1. Growth, Carcass Characteristics and Meat Quality

Effect of diet on pH and colour of meat in young bulls.

P. ALBERTI, C. SAÑUDO[1], P. SANTOLARIA.

Servicio de Investigacion Agraria, Apdo. 727. 50080 Zaragoza Spain

1 Facultad de Veterinaria, c/Miguel Servet, 177. 50013 Zaragoza Spain

The objective of this work was to study the influence of diet on the colour of fat and muscle and on other meat quality characteristics. 53 Brown Swiss and 18 Pirenaicos calves of 7 months of age were allotted on 12 lots and fed according to one of these diets: ad libitum on concentrates; or forages plus different amounts of concentrates, up to slaughter at 480 kg. This work was carried on from autumn 1989 to autumn 1990.

The 10th rib was removed from carcasses and then the pH of muscle Longissimus dorsi measured at 24 h. Colour was measured on a photocolorimeter at 24 h on subcutaneous fat and at 48 h on the M. Longissimus dorsi. At 7th day, water holding capacity, cooking losses and shear force (Warner-Bratzler) were measured on the M. Longissimus.

The animals fed with forages plus a finishing period exhibited ultimate pH higher than 6 usually associated with dark cutting, the meat showed lower saturation and hue values than meat from the animals fed with concentrates. The shear force and the water holding capacity of the meat do not change due to the diet received by the animals. Results suggested that a finishing period with concentrates to forage fed animals do not change fat colour or shear force of meat but presented darker colour than meat of concentrate fed bulls.

Effect of Adding Inorganic Selenium and Vitamin E on the Growth and Status of Lambs in Regions Containing Toxic Concentrations of Copper in Fodder

L. ANGELOW and I. YANCHEV

Institute of Animal Science, BG-2232 Kostinbrod, Bulgaria

The influence of selenium concentration on the growth, health status and mortality of lambs bred in regions, characterized by high copper content in food (25 ppm) has been investigated. The carry-over effect when using appropriate indicative organs has been studied. The initial and final Se-, Cu- and Zn-status of supplemented and unsupplemented animals has been analyzed by AAS-HS and AAS. Increased amounts of Cu in food had a negative influence on average daily gain of the lambs during the experiment (103 days). The animals bred with low levels of Se exhibited symptoms of Cu toxicity after the 30-th day. Significant higher mortality up to the 60-th day has been observed with the unsupplimented lambs.

The addition of Se had a positive effect on the normalization of the Se-status and decreased significantly the accumulation of Cu in the liver. The evolution of Se and Cu in blood serum has been used as an indicator for the animal status. It can be concluded that toxic amounts of Cu destroy the Zn-status too. A significant reduction of Zn content in the ribs and liver has been measured. The negative influence of Cu required a 2.5-3.0 times increasing of Se. Nevertheless, the observable growth depression indicates that Zn compensation is also necessary.

Meat quality of "Mediterrâneo" *Bubalus bubalis* and "Nelore" *Bos indicus* breeds

H.K.ARIMA[1], J.C.A.MATTOS[2], J.M.C.DELLA TORRE[1], E.T.F.SILVEIRA[1] and M.C.GAZETTA[2]

[1]Centro de Tecnologia da Carne/ITAL, Av. Brasil, 2880, Campinas 13073, Brazil
[2]Instituto de Zootecnia, R. Heitor Penteado, 65, N.Odessa 13460, Brazil

The objective of this work was to determine the incidence of abnormal meat condition (DFD) in different lots of "Mediterrâneo" buffalo and "Nelore" cattle, and to compare their meat quality in animals presenting *longissimus dorsi* muscle in normal condition.

For screening, pH of thawed (frozen stored at -18°C) samples of *l.dorsi* muscles from a total 38 buffaloes and 29 bovines were determined to detect abnormal conditions. Ten percent of the buffaloes and 24% of the bovines presented DFD ($pH \geq 6,2$) or intermediate ($6,0 \leq pH < 6,2$) conditions in their *l.dorsi*.

Two lots consisted of 4 animals each (i) 23 to 26 month-old "Mediterrâneo" and (ii) "Nelore" both entire males reared in pasture showed in *l. dorsi*, *psoas major*, *flexor digitorum superficialis*, *vastus lateralis*, *sartorius* and *triceps brachii* the following pH values: 5,49 and 5,61; 5,47 and 6,01; 6,21 and 6,42; 5,62 and 5,98; 5,62 and 6,04; 5,69 and 6,11, respectively. Buffaloes systematically presented lower pH than bovines.

Two other lots of (iii) 8 buffaloes and (iv) 6 bovines, 17 to 21 month-old entire males reared in semi-confined management had the normal *l.dorsi* compared. Lots (iii) and (iv) presented respectively for thawing and cooking losses, pressed juice, Warner-Bratzler shear and adhesion of boneless 2,5cm thick steak, trimmed to 1cm fat over the rib eye, and roasted at 177±25°C (72°C inside), the following values: (10,5±1,7 and 9,2±1,5)%, (35,2±1,4 and 35,3±5,8)%, (38,8±1,9 and 42,0±4,1)%, (3,42±0,13 and 4,52±0,25)kgf/0,5 in, and (2,45±0,31 and 3,27±0,29)kgf/0,5 in. Among these determinations only shear and adhesion values were statistically significant, lower in (iii) meat.

Moisture, protein and fat of the same thawed *l.dorsi* were respectively for (iii) and (iv) (74,0±0,9 and 76,1±0,9)%, (23,1±1,1 and 22,3±1,4)% and (1,9±0,5 and 1,0±0,4)%. Only moisture content was statistically significant, lower for buffaloes.

Conclusions: 1) "Mediterrâneo" entire males were less suscetible to pre-slaughter stress condition, 2) "Mediterrâneo" meat was tender than "Nelore", and 3) animals with normal *l.dorsi* can present DFD in other muscles.

Effect of Clenbuterol on Lipid Metabolism in Fattening Lambs

V. BANSKALIEVA, Z. SHINDARSKA, T. DARDJONOV and V. DIMOV

Institute of Animal Science, 2232 Kostinbrod Bulgaria

The effect of clenbuterol on both growth and fatty acid composition of different adipose tissues in fattening lambs was studied.

From the weaning (at about 45 days of age) up to the end of the experiment (135 days of age) animals were fed on ration containing energy and protein - 6.0 MJ and 200 g/kg respectively. After reaching approximately 27 kg of live weight, lambs received daily additionally 10 mg clenbuterol per kg of diet for 6 weeks afterwards, followed by a 7 day-withdrawal period.

Administration of clenbuterol reduced the total body fat, especially perirenal fat and that of caul (over 50%), as well as the thickness of different fat depots.

In all adipose tissues investigated clenbuterol reduces the relative amount of 16:0, but does influence differently on the other fatty acids. The unsaturation of both intramuscular and perirenal adipose tissues in treated animals did not change, however this of caul decreased and that of both subcutaneous and breast increased. No significant differences were established in treated animals after a week-withdrawal period.

Results obtained show that clenbuterol exerts a different effect not only on the amount of depot lipids but also on their composition.

Relationship between halothane status and meat quality in Landrace and Large White pigs

PATRICIA BARTON-GADE and MAIKEN BALTZER

Danish Meat Research Institute, Maglegårdsvej 2, DK-4000 Roskilde, Denmark

When routine meat quality estimations were discontinued in Danish pig breeding work in 1987, opportunity was taken to investigate the effect of halothane status (positive or negative) on a number of relevant meat quality characteristics. Litter groups (a castrate and a gilt) were halothane tested about 1 week after arrival at the testing station at an approximate live weight of 30 kg. Pigs were fed ad-libitum and slaughtered at a live weight of about 100 kg. They received a standardised pre-slaughter treatment designed to provoke PSE in susceptible animals. In the experimental period there were 118 litter groups with halothane positive pigs corresponding to a frequency of 2.2% for Landrace and 1.0% for Large White. A number of pigs died during fattening or transport/lairage and some were unthrifty, so that the actual number of pigs investigated for meat quality was reduced to 100 Landrace (44 positive) and 58 Large White (27 positive).

None of the halothane positive Landrace pigs developed normal meat quality. 89% were PSE and 11% more or less DFD. Positive Landrace pigs also had a tendency to both PSE- and DFD-meat within the same carcass and even within the same muscle. Positive Large White pigs showed a similar figure for PSE (89%) but very little tendency to DFD. 21% of the halothane negative Landrace and 16% of negative Large White pigs developed PSE meat, typically in longissimus dorsi. The genotype of the negative pigs was not known but most of them were probably heterozygotes.

Halothane status had no effect on the % protein, % water and % fat in semimembranosus or total pigment content in biceps femoris and longissimus dorsi.

Influence of Age, Strain and Breeding Method on the Eating Quality of Broiler Chickens

[1]A. BASTIAENS, [1]C. DEROANNE, [1]G. CARLETTI and [2]R. ZAYAN

[1]Faculté des Sciences Agronomiques de l'Etat, B-5030 Gembloux, Belgium

[2]Centre d'Ethologie des Animaux Domestiques, B-1325 Corroy-Le-Grand, Belgium

ROSS and COU NU d'Aquitaine broiler chickens grown on pasture and in confinement.

The feeding was the same for both groups.

The chickens were commercially killed at three ages: 6 weeks, 9 weeks and 12 weeks.

They were frozen for at least 2 weeks at -20°C. The breast meat and leg meat were analysed for the chemical composition,, the juice losses, the color and the tenderness assessed by the shear forces and by a taste panel.

Results obtained indicate that:

1. The age has a great influence on the juice losses and the tenderness.
2. The strain has a great influence on the growing rate and on the yield of meat.

   After 9 weeks the growing of the ROSS strain isn't, economically, interesting anymore.
3. The growing on pasture doesn't improve the eating quality of broiler chickens.

