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Conference paper

ESTIMATION OF GENETIC PARAMETERS FOR GROWTH, SLAUGHTERING PERFORMANCE AND MEAT QUALITY IN CATTLE

J. J. Frickh, J. Sölkner

Summary

The results of this investigation show a distinctive antagonism between traits of meat quality and traits of fattening and slaughtering performance. Higher daily gains are connected with lower feed conversion and fatty tissue and also increase feed intake capacity. The genetic correlations between daily gains and the meat quality traits ph-value, brightness, shear force and rib eye fat area are positive but negative between daily gains and the traits redness and water holding capacity. However, the recent estimation of genetic parameters for meat quality traits supply favourable heritabilities and correlations to be used in future genetics evaluations.

Introduction

The presented trial was ordered by the Federal Ministry for Agriculture and Forestry, Environment and Water Economy and conducted by the Agricultural Federal Research Company in co-operation with the Department of Livestock Sciences of the University of Natural Resources and applied life sciences Vienna and the Federation of

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J. J. Frickh, Agricultural Federal Research Company, Rottenhauserstraße 32, 3250 Wieselburg, Austria; J. Sölkner, Department of Livestock Sciences, University of Natural Resources and applied life sciences Vienna, Gregor Mendel Straße 33, 1180 Wien, Austria.

Austrian Cattle Breeders. The aim of this scientific investigation was to estimate genetic parameters for meat quality, slaughtering performance and fattening performance for the Simmental population in Austria. Represented are heritabilities and genetic trait relations.

Methods

Between 1995 and 2001 data of 920 young Austrian Simmental bulls from performance testing were collected on the progeny testing station Königshof. The bulls were fattened from the 75th up to the 365th or 425th day of life, housed on tethering and fed individually with pelleted feed. Variance components were estimated using restricted maximum likelihood under a multi-trait animal model (Patterson and Thompson, 1971).

Results

By observing the results of this investigation it has to be taken into account that data in such extent and quality are unique in literature nevertheless for a reliable estimation of population parameters more data would be needed. The phenotypic and genetic correlations between meat quality and fattening performance are shown In Table 1 between meat quality and slaughtering performance in Table 2. On the diagonal heritabilities of the traits are quoted. Heritabilities (h^2) of 0.67 and 0.51, respectively, were estimated for daily gain. Blaas (1993) analysed 0.35 by using data of field survey within the same Simmental population.

This indicates that higher heritabilities are estimated with data of the progeny station than with data of field survey. The maximum h^2 were 0.77, 0.72 and 0.70 for feed intake, net gain and meat yield, respectively. The estimated h^2 of meat quality traits varied from 0.05 (grilling loss) to 0.52 (redness). The highest h^2 was found for brightness (0.52) and shear force (0.23). Marbling reached 0.17. In comparison to literature this estimation shows higher values for many heritabilities.

Important genetic correlations, for example, between traits of fattening performance and meat quality were found between shear force and the traits feed intake (0.48), feed conversion (0.26) and daily gain (0.47). With higher fattening performance higher shear force values can be expected. The water holding capacity (drip loss, grilling loss, cooking loss) had a negative genetic relation (r_g = -0.82, -0.18, -0.48) to the daily gains (125.-425.d).

Table 1 - ESTIMATED VALUES FOR HERITABILITIES (DIAGONAL), GENETIC CORRELATIONS (ABOVE THE DIAGONAL) AND PHENOTYPIC CORRELATIONS (BELOW THE DIAGONAL) OF DIFFERENT TRAITS OF FATTENING PERFORMANCE AND MEAT QUALITY

Trait	01	02	03	04	05	06	07	08	09	10	11	12	13
01 daily gain (125. -365 d)	0.67	0.96	-045	0.39	0.20	0.34	-0.03	-012	0.30	-022	-046	0.53	-0.52
02 daily gain (125.-425. d)	0.88	0.51	-036	0.44	0.38	0.47	-0.04	-0.06	0.27	-017	-0.82	-0.18	-048
03 feed conversion (125. -365. d)	-0.53	-0.51	0 67	0.66	-0.29	0.26	-0.28	0.26	-0.27	0.09	0.14	-0.04	0.35
04 feed intake (125.-365. d)	0.41	0.33	0.55	0.77	-0.22	0.48	-0.48	0.22	-0.04	-0.05	0.65	0.46	-0.06
05 pH-value, 96 h p. m.	-0.08	0.00	0.21	0.16	0.17	0.33	-0.09	0.32	0.16	-0.51	-080	0.14	0.39
06 shear force	-0.06	-0.07	0.11	0.05	-0.02	0.23	-0.19	0.30	-0.02	-0.31	-0.07	-0.65	-0.12
07 marbling	0.29	0.19	-0.22	0.05	-0.17	0.00	0.17	0.28	0.15	-0.35	-062	-0.07	0.40
08 rib eye area	0.32	0.35	-020	0.10	-0.19	0.00	0.23	0.34	-0.38	-0.03	0.50	-0.25	0.64
09 $_{1}L_{10}^{*}$ - brightness	-0.11	0.01	-0.01	-0.11	-015	-0.17	-0.15	-0.16	0.12	-0.57	-025	0.75	-0.49
10 $_{1}a_{10}^{*}$ - redness	0.22	0.12	0.04	0.25	-0.12	-0.13	0.18	0.18	-0.29	0.52	0.35	0.20	-0.14
11 drip loss	0.08	0.08	0.13	-0.07	-045	0.05	0.05	0.15	0.32	0.05	0.06	1.00	-0.36
12 grilling loss	-0.07	-0.01	0.01	0.03	-0.09	0.23	-0.03	0.03	0.16	-0.10	0.04	0.05	0.80
13 cooking loss	-015	-0.09	0.14	0.01	-0.03	0.11	-0.30	-0.11	-016	-0.04	0.12	0.08	0.40

