,445**	-15,179	-0,508**	-13,918	- 0,396**	-12,315	107,48
ADG	0,474**	0,236	0,457**	0,177	0,357**	0,109	0,380**	0,134	0,583
CONV	0,397**	0,464	0,447**	0,543	0,468**	0,517	0,539**	0,651	1,091
ABT	-0,294	-2,548	0,186**	2,337	0,111	1,334	0,088	1,003	13,74
TG	-0,097	-0,623	0,044	0,194	-0,242	-3,612	-0,880**	- 0,619	71,67
TFI	0,384*	41,382	0,489**	41,082	0,619**	44,246	0,577**	47,809	71,56

Conclusion

The results of the research point out the significant influence of feed intake level in the test from 30 to 100 kg on phenotype declared indicators of the gain for Large White boars, on feed conversion ratio as well as on duration of the test. Hence, they can be of use in breeding and selection.

Higher daily feed intake was correlated with shorter test duration (r = -0.396**), higher daily gains (r = 0.380**) and poorer feed conversion ratio (r = 0.539).

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