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Reflexion measurements of intramuscular fat and color of beef meat in the visible and near infrared range

G. BECK, ROSWITHA DÜRR and H.M. EICHINGER
Versuchsstation Thalhausen, Techn. Univ. München, W - 8051 Kranzberg, Germany

On line measurements of quality criteria are prerequisites for an efficient and reproducible classification of meat quality. This will provide immediate information for the fresh meat customer as well as for meat processing and for further technological treatments (e.g. conditioning). Most important criteria for beef meat quality are intramuscular fat content (IMF) and meat color. Fat content was already measured by near infrared (NIR) techniques in homogenized materials. But little is reported on measurements of beef IMF directly on the meat surface without further sample preparation especially at levels below 10%.
It was the aim of this study to optimize the NIR measurement for low IMF ranges and to combine it with meat color measurement.
The following results were obtained using the NIRSystems Analyzer Model 6500 with an external remote reflectance module (1 day post mortem). Muscle samples (m. long. dorsi) for calibration were removed from carcasses of 20 young bulls and 20 heifers; for verification further long. dorsi muscles of 20 young bulls and 19 heifers were used. Lab values of chloroform/methanol extracted IMF ranged from 1.2 to 11.1%, Minolta L-values from 31.7 - 44.4.

NIR measurements on homogenized material correlated to IMF-Lab values as r = 0.99 (RMS = 0.40%) and on fresh cut muscle surface as r = 0.88 (RMS = 0.96%). Color correlation was best at wavelenghts about 700 nm (r > 0.90). The results of this study indicate, that reflexion measurements in the visible and NIR range via fiber optic techniques are suitable for direct classification of beef meat quality.

The effect of ageing on the eating quality of normal pork loins

CAMILLA BEJERHOLM
Danish Meat Research Institute, Maglegårdsvej 2, DK-4000 Roskilde, Denmark

The literature has shown conflicting effects of ageing on the eating quality of pork, especially on tenderness. Some experiments have shown that ageing pork loins was of little benefit while other experiments, especially Danish work, have shown that ageing improved tenderness. The Danish work dates back to 1971, where the experimental material consisted of Danish Landrace only. Today the majority of Danish slaughter pigs are crossbred with a higher intramuscular fat content. The aim of this work was, therefore, to repeat the previous Danish ageing experiment, but with crossbred pigs. In addition, the experiment included the effect of time of cutting from the carcass in relation to slaughter, as there is commercial interest in fast turnover times in the industry.

20 pigs with normal meat quality i.e. not PSE or DFD and with intermediate levels of intramuscular fat were selected. One side was cut up 8 to 9 hours after slaughter while the other side was first cut up the day after slaughter. The loins from both sides were cut into four pieces and aged respectively 1, 2, 3 and 6 days at 4°C. The eating quality was assessed by a nine-member experienced sensory panel.

The results showed that increased ageing time improved the tenderness. Ageing for 3 and 6 days improved the tenderness significantly compared with ageing for 1 or 2 days. The greatest effect was obtained from 1 to 2 days of ageing. The effect of time of cutting the loin from the carcass had no significant effect on tenderness.

This experiment confirmed the importance of ageing pork loins before they are sold to the consumer.

PORK QUALITY AS AFFECTED BY ANIMAL AGE AND MEAT COLOUR

Ph. BERGE, C. TOURAILLE, R. BOCCARD, R. FOURNIER and M.C. BAYLE
I.N.R.A., Station de Recherches sur la Viande, Centre de Clermont-Fd/Theix,
63122 ST-GENES-CHAMPANELLE, France.

Pig producers are facing an increasing demand from the consumers for high-quality raw meat. In various european countries, consumers can now buy pork of known characteristics. In France, for instance, the "Label Porc" guarantees characteristics such as breed, sex, age, live weight, feeding background and rearing method of pigs, slaughter procedure, carcass muscle proportion and muscle pH. The minimum age at slaughter required in this case is 182 days. One may expect however that slaughter at a more advanced age could lead to even better sensory properties of pork. Moreover, sensory traits of "Label Porc" meat shows a great variability that could be due to differences in animal maturity at the same slaughter age. A trial was thus undertaken to study factorially the effect of age (mean 190 and 206 days at slaughter) and that of meat colour (pale, P, or dark, D, assessed visually) on meat composition and sensory traits of pork from pigs of similar carcass weight and carcass muscle proportion.

The two factors studied had no significant effect on muscle (Longissimus dorsi) DM, haem pigment, lipids and collagen contents ($P > 0.05$). Age had not effect on sensory traits of cooked meat. But D animals scored higher tenderness and higher juiciness than P animals while flavour remained unaffected by meat colour. However, correlation coefficients between variables of meat composition and sensory parameters were low and non significant. These results show that meat quality varies little with age in pigs, at least within the limits achieved in this trial, and that meat colour could be used as a partial indicator of sensory traits of pork for the selection of carcasses according to meat quality.

Carcass Quality and Water in Some Muscles of Chinchilla Rabbit Fed with Substratum remained after the Production of Pleurotus Pulmonarius Mushrooms

BOŽAC R., S. MUŽIC, I. JURIĆ and MARIJY DIKIĆ
Fakultet poljoprivrednih znaosti, 41000 Zagreb, Simunska 25, Yugoslavia

Besides genetic ground, the most significant factors upon which the nutritive, salutary, slaughter and other factors of meat quality together with post mortem process depend, are the quality and the manner of feeding. Therefore, a research has been done on how the feeding of chinchilla rabbit with mycelium substrate mixture (which remains after the Pleurotus pulmonarius mushrooms's production) affects the slaughter weight, stomach fat, dressing percentage, the weight of commercial parts of the carcass and organs, the speed and the course of post mortem glycolysis and water holding capacity in m. longissimus dorsi and m. biceps femoris.

The feeding of chinchilla rabbit with the mycelium substrate mixture (group A 10%, B 20%, C 30%) did not affect significantly slaughter weight and dressing percentage. Group C had significantly more stomach fat than group B ($p<0.05$). As expected, the rabbits from group C had almost significantly heavier commercial loin-ribs-stomach part than those from B group. The weight of organs (liver, heart, kidneys, lungs and wind-pipe) did not show significant differences between the groups, $p>0.05$). The pH value tendency during 120 hours post mortem in m. biceps femoris and m. longissimus dorsi war regular and did not show significant differences between the groups ($p>0.05$).

Total water, water holding capacity and water binding capacity in m. biceps femoris and m. longissimus dorsi after rigor mortis, was similar in all groups ($p>0.05$). As expected, the data on pH and water between m. longissimus dorsi and m. biceps femoris show significant differences in all groups. However, apart from quantity of stomach fat being significantly higher in group C than in group B, the feeding of chinchilla rabbits by mycelium substrate mixture (which remains after the Pleurotus pulmonarius mushroom's production on straw) did not influence significantly the parameters tested.

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The Influence of the Genotype of the Sire and Dam on Beef Tenderness

J.F. DE BRUYN, R.T. NAUDÉ, J.H. HOFMEYR AND H.H. MEISSNER*
Animal and Dairy Science Research Institute, Private Bag X2, Irene, 1675, Republic of South Africa
*Department of Animal Production, University of Pretoria, Pretoria, 0002, Republic of South Africa

The primary concern of this genotypic evaluation study was to evaluate the production and product (carcass, meat & leather) characteristics of certain sire (Afrikaner-A, Brahman-B, Charolais-C, Hereford-H & Simmental-S) and dam (A & Bonsmara-Bo and BA, CA, HA & SA two-way crosses) genotypes, when fed under intensive production systems. Weaner steers of these respective purebreds and crosses were intensively fed (average: ME = 10,50 MJ/kg and CP = 11,86 %) in individual feeding pens and growth responses (ADG & FCR) monitored. Animals from each genotype were slaughtered immediately post weaning (≃210 kg) and at 340, 380 and 440 kg live masses respectively for a complete slaughter animal, carcass, meat quality and hide/leather quality evaluation. Meat tenderness evaluations included shear force determinations on meat samples cooked when sealed inside a plastic bag for one hour in waterbaths kept at 60, 70 and 80 °C respectively, as well as in an oven (160 °C to internal temperature of 70 °C). The latter oven-roasted sample was also evaluated by a sensory panel, using a five point measuring scale, for, *inter alia*, tenderness.

All five meat tenderness characteristics showed a significant ($P<0,05$ & $P<0,01$) sire effect, with the effect of the respective dam groups being non-significant. Sire differences were primarily due to the less tender meat of S- and B-sired genotypes at about the same magnitude, with A-, C- and H-sired genotypes showing favourable results. When including the B and S respectively in a rotational crossbreeding system with the A, the most favourable heterosis responses were respectively observed in the BA backcrossing to the A-sire (ABA-25 % B) and SA two-way cross (50 % S).

In the diverse genetic population examined, meat tenderness differences were only due to the less tender meat of the B- and S-sired genotypes. Positive heterosis responses in the ABA and SA resulted in a favourable meat tenderness in crosses possesing respectively 25 % B and 50 % S blood.

An In Vivo Predictive Test for Meat Quality in Pigs

K.S. CHEAH[1], A.M. CHEAH, R. LAHUCKY[2], J. MOJTO[2], and J. POLTARSKY[2]
[1]Animal Production Section, School of Agriculture & Forestry, University of Melbourne, Parkville, Victoria 3052, Australia and [2]Research Institute of Animal Production, Hlohovska 2, 949 92 Nitra, Czechoslovakia.

A new procedure for evaluating meat quality is described. It provides the pig industry with an in vivo diagnostic method for identifying PSE-prone pigs.

Biopsy samples (0.5-1.0g) of M longissimus dorsi (LD) were obtained by "Shot Biopsy" technique on live halothane-tested pigs (65-80Kg). Meat quality was assessed by measurements of pH of LD muscle at 45 mins post-mortem, and pH, water holding capacity (WHC) and Ca^{2+} released after incubation of 0.5g LD biopsy and/or immediate (<3 mins) post-mortem samples with an equal volume of 150mM KCl at 39°C for 45 mins. After incubation, the LD muscle was finely minced with a pair of scissors for 2 mins in ice and then centrifuged at 12,000g for 2 mins. The supernatant or "Fluid Volume", is used as a measure for the WHC, and for pH and Ca^{2+} determinations. Meat quality (pH and colour) was also measured on LD muscles at 24 hrs post-mortem.