Table 2 - ESTIMATED VALUES FOR HERITABILITIES (DIAGONAL), GENETIC CORRELATIONS (ABOVE THE DIAGONAL) AND PHENOTYPIC CORRELATIONS (BELOW THE DIAGONAL) OF DIFFERENT TRAITS OF SLAUGHTERING PERFORMANCE AND MEAT QUALITY

Trait	01	02	03	04	05	06	07	08	09	10	11	12	13	14
01 dressing out percent.	0.23	0.27	-0.05	0.29	0.28	0.83	-0.03	0.83	0.38	0.10	-0.35	-0.22	-0.81	0.04
02 net gain	0.41	0.72	0.26	0.12	-0.17	0.23	0.08	0.23	0.37	-0.13	-0.06	-0.09	-0.90	0.47
03 meat yield	0.24	0.20	0.70	-0.09	0.86	-001	-0.29	0.24	0.15	-0.09	-0.42	-0.13	0.70	-0.71
04 fatty tissue	0 18	0.33	-0.00	0.15	0.44	-046	0.04	-0.46	-0.25	-0.06	-0.39	0.07	0.67	0.41
05 carcass leanness	0.21	0.52	0.07	0.32	0.12	0.44	0.99	0.96	0.66	-0.09	-0.69	-0.19	-0.93	0.08
06 rib eye area	0.24	0.45	0 10	0.24	0.41	0.32	-0.21	0.65	0.03	-0.71	-0.38	-0.03	0.33	-0.31
07 rib eye fat area	0.06	0.00	0.21	-0.06	0.07	0.19	0.26	0.97	1.00	0.42	-0.73	-0.21	-0.99	0.97
08 pH-value, 96h p. m.	0.07	-0.04	0.05	-0.05	-0.17	-0.19	0.00	0.17	0.33	-0.09	-0.51	0.16	0.81	0.09
09 shear force	0.07	0.04	-002	0.03	0.03	0.01	0.30	0.04	0.25	-019	0.02	-0.37	-0.07	-0.65
10 marbling	0.06	0.21	-0.13	0.30	0.34	0.23	0.58	-017	0.00	0.16	0.20	-0.34	-0.62	-0.07
11 $_1L_{10}^*$ - brightness	-0.08	-0.16	0.00	-0.19	-0.21	-0.16	-0.12	-0.15	-0.17	-0.15	0.12	-0.57	-0.25	0.75
12 $_1a_{10}^*$ - redness	0.15	0.26	-0.10	0.26	0.25	0.18	0.11	-0.12	0.21	0.18	-0.29	0.52	0.53	0.20
13 drip loss	-0.01	0.02	-0.12	-0.00	0.14	-045	0.03	-044	0.02	0.05	0.32	0.05	0.06	1.00
14 grilling loss	0.07	-0.01	0.08	-0.02	-0.12	-0.09	-0.01	-0.09	0.23	0.00	0.16	-0 10	0.04	0.05

The genetic correlation between rib eye area and rib eye fat area is of main interest. A new video analytic method, developed on the Agricultural federal research company, was used to mark these areas. These traits had h^2 of 0.32 and 0.26. The genetic correlation between them was -0.21. With higher rib eye area intramuscular fat decreased. Therefore the conclusion can be drawn that by breeding on higher intramuscular fat, smaller rib eye area and carcass leanness can be expected.

PROCJENA GENETSKIH PARAMETARA ZA RAST, KLAONIČKE REZULTATE I KAKVOĆU MESA GOVEDA

Sažetak

Rezultati ovog istraživanja pokazuju izrazit antagonizam između osobina kakvoće mesa i osobina tova te klaoničkih rezultata. Veći dnevni prirasti u vezi su s manjom konverzijom hrane i masnog tkiva a isto tako i svojstva unosa hrane.Genetske korelacije između dnevnih prirasta i osobina kakvoće mesa: pH vrijednost, svjetlost, kauzistencija i poprečni presjek dugog leđnog mišića su pozitivne ali su negativne između dnevnih prirasta i osobine crvenila te sposobnosti zadržavanja boje. Međutim, novija procjena genetskih parametara za osobine kakvoće mesa daje povoljne sposobnosti nasljeđivanja i korelacije, što treba primijeniti u budućim genetskim procjenama.