A significant difference ($P<0.001$) in the "Fluid Volume", Ca^{2+} released and pH was observed between the halothane-sensitive and halothane-insensitive pigs, with a good correlation ($r = -0.85 \pm 0.19$ [$p<0.001$]) between pH and "Fluid Volume". The data suggest that pigs with a "Fluid Volume" of less than 0.45g/0.5g wet wt LD will produce normal pork, and those with values greater than this will produce PSE pork.

Measurement of "Fluid Volume" and pH using small "Shot Biopsy" LD samples can identify PSE-prone pigs, and can be used to select pigs with a potential to produce pork of good WHC.

On-line objective evaluation of pork quality

R. CHIZZOLINI, G. DELBONO, E. NOVELLI, S. PONGOLINI, P. ROSA

Istituto di Scienza e Tecnologia degli Alimenti, Facoltà di Medicina Veterinaria, 43100 Parma, Italy

A research has been undertaken in which various methods for meat quality evaluation have been compared over a group of approximately 800 pigs of various genetic and breeding backgrounds. Measures were taken at 45' and 24h p.m. on the Semimembranosus muscle during routine abattoir working operations. The techniques employed were pH (by homogenization and by combination electrode), light scattering, conductivity, dielectric loss factor and colour.

The results have shown a very low incidence of PSE and DFD cases and a limited correlation between pH measures by homogenization and by combination electrode. Dielectric loss factor, as measured by the MS Tester, appeared to be specifically suited for PSE diagnosis. On the other hand, light scattering and conductivity measured at 24h p.m. seemed to be better suited for meat quality evaluation outside strict PSE. Colour measurement have given interesting hints, especially with the parameters L*, a* and Hue. Meat could, in fact, be classified by red colour intensity (a*), by type of colour (Hue) and by exudative appearance (L*).

No marked effects of breeding techniques have been observed, while the genetic background appears to influence some colour parameters.

Principles for Future Payment of Pigs

CHRIS CLAUDI-MAGNUSSEN

Danish Meat Research Institute, Maglegaardsvej 2, DK-4000 Roskilde, Denmark

Introduction of the classification centre (CC) to Danish slaughterhouses has made a more detailed classification of the the carcasses possible. CC measures the depth of the fat and the meat layer plus the total depth in all parts of the carcass. The content of meat is calculatet for the whole carcass and for the forend, middle and leg. Furthermore, in future the Danish classification is expected to include meat quality classification as well.

The detailed classification provides a possibility for more varied payment methods, which can improve the payment as guide to the raw material quality and at the same time make the payment more just compared to the value of the carcass.

By entering more parametres into the payment a problem with the statement of value of the individual parametres in the payment formula will arise. The payment parametres cannot be fixed individually, but should be taken as a whole to secure the optimal payment formula.

It is recommended to apply statistic methods to fix future payment formulae. It can be made by calculations based on a data material consisting of a representative sample of carcasses worked up into a representative assortment of products. The products are priced and the sum of the application value of the products is compared to the classification measurings. Alternative payment formulae can be made and compared. The pricing of the products may depend on the quality registered and may be altered pari passu with the market alterations. The value of use for the carcasses of the data material can be re-calculated and compared with alternative payment formulae.

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Effects of several diets on the chemical and fatty acid composition of rabbit meat

A. COBOS, M.I. CAMBERO, J.A. ORDOÑEZ and L. HOZ
Dpto. Higiene y Tecnología de los Alimentos, Fac. Veterinaria, Univ. Complutense, 28040 Madrid. Spain

In comparison with other species, rabbit meat has low levels of sodium and fat and a high content of protein, phospholipids and PUFAs (1,2). Thus, this meat could be a very interesting food in human dietetics. The effects of several diets on the chemical and fatty acid (FA) composition of rabbit meat were studied.

Diets were prepared with four levels of barley (B), complemented with beet pulp (BP), cereals straw (CS) or alfalfa hay (AH) (Diet 1 (%): B, 50; BP, 0; soy meal, 14.3; CS, 5.3; AH, 29.7. Diet 2: 0;50;14.3;5.3 and 29.7. Diet 3: 30;0;11.1;0 and 58.3. Diet 4: 15;15;11.1;0 and 58.3). Four batches of ten rabbits each were fed with the appropriate diet. Animals were slaughtered at weights from 2.0 to 2.5 kg. Meat obtained from each animal was homogenized in a blender. Moisture, protein and ash were measured according to AOAC. Lipids were extracted according to (3). FA methyl esters were obtained according to (4) and analyzed with a Konik KNK chromatograph equipped with a capilar column (25 m x 0.22 mm I.D) SGE packed with BP5 on fused silica.

Significative differences ($p<0.05$) were found for the chemical composition of the rabbit meat (n=10) in batch 2 versus 3 for dry matter and fat and in 1 v 2 for fat. Significative differences ($p<0.05$) were also found for C-16:1, C-16:0, C-18:1, C-18:0 and C-20:4 FAs in batch 2 v 3; for C-16:1, C-16:0, and C-18:1 in 2 v 4; for C-16:1 and C-18:0 in 2 v 1 and for C-16:1 and C-18:0 in 1 v 4.

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Virginiamycin and growth performance in beef cattle

G.M. CROVETTO*, L. RAPETTI*, A. TAMBURINI* and E. BOSELLI**
* Istituto di Zootecnia Generale, Facoltà di Agraria, via Celoria 2, 20133 Milano, Italy
** SmithKline Beecham, via Sporting Mirasole 2, Noverasco di Opera, 20090 Milano, Italy

Aim of the trial was to compare Virginiamycin (VM) to Monensin Sodium (MS) effect on beef cattle growth performances. 63 Salers bulls (353 kg on average) were assigned to 3 treatments: group C=MS 150 mg/head daily, group VM75=VM 75 mg/head daily, group VM150=VM 150 mg/head daily.

Animals were randomly assigned to 9 pens (7 bulls each) with 3 replications per treatment. Two diets were fed ad libitum: "grower" (129 days, 353-555 kg LW) and "finisher" (59 days, 555-623 kg LW). Live weight was individually recorded every 43 days in the grower phase and at the beginning and at the end of the finisher phase. Individual daily weight gains (DWG) and feed conversion ratios (FCR, kg DMI/kg LWG) of each pen were calculated for each interval between consecutive weighings. Average liveweights at start were homogeneous, but with a fairly high variability within each group which affected statistical evaluation.

In the "grower" phase average DWG were 1329, 1364 (+2.6%) and 1444 (+8.7%, P=0.08) g and FCR 7.01, 6.89 (-1.7%) and 6.63 (-5.4%) for group C, VM75 and VM150, respectively. In the "finisher" phase average DWG and FCR were: 1055, 1149 (+8.9%), 1101 (+4.4%) g and 8.84, 8.23 (-7.9%), 8.42 (-5.8%) for group C, VM75 and VM150, respectively. In the entire experiment average DWG and FCR were: 1248, 1300 (+4.2%), 1332 (+6.7%) g and 7.53, 7.27 (-3.5%), 7.09 (-5.8%) for group C, VM75 and VM150, respectively. Dressing percentages at slaughter were similar in the three groups. Virginiamycin integration of the diet positively affected growth performance in fattening bulls, with a dose response effect.

Grading beef carcases on the meat haem iron content

B.L. DUMONT, E. HUDZIK and J. BOUSSET

Laboratoire de recherches sur la viande de l'INRA, F 78352 Jouy en Josas Cedex, France

The possibility of grading beef carcasses on the meat haem iron content has been explored in one sample of animals (N=10) choosen to be representative of the diversity encountered in the French market. In each carcase, the haem iron (Fe) assessed according to Hornsey's method (1956) was determined in 39 muscular locations. The average of Fe_i values was considered in each carcase as its average haem iron index (FE). The relationship between Fe value of the 39 individual muscles and FE were all significant, the variation of FE being specially explained (96.4 to 93.3 per cent of variation) by the Fe of muscles such as *semimembranosus, gracilis, vastus lateralis, adductor, gluteus medius, longissimus lumborum*. It is thus suggested to grade beef carcases from the Fe values of any of the above muscles. To have a simple and practical method of the haem iron content estimation it is also proposed, as an alternative to the Hornsey's method (which is long and relatively unpractical on line at the abattoir), to determine the haem iron content from microsamples of meat (3 samples of 2 g each) by measuring, as suggested by HUDZIK (1990), the optical density of their water extracts at 410 nm which was found to be very highly correlated (r = + 0.99) with Fe.

Applications of the grading carcasses method for haem iron content are discussed by considering both the certification of nutritional value of meat and the assessment of maturity index of the carcase.

The Suitability of Measurement Points and Carcass Traits for Estimating the Main Tissue Composition of Beef Carcasses

G. ENGELHARDT

Federal Centre for Meat Research, Institute for Meat Production and Marketing, D-8650 Kulmbach, Germany

The aim of this study is to investigate objective methods for predicting the main tissue composition of beef carcasses. A sample of carcasses from young bulls of typical german breedtypes has been used in this investigations.

The suitability of various combinations of carcass characteristics and measurement points as well as the degree of accuracy that can be achieved has been tested by means of multiple regressions analysis.

At all the results show a high accuracy of the estimates. For predicting the lean percentage a combination of several fat and body shape measurements gives a good alternative. Nearly the same combination is an acceptable method for estimating the percentage of fat tissue, too.

This results show clearly that even for grading purposes there exists a possibility to predict the lean and fat percentage with a high accuracy. Therefore the question for future grading aspects can be derived. Especially the lean percentage seems to become more important.

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Finishing effect on carcass composition and meat quality in Frisian young bulls

S. GIGLI, A. CARRETTA, S. FAILLA, A. DI GIACOMO

Istituto Sperimentale per la Zootecnia, Via Salaria, 31 - 00016 Monterotondo Scalo (ITALY)

The trial effect was carried out on 80 Friesian young bulls subdivided into 5 groups: **a** - fed mais-silage ad libitum and 800 g/d of soybean meal from 420 kg to 570 kg, **b** - as **a** + 1 kg/q live weight of corn-mais from 420 to 570 kg, **c** - as **b** but from 500 to 570 kg, **d** - as **a** + beet-pulp equivalent to corn-mais energy of b, **e** - as c but from 500 kg to 570 kg.

All the animals were slaughtered and their half-carcass were anatomical dissected in meat, fat (subcutaneous and intermuscular) and bone. On three muscles (Longissimus dorsi, semitendinosus and gluteo biceps), pH and colour (L, a, b, C and H) with 3 illuminants (A, F and C) only on raw meat, water holding capacity and tenderness (warner bratzler shear) on raw and cooked meat were determined.

The long time of finishing affect significantly average daily gain (1.480 kg, 1.270 kg for **b** and **d** groups vs 0.998 for **a** group). Conformation of **c** and **d** groups is hardly better (3 vs 3-) as the fatness is major for c group (3- vs 2+) as the others.

The animals of **d** group showed the maximum of meat percentage (65,3%) while the total fat percentage is maximum in **c** group and minimum in **b** group (14.8% vs 13.1%).

In raw meat there are differences among group while in cooked meat no differences are noted for tenderness.

Also a water holding capacity is not affected by these types of finishing, while colour, in particular Chroma (C), shows differences among groups and muscles.

Our trial shows that the use of finishing affect a.d.g. and carcass composition in particular in long time while variation of meat quality is not very manifest.

Some Characteristics of Egyptian Lamb Meat

K. HAMMADI and A. AWAD

Food Science and Technology Department, Minia University, El Minia, Egypt

Sheep meat isf frequently consumed by Egyptian and Arabian people. The whole carcass of Egyptian lamb (Osgmi), 1.5 year in age was divided into 8 cuts namely, leg, shoulder, breast, flank, loin, 7th-12th tibs, neck, and 5th-6th ribs. Each cut had been deboned, and liberated from external fats and connective tissues. The separated muscles were passed through meat grinder twice to get homogenous samples. The chemical composition, sarcoplasmic, myofibrillar, and stroma proteins; amino acids composition; phosphorus compounds; PH-WHC curves; and emulsifying capacity were determined in each cut muscle of Egyptian lamb. The present study is designed to provide knowledge about some physical, chemical and nutritive properties of Egyptian lamb muscles. The results revealed that all cuts of Egyptian lamb meat contained high percentage of protein essential amino acids and phosphorus.

The main protein fraction in all cuts was myofibrillar proteins. The breast cut possessed the highest myofibrillar to stroma ratio, while the flank muscle had the lowest. The total phosphorus in the muscles of all cuts studied ranged from 187 to 31 mg/100g tissues. PH-WHC curves indicated that the isoelectric regions of the cut proteins were around pH 5. The breast proteins gave the higher emulsifying capacity and emulsion stability than the other cuts.

Effect of moderate indoor exercise on carcass composition, meat quality and muscle enzyme activities in pigs

I. HANSSON, K. LUNDSTRÖM, A-C. ENFÄLT, A. KARLSSON, B. ESSEN-GUSTAVSSON AND J.HÅKANSSON
Swedish University of Agricultural Sciences, S-750 07 Uppsala, Sweden

The aim of this experiment was to study the effect of moderate indoor exercise on carcass composition and muscle characteristics of pigs. Forty crossbred pigs, reared in groups of ten pigs in each of four pens, were used in the study. The pigs in two of the pens were given moderate indoor exercise by running/walking together in groups, five days a week during the whole rearing period. The pigs were forced to follow the narrow feeding passage in the house and the distance on each running occasion was about 500 m. Both groups were restrictedly fed the same diet with the same daily allowance.

The pigs were slaughtered the week they reached a live weight of 103 kg. After at least two hours of rest at the lairage the pigs were stunned on floor with low voltage elecricity. Immediately after exsanguination, muscle samples were taken from M. longissimus dorsi and M. biceps femoris for enzyme analyses. Initial pH was measured in the same muscles.

Two days after slaughter, the carcasses were partially dissected to obtain an estimate of the lean meat content. The hams were also totally dissected into individual muscles. The quality of the meat was evaluated by reflectance, pH_u and water holding capacity. Muscle samples were taken for analysis of intramuscular fat content (IMF) and protein extractability.

The exercise had negligible effects on most of the parameters studied. The lean meat content in the whole carcass was the same in both groups. The exercised gilts had a slightly heavier ham, due to a somewhat heavier M. gluteus and more subcutaneous fat. Exercise influenced the IMF content, decreasing the level in M. biceps femoris (1.5% vs 1.8%; $p<0.5$). The lairage and slaughtering procedure used resulted in relatively low levels of stress, and no effect of earlier exercise was observed for meat quality parameters other then IMF, glycogen content or enzyme activities, which might otehrwise have been apparent in a more stressful environment.

Evaluation of growth patterns in pigs by Magnetic-Resonance-Tomography

M. HENNING, U. BAULAIN and E. KALLWEIT

Federal Agricultural Research Centre - Institute of Animal Husbandry and Animal Behaviour, 3057 NEUSTADT 1/Mariensee, Germany

Growth of lean in meat producing animals is of major economical importance. Therefore appropriate methods to estimate tissue portions in live animals and carcasses are essential. Non invasive measuring techniques like ultrasound, X-ray- and Magnetic resonance tomography have to be adapted from their original medical and diagnostic application to quantitative determination of lean and fat.

Pigs were scanned in a whole body MR-Imaging system (BRUKER Medspec BMT 15/100) at 3 liveweight classes during growth (20, 50, 90 kg). Simultanously, litter mates were slaughtered, carcasses were also scanned and dissected. Scanning positions along the carcass were 13th/14th thoracic vertebra, 2nd/3rd lumbar vertebra, 1st sacral vertebra and ham region at the caudal end of os pubis. Two dimensional evaluation of transversal images was used for calculation of lean to fat ratio.

Dissection results were compared to MR measurements. The information of images at different positions were combined in different evaluation models and yielded max. $R^2 = .98$ for lean and $R^2 = .97$ for fat content in the carcass.

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Quality characteristics of Angus beef for the Japanese market derived from different sources

D. HOPKINS

Department of Primary Industry, P.O. Box 180, Kings Meadows, Tasmania, 7249, Australia

There is possibly scope to optimise selection of cattle for feedlotting for the Japanese market based on the known performance of cattle from specific sources. To investigate this approach, data on the quality characteristics of cattle lot fed together, but sourced from different properties were obtained. Eighty-three Angus steers from sixteen properties were lot fed for 400 days. At slaughter hot carcass weight, subcutaneous fat depth at the 5th/6th rib (EM) and the P8 site were obtained. A visual assessment of fat distribution was given on a 15 point scale (1 = very poor distribution to 15 = excellent, even cover). Other attributes assessed were marbling on a 12 point scale (1 = zero marbling to 12 = very highly marbled), meat colour on a 9 point scale (1 = very light red to 9 = very dark red) and fat colour on a 10 point scale (0 = polar white to 9 = creamy yellow) all at the quartered 5th/6th rib surface. The carcasses had a mean weight of 349kg (281-419) and a fat depth at the P8 site of 19.7mm (10-33). There was no correlation between subcutaneous fat depth at either the P8 or EM sites and marbling. The property source of the steers did not have a significant effect on the marbling or fat colour scores. It was apparent that no property produced cattle with more of a propensity to marble, this in no way implying a genetic effect does not exist, simply that more elaborate procedures would be needed to detect differences. The finding that accumulation of subcutaneous fat is an inefficient indicator of increases in marbling implies significant economies could be made, if cattle that attain minimum specifications for fatness could be identified by non invasive techniques to prevent overfeeding.

Liveweight gain and carcass characteristics of lambs grazing two rape varieties

D. HOPKINS and D. JOHNSON

Department of Primary Industry, P.O. Box 180, Kings Meadows, Tasmania, 7249, Australia

There have been several new varieties of brassicas released for use in Australia amidst claims of improved animal performance. One of these is a variety called Arran, observed in local trials to have improved herbage production. The conversion of this increased feed into animal product is in question as this variety is less palatable to sheep than the widely grown Rangi. A study was carried out to investigate the liveweight gain of lambs grazing the two varieties and their subsequent carcass characteristics. Two 0.4 ha plots were sown with either Arran or Rangi. Herbage yield was estimated prior to grazing using quadrats and only considering green leaf and petiole. Twenty weaned mixed sex lambs were randomly assigned to each plot based on stratified liveweight. The first grazing period was of 54 days duration after which all suitable lambs were slaughtered. After 21 days regrowth the crop was grazed for 35 days by 19 lambs per variety. At slaughter the carcass weight and GR (tissue depth over the 12th rib 110mm from the midline) were recorded. Available herbage prior to the first grazing was 2450 kg/ha and 2690 kg/ha for Rangi and Arran respectively. After regrowth, the yields were 1180 kg/ha and 1510 kg/ha respecitvely. For both grazing periods, there were no significant differences in liveweight gain or carcass characteristics of lambs grazing the two varieties. Thus despite observations that sheep find Arran less palatable than Rangi, similar growth rates were observed. There was a tendency for lambs grazing Arran to grow faster, probably directly related to the greater dry matter allowance. This implies animal production can be potentially increased off a set area of land, a response which requires validation.

Boneless mutton: Factors foundational to real price setting

D. HOPKINS, A. ROBERTS and K. PIRLOT

Department of Primary Industry, P.O. Box 180, Kings Meadows, Tasmania, 7249, Australia.

Effective costing of carcasses by the meat processing sector which trades in primal cuts can be undertaken if these components can be predicted and then related to the price paid for the carcass. Two parameters are obtained on small stock slaughter floors in Australia, carcass weight and a measure of fatness which is based on the "GR" measurement (total tissue thickness at the 12th rib 110mm from the midline). These two variables can be used to predict carcass components. Data on 551 mutton carcasses from 296 ewes and 261 wethers covering the carcass weight and "GR" measurement ranges of 9.2-43.8kg and 0-41mm respectively were obtained. All carcasses were boned under commercial conditions into a range of cuts. Those considered here are boneless legs, with and without the fillet head and fillets. The mean weight of these cuts and the range was 4.1 (1.8-6.6kg), 4.3 (1.9-6.8kg) and 0.29 (0.16-0.42kg) respectively. Each cut was trimmed to a selvedge acceptable for sale on a retail basis. The amount of trunk meat designated 80 and 90% visual lean was also determined. The effect of fatness and carcass weight on the rate of boning was determined. Sex did not have a significant effect on the models developed for each cut and all explained a large amount of the variation in component weights (r^2 = 0.75-0.93). As fatness increased so did boning time. Integrating prediction equations with financial information (costs and returns) for all the components of a carcass in a computer program allows the equilibrium price for different carcasses to be established. This is the price a processor can afford to pay for a specified carcass. The computer program under development has the overall aim of clarifying diffuse market signals.

Estimation of EC-lean meat percentage in major cuts of pig carcasses based on multiple measurements of fat thickness with the Hennessy Grading Probe 2

B. HULSEGGE, P. STERRENBURG and G.S.M. MERKUS

Research Institute for Animal Production 'Schoonoord', P.O.Box 501, 3700 AM Zeist, The Netherlands

ABSTRACT

An experiment was carried out to examine the possibility of estimating EC-lean meat percentage in the major cuts by measuring subcutaneous fat thickness in these cuts. The thickness of subcutaneous fat was measured at 15 locations in the right side of 30 randomly chosen carcasses with the Hennessy Grading Probe 2. The right sides of the carcasses were dissected according to the IVO-standard method. Additionly the major cuts, ham, shoulder, belly and loin, were dissected according to the EC-reference method.

Fat thickness, between the 13th and 14th thoracic vertebrae from cranial and 6 cm off the midline, appeared to be the best single estimator of the EC-lean meat percentage in the major cuts. Fat thickness, between the 3rd and 4th thoracic vertebrae from caudal and 6 cm off the midline, constituted a good alternative.

The use of multiple measurements, compared to single measurements, hardly reduced the residual standard deviation (RSD) of the estimation of EC-lean meat percentage in the cuts. It did however increase the R^2 of the estimation with 0.10 and 0.15.

The results indicate that multiple probing, compared to single probing, improves the accuracy of the estimation of EC-lean meat percentage in major cuts. However the additionly effort in taking multiple measurements may outweigh the relative small gain in precision of predicting the EC-lean meat percentage in major cuts.

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Mechanisms for Improving the Prediction of Carcase Composition Using Subcutaneous Fat Thickness

E.R. JOHNSON* and R. PRIYANTO†

* Faculty of Veterinary Science, The University of Queensland, Qld. Australia, 4072

† Faculty of Animal Science, Bogor Agricultural University, Bogor, Indonesia

In an effort to improve the value of the subcutaneous fat thickness measurement for predicting beef carcase composition, simple regression was used, examining first for breed-weight group interactions. Sixty-eight steers were slaughtered sequentially at approximately 300, 400, 500 and 600 kg liveweight within each of three genotypes, and a side from each chilled carcase was anatomically dissected. Regressions of percentage side fat and percentage side muscle on subcutaneous fat thickness showed no significant breed x weight group interactions. However at equal fat thickness significant breed differences were found in the two heavier carcase weight groups. When the two heavier and two lighter weight groups combined into a "heavy" and a "light" group respectively, and re-analysed, breed did not explain any important differences in the prediction of fat or muscle. However, when regressions were adjusted for fat thickness, breed variations occurred which indicated that fat thickness was not a reliable predictor of fat or muscle in the "heavy" carcases. Multiple regression analyses showed that in the "light" carcases, percentages of fat and muscle were best predicted by subcutaneous fat thickness alone while weights of fat and muscle were best predicted from fat thickness and hot side weight. In the "heavy" carcases, percentages and weights of fat and muscle were best predicted by using fat thickness and hot side weight together with eye muscle area. Muscle score was of no value as an additional regressor. It is concluded that for light weight carcases fat thickness and hot side weight provide adequate prediction of carcase composition while in heavy weight carcases, fat thickness, hot side weight and eye muscle area are all necessary for satisfactory prediction.

The Use of Saleable Beef Yield as a Scientific Parameter

E.R. JOHNSON*, D.G. TAYLOR* and D.P. MEEHAN†

* The University of Queensland, Qld., Australia, 4072

† Livestock and Meat Authority of Queensland: current address, Australian Meat and Livestock Corporation, Brisbane, Qld., Australia 4102

Studies of sixty heavy export steer carcases (fifteen each of four genotypes weighing from 297 to 395 kg hot carcase weight) using a commercial breakdown procedure taken on to total anatomical dissection showed that the fat content of saleable beef yield varied widely. In Hereford steers the total fat percentage of saleable beef yield ranged from 14.9 to 24.4; in Brahmans, 13.2 to 22.5; in Brahman x Hereford steers, 12.7 to 21.5; and in the Simmental x Hereford group, 11.0 to 20.3. While saleable beef yield varied with genotype, differences could not be explained by degree of fat trim. The Herefords, with the lowest saleable beef yield at any given subcutaneous fat thickness, contained the highest levels of dissectible fat relative to fat thickness. The percentage of total fat in saleable beef yield increased with increasing fat thickness at about the same rate in all four genotypes, with no evidence of curvilinearity and no tendency to plateau. Although the carcase trimmer was attempting to trim cuts and manufacturing meat to a specification, he inadvertently allowed a greater proportion of fat into saleable beef yield with increasing carcase fatness, regardless of genotype. The variability in total fat percentage of saleable beef yield in this study (11.0 to 24.4) and the fact that it did not plateau, suggest that scientists should be very cautious in interpreting carcase growth responses when they use saleable beef yield as the dependent variable. It is recommended that studies be made on the individual components of beef carcases, that is total muscle and dissectible fat, in order to obtain a more accurate appraisal of carcase growth changes.

Muscle characteristics in relation to technological meat quality and meat quantity in pigs

ANDERS KARLSSON[1], ANN-CHARLOTTE ENFÄLT[1], BIRGITTA ESSEN-GUSTAVSSON[2], KERSTIN LUNDSTRÖM[3], INGEMAR HANSSON[1], LOTTA RYDHMER[3] and SUSANNE STERN[3]

[1] Dept. of Food Science, [2] Dept. of Medicine and Surgery, [3] Dept. of Animal Breeding and Genetics, Swedish University of Agricultural Sciences, S-750 07 UPPSALA, Sweden

The aim of this experiment was to study the relationship between muscle histochemical and biochemical properties and technological meat quality in slaughter pigs from an experiment where selection was made for lean tissue growth rate. The pigs were either fed a high (18.5% crude protein, 0.96% Lysine) or a low (13.1% crude protein, 0.64% Lysine) protein diet. Muscle samples were taken from M. longissimus dorsi (LD), M. biceps femoris (BF) and M. quadriceps femoris (rectus femoris; QF) at slaughter and analysed for fibre types (I, IIA, IIB), glycogen content and enzymes indicating oxidative and glycolytic capacity. The technological meat quality was measured as pH, water holding capacity, surface and internal light reflectance, intramuscular fat content (IMF) and protein extractability. Comparisons were made between diets and between generations.

A high protein level in the diet resulted in a higher lean content in the carcass and a lower intramuscular fat content (IMF) compared with the low protein diet. QF had higher oxidative and lower glycolytic capacity compared with LD. BF was in between the other two muscles. Pigs fed the low protein diet had higher oxidative and lower glycolytic capacity than those given the high protein diet. A negative relationship was found between glycogen content and ultimate pH. The high protein diet resulted in a higher lean meat content and a slightly higher technological meat quality. A negative relationship was found between IMF and Lactate dehydrogenase activity, which indicates that animals with a low IMF have a more glycolytic muscle metabolism and vice versa. The results of this study indicate that protein levels in the diet influence muscle characteristics and technological meat quality.

Variations in Lightness and Exudation Among Ten Porcine Muscles

R. G. KAUFFMAN, R. D. WARNER and R. L. RUSSELL

Muscle Biology Laboratory, University of Wisconsin, Madison, WI 53706 USA

Drip loss and color are important quality traits of pork and the longissimus thoracis (LT) is used to classify carcasses for these traits. Nineteen carcasses, possessing a wide range in quality, were used to compare variations of quality in the LT, psoas major (PM), gluteus medius (GM), rectus femoris (RF), semimembranosus (SM), semitendinosus (ST), biceps femoris (BF), triceps brachii (TB), infraspinatus (IS) and supraspinatus (SS). At 24 hr. post mortem, muscle exudate was determined by mg fluid retention on filter paper (FP), and surface lightness (CIE-L^*) was measured with the Minolta Chromameter. The LT of each carcass was classified into one of the following five categories: PU, pale (L^*>56) and unacceptable for exudation (FP>100 mg), N=3; PA, pale and acceptable for exudation, N=2; RU, red (L^*=47-56) and unacceptable, N=3; RA, red and acceptable, N=7 and DA, dark (L^*<47) and acceptable, N=4. The results indicated that four muscles of the ham (GM, SM, ST, BF) responded similarly in quality traits to those of the LT, regardless of the condition, whereas the other muscles (PM,RF,TB,SS,IS) were similar to the LT only for the DA class. For example, the mean mg exudation for the PU class was, LT=128, ham = 112 ± 15, other (PM,RF,TB,SS,IS) = 58 ± 17, and for the DA class, LT=28, ham = 33 ± 4, and other = 25 ± 3. The mean L^* values for the PU class were LT = 59, ham = 55 ± 2, other = 43 ± 3, and for the DA class, LT = 43, ham = 40 ± 3 and other = 39 ± 2. In conclusion, quality measurements of the LT adequately represent those of the major ham muscles when the conditions represent a range in quality. However, this is only true for the other muscles when the condition is DA.

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Influence of cross breeding of *cigaja* x *german land sheep* on the lamb carcass and meat quality

DJURDJICA KELEMEN-MASIC and R. REDE

Faculty of Technology, Yu-21000 Novi Sad, Yugoslavia

The influence of cross-breeding on carcass and meat quality parameters of lambs of *cigaja* x *german land sheep (Württemberg)* of F_1 and R_1 generation were investigated. All animals were fed on identical rations and slaughtered at the same age of 120 days. After slaughtering the measuring of carcass characteristics, the determination of chemical composition of meat, of glycogen break down rate, measuring of pH_{24} and WHC, as well as the estimation of sensory value was carried out. Average live weight was by crosses (C x W) much higher (49.6 kg) than by *cigaja* lambs (42.30 kg). Carcass weight after cooking was by cigaja lambs 22.20 kg, by F_1 and R_1 crosses 27.10 kg and 25.90 kg, respectively. The parameters of the chemical composition did not show any differences between investigated groups. By comparative measuring of pH_{24}, WHC and colour (CIE system) of MLD no differences between *cigaja* lambs and crosses of F_1 an R_1 generation, which should result in differences in meat quality of lambs, were stated. The significant differences in tenderness and juiceness of cooked MLD were determined, not only between *cigaja* lambs and its crosses, but also between both generations. The crossing of domestic *cigaja* and *german land sheep* results in advancing of meat yield and eating quality.

Effect of type of feed and feeding level on the meat quality and yellowness of the fat in cows

SIGNE KLASTRUP and LISE RAMSGAARD JENSEN

Danish Meat Research Institute, DK-4000 Roskilde, Denmark

The objective of this study was to investigate if it is possible to improve the carcass characteristics and meat quality of Jersey cows, as well as reducing the yellowness of the fat, because many cows have poor muscularity and yellow fat at slaughter. This is done by feeding at a high feeding level in the last 8 weeks before slaughtering and by using a low carotene feed. This paper decribes the results for the colour of the fat and the meat quality.

The investigation included 60 cows. For the first 20 weeks after calving the cows were fed on either grass silage (high carotene) or corn-silage (low carotene) with a high energy level (HG or HC) or corn-silage with a lower energy level (LC). The last 8 weeks before slaughtering half the cows in these three groups were fed at a normal feeding level (a) and the remainder at a high feeding level with corn-silage (b). The cows were slaughtered 30 weeks after calving and were evaluated according to the Institute's standard procedures. The colour of the fat cover was evaluated subjectively. Determination of meat quality included measurement of ultimate pH, Hunterlab-colour, % intramuscular fat and shear force, as well as sensoric evaluation of Longissimus dorsi (LD). Hunterlab-colour and the carotene content was measured for the fat above the LD.

Results from 27 cows showed a tencency towards less yellow fat colour and towards a higher intramuscular fat content (up to 2.2%) in group b compared to group a. The Hunterlab saturation value for the fat was lower in the b-groups than in the a-groups. The carotene content was considerably higher in the HC-a group (18.7 ppm carotene) than in the other groups (1.7 to 9.8 ppm carotene). The fat contains more carotene in animals fed at normal feeding level, than in those fed at a high feeding level.

System of Carcass Grading in Meat Industry

V. KRASTANOV

Institute of Meat Industry, Bul. Cherni Vrah 65, Sofia 1407, Bulgaria

In the present study the author examined an effective solution to the problem of carcass grading in reimbursement with the suppliers. On the base of the experiences of the firms producers of equipment as Fat-o-Meater (Denmark), Henessy (Australia) and the Soviet developments at VNIIKIMP (Moscow) the author developed a simple and light instrument. The instrument data on suitable interface can be processed in microcomputer PC-XT of PC-AT. A single machine program determines the fat thickness, lean meat thickness and meat/fat ratio. The system is equiped with taring device of the instrument, which depends on its distribution.

The system allows complete automatization of the process of carcass reception. As the system is equiped with electron scales and instruments for measurement of fat thickness and lean meat, it can accomplish together with the microcomputer and objectice estimation of carcass quality and weight without human interference. This system economizes the hardware functions that compensates the software functions of the computer. The expected price of the system is about ten times lower than the Danish and Australian systems. In the study is presented the machine software and the program products for further data processing.

If the system implements in the meat industry, the effects of the above mentioned systems will be achieved but at lower cost and with fast realization.

Total Body Electrical Conductivity as a Research Tool in Pork Carcass Evaluation

C.H. KUEI, J.C. FORREST, A.P. SCHINCKEL and M.D. JUDGE

Department of Animal Sciences, Purdue University, West Lafayette, Indiana 47907, USA

Complete dissection of carcasses is costly in animal breeding, nutrition and related research. The potential for using total body electrical conductivity (TOBEC) to estimate pork carcass composition in a laboratory environment was studied by complete dissection of right carcass sides from 325 pigs. Pigs were randomly divided into two groups. Prediction equations were developed on data from 280 pigs and these equations were validated on the other 45 pigs. TOBEC measurements were conducted with a Agmed Inc. HA-2 electromagnetic scanner before carcasses entered the chill cooler. The combination of TOBEC readings, 10th rib backfat depth, warm carcass weight or primal cut weight, plus warm carcass lenght or warm carcass temperature were used to develop prediction equations. Four-variable equations could accurately estimate fat-free lean (FFL) weight in carcass (R^2.91, RSD 1.47), ham (R^2.93, RSD.22), loin (R^2.90, RSD.20) and shoulder (R^2.91, RSD.19). Substitution of rough cut weight for primal cut weight in prediction equations will save labor without significantly affecting the accuracy (R^2.93 and RSD.22 for ham; R^2.88 and RSD,23 for loin, R^2.89 and RSD.22 for shoulder). It is not necessary to have different equations for different gender, weight or backfat depth groups of pigs. Addition of 10th rib loin muscle area measurement does not significantly increase the prediction accuracy. Bias was practically non-existent in the equations presented. Results suggest that TOBEC can be used to substitute for complete dissection in pork carcass composition research.

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On the validity of several tests for assessing waterholding capacity of fresh pork after refrigerated storage.

RIËTTE L.J.M. VAN LAACK and FRANS J.M. SMULDERS
Department of the Science of Food of Animal Origin, Faculty of Veterinary Medicine, University of Utrecht, Utrecht, The Netherlands.

The waterholding capacity (WHC) of semi-hot boned, cold boned and PSE porcine longissimus muscles was investigated.

Based on muscle pH at 45 min post mortem, 18 'normal' carcasses (pH_{45}>6.2) and 20 possible PSE carcasses (pH_{45}<6.0) were selected. All carcasses were conveyed through a blast-chilling tunnel at -25°C for 45 min. After a subsequent equilibration period of 3 h at 2±2°C, the longissimus muscle of one side of each of the 18 'normal' carcasses was deboned (semi-hot boned, SHB), weighed, vacuum packaged and stored at 0-2°C. Based on visual assessment and fibre optic probe (FOP) measurements at 1 day post mortem, 12 of the 20 carcasses with pH_{45}<6.0 were identified as being PSE. The loins of these carcasses as well as those of the 18 remaining sides from the 'normal' carcasses were deboned, weighed, vacuum packaged and stored at 0-2°C. At 1, 7, and 13 days post mortem 6 loins of each group were unpacked whereafter WHC was assessed. As indicators for WHC and degree of protein denaturation the following tests were conducted: a. drip losses during storage, b. drip losses from standard size cut (Honikel's method), c. swelling at several pH values, d. Kauffman's filter paper method, e. Fibre Optic Probe and f. transmission value.

Differences in WHC between SHB and cold boned pork loins were negligible (p>.05). PSE loins had lower WHC than 'normal' loins in all tests, with the exception of the filter paper method at 7 or 13 days post mortem and Honikel's method.

The different tests used in the experiment are being discussed with regard to their value for predicting waterholding capacity of meat after refrigerated storage.

Chilling rate and pork quality - an orientation.

RIËTTE L.J.M. VAN LAACK and FRANS J.M. SMULDERS
Department of the Science of Food of Animal Origin, Faculty of Veterinary Medicine, University of Utrecht, Utrecht, The Netherlands.

The effects of chilling rate, rapid versus moderate, on physical-chemical quality traits of the pork loin were investigated. Rapid chilling was achieved by immersing pre-rigor loins in water of 10°C for 2 h, followed by 21 h in ice-water. Moderate chilling was effected by immersing pre-rigor loins in water of 15°C for 2 h, whereafter they were stored in air of 2±2°C for 21 h.

On the basis of the loin pH at 45 min post mortem (pH_{45}) being > 6.2, 20 pig carcasses (Large White/Dutch Landrace cross-bred) were selected. "Bone-in" loins of all 40 carcass sides, excised within 1.5 h post mortem, were put in a bag which was sealed without drawing vacuum. Of each carcass one loin was rapidly chilled (RC), the other subjected to moderate chilling (MC). At approximately 24 h post mortem loins were deboned, subdivided in three portions of similar size, vacuum packaged and stored at 1±1°C. At 1, 3, and 8 days post mortem, one portion of each loin was sampled to assess the following quality characteristics: colour (L^*, a^*, b^*-value), waterholding capacity (filter paper method, drip loss and cooking loss), transmission value, shear force and sarcomere length.

Despite the relatively slow rate of glycolysis, RC and MC loins exhibited similar values for all these quality traits. It is suggested that a genetic insensitivity to toughening of the Dutch pig population accounts for our observations, as opposed to those reported by Danish/English investigators.

Relationship between dietary fat and fatty acid composition of subcutaneous and intramuscular fat in heavy pigs

MANFREDINI M., BADIANI A. and NANNI N.

Istituto di Approvvigionamenti Annonari, Mercati e Industrie degli Alimenti di Origine Animale

Via San Giacomo n. 11, I-40126 Bologna, Italy

A total of 75 Large White castrated pigs were divided into three groups and fed as follows: C = traditional diet, with 40% maize meal; T1 and T2 = diets containing 20 and 40% sweet potatoes (*Ipomoea batatas*), in place of the same quantity of maize meal. Lard was added to diets C, T1 and T2 at 1, 1.5 and 2% respectively to render them isocaloric. Dietary effects on daily gain, feed efficiency, slaughter data, carcass and meat characteristics (for Parma ham production) have been discussed elsewhere. The aim of this research was to assess if and how the three diets modify the fatty acid composition of some fat tissues.

Significant differences in backfat fatty acid composition at slaughter (approx. 156 Kg live weight) were found among the groups; palmitic, palmitoleic, stearic and oleic acids were lower in C than in treated groups, while linoleic acid was higher. Thus, the saturated-unsaturated fatty acid ratio and the ratio between stearic and linoleic acids were lower in C, while the polyunsaturated-monounsaturated fatty acid ratio was higher. Significant differences were also found in the fatty acids in the intramuscular fat of twelve-month aged hams; linoleic acid, gondoic acid and polyunsaturated:monounsaturated fatty acids were higher in C than in the treated groups, while stearic-linoleic acid ratio was lower. In groups C, T1 and T2 the linoleic acid content was 15.55, 13.93, 11.99% in backfat and 10.92, 9.22, 8.63% in intramuscular fat, respectively. The iodine value of the ham depot fat decreases slightly, but not significantly, from C (67.70) to T1 (66.92) to T2 (66.62). Neither fat nor lean defects of flavour, colour and firmness were found upon sensory evaluation of the hams.

The changes in fatty acid composition are favourable to the ageing of the ham, since they lower the degree of unsaturation of the fat.

Effect of testosterone and estradiol added in the feed on skatole and boar taint level in entire male backfat

HANS PEDER MORTENSEN

Danish Meat Research Institute, Maglegårdsvej 4, DK-4000 Roskilde, Denmark.

The aim of this work was to examine if adding testosterone or estradiol to the feed for entire male pigs had any effect on skatole deposition in backfat or the intensity of boar taint. The experimental material consisted of five litters with three entires, divided into three groups. All pigs received basal feed for eight weeks. Then group 1 continued the control ration; group 2 received in addition 20 mg testosterone per day and group 3 10 mg estradiol per day. Backfat was analyzed for skatole compounds, androstenone, testosterone, estradiol and the intensity of boar taint judged by a trained panel. The content of the large intestine (faeces) was analyzed for androstenone, testosterone and estradiol. The results showed that testosterone increased backfat skatole content and the intensity of boar taint ($P<0.001$). The content of androstenone ($P<0.01$) and testosterone (ns) in faeces was increased. Estradiol only affected estradiol levels in the faeces ($P<0.001$). The backfat content of androstenone, testosterone and estradiol was unaffected. Backfat skatole gave the best prediction for intensity of boar taint ($r=-0.74$). Androstenone and testosterone in faeces showed a better correlation to boar taint ($r=-0.67$ and -0.64) than androstenone and testosterone (ns).

It is not possible from this preliminary study to conclude if the skatole deposition is caused by testosterone in the faeces alone. But it is evident that testosterone added to the feed increases both the backfat skatole and intensity of boar taint.

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Carcass and Meat Quality of Cattle and Buffalo (Bubalus bubalis)

L. MÜLLER, L.F. AGUIRE, J.RESTLE and Z. PEROBELLI

Universidade Federal de Santa Maria, Departamento Zootecnia, Santa Maria, RS, BRASIL

Eleven Charolais and eight Buffalos steers were used to compare carcass and meat characteristics of these two species. Both groups were slaughtered with 2 years of age and live weight of 434 and 435 kg for cattle and buffalo. After 24 hs. chill carcass evaluation was performed and the following values were obtained for Charolais and Buffalo, respectively. Hot carcass weight 252 and 231 ($p<0.05$), dressing % of 58 and 53 ($p<0.01$), conformation Good and Standard, chilling loss 3.74 and 4.97 % ($p<0.05$) and physiological maturity. A and B. The data for objective measurements, in the same order, were: Longissimus area 73 and 50 cm^2 ($p<0.01$), fat thickness 3.4 and 5.3 mm ($p>0.05$), carcass length 123 and 124 cm ($p>0.05$), leg length 67 and 70 cm ($p<0.05$), thickness of cushion 23 and 24 cm ($p>0.05$), arm perimeter 37 and 25 cm ($p<0.01$), arm length 38 and 41 cm ($p<0.01$). The three major cuts in the carcass revealed that Charolais had better pistol cut 48.77 against 47.37 % ($p<0.01$) for Buffalos, less forequarter 37.03 against 37.94 %(($p<0.05$) and lower proportion side 14.17 against 14.66 % ($p>0.05$). The physical composition was: muscle 65 against 58% ($p<0.01$), fat 20 against 22% ($p<0.05$) and bone 15 against 18% ($p<0.01$). Charolais also presented better amount of marbling, more fine texture and brighter colour of the lean. There was no significant difference for tenderness, but the meat from Charolais steers were judged more juicy and with better flavour. It can be concluded from this study that Buffalos produce a fairly good carcass with acceptable meat quality.

The Evaluation of Qualities of Beef with Standard Models

H.NAKAI, T.IKEDA, S.ANDO and R.TANABE

National Institute of Animal Industry, Tukuba Norindanchi Ibaraki 305, Japan

Trials were made to establish an easy and objective method of judging meat color, fat color and marbling which were the most importa of the evaluation items of meat quality of cattle. The method, using standard models of beef-color, beef-fat-color and beef-marbling, can replace the old sensuous and experiential method. To establish an easy and objective method of judging the shades and tone of beef color, the author developed a set of standard models of beef-color. In order to develop standard models of beef-color, it was necessar to set the standard values of beef-color. The author selected, therefore, 148 half-carcasses (80 of Japanese Black and 68 of Holstein cattles) at random from a carcass-wholesale market and cut off a part of muscle of longissimus dorsi of the 6th thoracic vertebrae. Th color of the muscle-section, which had been blooming for 1 hour after cutting, was measured with color difference meter, and was indic ed with Hunter's L. a. b. values. The author prepared 7 grades of color-model, in which the lightest one was marked with 1, the darkes with 7. Judging beef-color, the models were brought near the surface of the loin-eye-section which had been blooming for 1 hour after catting of beef carcass or loin cut under a day-light lamp.

The author also developed a set of standard models of beef-fat-color. The standard models were based on standard values of beef-fat color. The standard values were set on the basis of measurements (Hunter's L. a. b. values) of color tone of subcataneous intra adipo tissues which were collected from the most whitish one and the darkest one of cattle-carcasses at a carcass-wholesale market. The auth prepared 7 grades of standard models of beef-fat-color, in which the most whitish one was marked with 1, the darkest, with 7.

Since, recently, the extent of marbling in loin-eye (muscle-section of longissimus dorsi) could be appraised accurately with image analyser, the author numerically expressed the extent of marbling in loin-eye comparing with the photographs of 6 grades (+0 to +5) published by Japan Meat Grading Association, and set the standard values for each grade of marbling. Then, standard models of beef-marbling were produ-ced to establish an easy and objective method of judging the extent of beef-marbling. The author prepared 12 grade of marbling-model, in which each grade corresponds to 0, 0^+, 1^-, 1, 1^+, 2^-, 2, 2^+, 3^-, 3, 4 or 5 of Japanese marbling grade. The stande models of beef-marbling could be applied to every part of surface of loin-eye-section of cattle-carcass or loin cut. Judging marbling cattle-carcass, the models were brought near the surface of the loin-eye-section which was chilled beforehand.

The Quality of Pork Produced in Estonia

M.REI, V.KIRIKALL, V.LUTS and H.KOPPEL

Estonian Agricultural Academy, 202400 Tartu, Estonia; Estonian Development Centre of Meat and Dairy Industry, Estonian Meat Association, 200106 Tallinn, Estonia

The aim of this work was to evaluate and compare physical, chemical and organoleptical characteristics of longissimus dorsi in three stages: fresh (48 hours after slaughtering), salted meat and smoked-cooked meat; also to compare the quality of pork from different farms. This investigation was carried out on 228 samples of pork from big farms and 67 samples from middle-sized farms during 1984-1990.

Water, protein, fat, ash-content, pH, colour and organoleptic quality were determined in fresh, salted meat and smoked-cooked meat. Water holding capacity and heat loss were measured in fresh and salted meat.

These quality characteristics were evaluated by correlation and dispersion analysis.

On the basis of pH it was estimated that the amount of PSE-pork (pH<5.7) from big farms was 7.2-46.7 %, from middle-sized farms 25.0-74.0 %, the quantity of DFD-pork (pH>6.3) from big farms was 0-22.5 %, from middle-sized farms 0-25.0 %.

Having analyzed all tehnological and chemical characteristics of pork from big and middle sized farms we concluded that the pork from middle-sized farms had better quality. The results showed that investigated pork was very unstable in quality.

Assessment of Rapid Method for Determining Water Holding Capacity of Meat

R.SAKATA, T.DEGUCHI and Y.NAGATA

Laboratory of Science and Technology of Animal Products, Azabu University, Sagamihara 229, Japan

This study was conducted to assess the effectiveness of a quick, non-planimetric filter-paper press method for determining the water holding capacity of meat. This method, modified by Hofmann(1982), is based on the ratio of pressed meat film(M) and total moist area(T) on filter paper, the M/T ratio, instead of the liquid ring area(conventional method).

All values determined by this method showed close agreement with those obtained by the conventional method. PSE-like meat was prepared by incubating normal porcine muscle whose pH had been adjusted to a lower value(5.4～5.0) for 90min at 40℃. M/T and M were noted to significantly decrease with drop in pH, whereas T remained essentially unchanged. M and T areas as determined planimetrically and by the intersection of axes method were confirmed basically the same. The effect of pH(4.0～7.0) on M/T as determined by the intersection of axes method was found almost the same as that on water holding capacity determined by the conventional method. M/T was lowest at a pH of about 5.0.

It is evident from the above that M/T as determined by the intersection of axes method can be used for quickly determining the water holding capacity of meat of various quality.

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Meat Quality of Pigs of Different Origin of the Old and New States of the Federal Republic of Germany

L. SCHÖBERLEIN[1] and G. von LENGERKEN[2]

[1] Schlacht- und Verarbeitungs-GmbH Leipzig, Hauptabt. Forschung/Entwicklung, D-7030 Leipzig and
[2] Martin-Luther-Universität Halle, Institut für Tierzucht und -haltung, D-4010 Halle, Germany

The meat quality of pigs of different origin was investigated by objective methods. The aim of this study was to assess the occurrence of meat quality alterations (PSE and DFD-meat) as they are influenced by the genetic line and origin of the pigs. The meat quality was determined by the pH- and pulse-impedance method in the M. longissimus dorsi. In some animals the drip loss and the colour brightness were measured in addition. The lean meat percentage was classified according to the EUROP-system.

The percentage of pigs with poor meat quality was strongly influenced by the genetic origin as well as by the breeding system, and the lean meat percentage. The share of PSE-meat quality in the M. long. dorsi differed from 6 to 85 per cent and the DFD-share was between 0 and 6 per cent dependent on the factors mentioned. In pigs originating from populations with very high lean meat percentage, the biological antagonism to meat quality properties was particularly pronounced. Pigs reared in large production units often have an insufficient pH fall after slaughter. This is due to the fact that transportation to the slaughter-house stresses these animals much more than pigs reared traditionally.

These results indicate that the selection for a high lean meat percentage must be accompanied by parameters of stress susceptibility and meat quality. By these means it should be possible to achieve a combination of high carcass quality and high meat quality.

Effect of Clenbuterol on Growth, Food Efficiency and Carcass Composition in Fattening Lambs

Z.SHINDARSKA, V.BANSKALIEVA, V.DIMOV and T.DARDJONOV

Institute of Animal Science, 2232 Kostinbrod, Bulgaria

Investigations have been conducted on male lambs weaned at an age of 45 days and fed fr weaning until the end of experiment on different energy levels (4,3; 5,1 and 6,0 MJ) and p teins (160; 200 and 200 g/kg) of complete mixture. After reaching 27 kg of live weight, an mals of experimental groups in each trial received for 42 days additionally 10 mg clenbute per kg of complete mixture. Both weight growth, consumption, food efficiency and some carc characteristics have been controlled.

No significant differences were established in final live weight, average daily gain be ween animals of control and experimental groups respectively, regardless of feeding type. Clenbuterol incorporated in diet leads to a reduced food intake (energy and protein respec vely) in each trial in proportion to the energy density of diet. At a high-concentrated fe ding clenbuterol improves food efficiency, in contrast to low-concentrated one, where a re verse trend was observed. Clenbuterol applied in a high-energy value of diet is favourable for obtaining more meat. An opposite effect is observed at a low energy level feeding. One week interval after clenbuterol was established to not influence on traits investigated.

Resluts obtained show that a dependence exists between the effect of clenbuterol and fe ding type.

Relation of colour versus conformation and fatness score as a result of veal classification in the Netherlands

P. STERRENBURG[1] and B. ENGEL[2]

[1] Research Institute for Animal Production "Schoonoord", P.O.Box 501, 3700 AM, Zeist, The Netherlands

[2] Agricultural Mathematics Group, P.O.Box 100, 6700 AC, Wageningen, The Netherlands

Classification of veal carcases in the Netherlands is conducted 45 min. p.m. at the slaughterhouses by an independent organisation, "Centraal Bureau voor Slachtveediensten" (CBS). The classification is performed visually under standardized conditions. The veal carcases are classified into five colour classes, five main fatness classes and five main conformation classes. Fatness and conformation main classes are divided into three subclasses. The results of the classification are recorded centrally by the Commodity Board for Livestock and Meat. This system for classification of fatness and conformation was implemented in 1988; in 1990 colour classification was added. This study is an investigation into a possible relationship between colour score and main class score for conformation and fatness.

Data from 1990, a total of 992,279 carcases, were available by courtesy of the Commodity Board of Livestock and Meat. Correlationcoefficients of colour vs conformation score and colour vs fatness score were very low (0.07 and 0.08 respectively) but, as a consequence of the vast number of data, significantly different from 0. The numbers of observed and expected carcases within a combination of colour-conformation score and of colour-fatness score were significantly different (Chi square test).

The results indicate that colour score is not independent of conformation and fatness score. This depency, however, seems to be of no practical significance.

Reproducibility of colour score as a result of classification of veal in the Netherlands

P. STERRENBURG[1], H. NIJEBOER[1] and Tj. DE BOER[2]

[1] Research Institute for Animal Production "Schoonoord", P.O.Box 501, 3700 AM, Zeist, The Netherlands

[2] Commodity Board for Livestock and Meat, P.O.Box 5805, 2280 HV, Rijswijk, The Netherlands

Colour classification of veal is carried out 45 min. p.m. at the veal slaughterhouses in the Netherlands by an independent organisation, "Centraal Bureau voor Slachtveediensten" (CBS). The classification is performed visually using standardized conditions. Veal carcases are classified into five colour classes by comparison of the *m. rectus abdominis* with a colour standard, developed by the Research Institute for Animal Production. The performance of the CBS grading personel is regularly checked with parallel-classification by inspectors, appointed by the commission quality control classification (CKC) in which both government and industry are represented. The correlationcoefficient between the results of the parallel-classification can be considered as a measure of reproducibility of the colour evaluation system.

Parallel-classifications were carried out at six slaughterhouses and involved a total of 6628 veal carcases. Of these carcases 79.8% were assigned the same colour class by both the CBS-personel and the inspectors. The inspectors assigned 10.5% of the carcases one colour class lower and 9.7% of the carcases one class higher than the CBS personel. The correlationcoefficient between the results of the parallel-classification was 0.87.

Although the system of colour classification is visual, the results indicate that, with a uniform implementation of the system, a high degree of comparability and reproducibility can be achieved.

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Free range pigs: carcass characteristics and meat quality

P.G. VAN DER WAL

Research Institute for Animal Producton 'Schoonoord', P.O.Box 501, 3700 AM Zeist, The Netherlands

ABSTRACT

Carcass composition and meat quality of 39 scharrel (= free range) pigs were compared with that of 38 litter mates (equal genetic background) raised according to regular farming conditions. All pigs were crossbreds (GY x (GY x Dutch Landrace)), while the sex ratio (barrows - gilts) in both groups was equal (1 to 1). The scharrel pigs were housed on straw in a danish type pig house in contrast to the control group which was kept on a partly slatted floor without straw. Feeding of the two groups was ad libitum. No significant differences in carcass composition (backfat- and muscle thickness, lean meat percentage) and meat quality (PSE-, FOP-, pH- and rigor values) could be demonstrated between both groups at 45 minutes post mortem. Furthermore, meat quality determinations proved that fat deposition on the inside of the chest, marbling and the percentage of intramuscular fat were also identical. This was also valid for water holding capacity (based on: subjective score for moisture, filter paper test, drip and cooking loss), colour, shear force and subjective quality evaluations. In contrast to the assumption that scharrel pigs are fatter or the meat should have a better water holding capacity, neither could be shown.

Studies on Meat Eating Quality from Chinese Loping, Landrace and their Crossbred Pigs

XIONG HUOYING, LUO MING

JiangXi Feed Science Institute, 330045, Nanchang, Jiangxi, P.R. China

In combination with traditional cooking and modern processing, this study had quantitatively analysed water-soluble and fat-soluble biochemical constitution of raw, cooked and processed meat in samples of M. LD from Chinese Loping, Landrace and their Crossbred pigs. Results indicated that:

(1) Intramuscular fat (IMF) was negatively correlated with cooking, processing and preserving losses, muscle fibre heating shrinkage, and with IMF processing retention; but positively with water-holding capacity, and saturation degree of fatty acids (FA). The significant differences of IMF content were detected among those three breed pigs (7.17, 4.78 and 2.47% in M.LD for Loping, Landrace and crossbred pigs, respectively). To some extent, sensory properties of cooked meat were improved by IMF.

(2) Reduced sugar (RS) contents of Loping, Landrace and Crossbred pigs were respectively: 0.98, 1.30, 1.27 mg/g in raw meat; 1.02, 1.34, 1.30 mg/g in cooked meat; 0.95, 1.16, 1.11 mg/g in processed meat. RS cooking and processing losses were proportianal to their initial level.

(3) Local Loping pigs had more FAA (Free Amino Acids) in raw meat, but less in cooked and processed meat than both of Landrace and Crossbred pigs. Total FAA contents were 76.63, 74.46, 70.24 mg/100g in raw meat, 53.90, 54.73, 56.75 mg/100g in cooked meat (based in raw), 46.04, 47.87, 49.53 mg/100g in processed meat (based in raw) for Loping, Crossbred and Landrace pigs, respectively. FAA content decreased, and Loping had the highest losses of FAA in the course of cooking and processing.

(4) There were significant differences in the saturation degree of FA and percentages of C10:0, C12:0, C14:0, C16:0 and C18:1 between Loping and Landrace. Crossbred pigs were largely the same as Landrace in the composition of FA. The changes of the composition of FA caused by cooking and processing were not obvious.

(5) The objective values and sensory scores of Crossbred pigs were basically in the middle of its two original purebreeds. The conclusions may be infered that the high IMF content was the most important chemical basis of the superior eating quality in Chinese breed pigs, and that FAA, as a flavor precursor, may improve the meat flavor of Chinese breed pig's meat.