

THE EFFECTS OF GENOTYPE AND FATTENING TECHNOLOGY ON MEAT PRODUCTION CHARACTERISTICS

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Abstract

Indigenous Transylvanian Racka ewes were mated to rams of various breeds: Beltex, British Milkshope, Charollais, Dorper, Ile de France, German Blackhead Sheep, German Mutton Merino, Suffolk and Texel to improve the meat production ability without changing the extensive production system. Forty crossbred lambs per genotypes (50-50% male and female) were fattened up to 30 kg of bodyweight or 130 days of age in 3 experiments: extensive, semi intensive, and intensive. The lambs were weighed after birth, during suckling and fattening period (two weekly) closing with body measurements. During the experimental slaughtering various data and carcass measurements were taken. There were significant differences among the fattening methods in each genotype of lambs. At the same time, a strong genotype effects was observed on the meat production traits. The extensive fattening produced the weakest results (independently from fathers' genotypes). The semi intensive fattening method resulted in better results, but most lambs could not reach the slaughter weight (30 kg) before 130 days (independently from fathers' genotypes). The use of intensive fattening technology gave acceptable results, but in the case of the control lamb group still needed longer fattening time comparing to crossbred lambs to get the requested body weight. There were significant interactions between lamb genotypes, gender, age and occupation of consumers as well as sensory evaluation of various lamb meat foods.

Key words: sheep, fattening technology, meat production, carcass classification, sensory attributes

INTRODUCTION

The crossbred animals have always better meat production than purebreds, for example Ile de France x Merino crossbred lambs were slightly superior for carcass conformation, dressing percentage and muscle /bone ratio than purebred Merino [8].

Crossbreeding of Mexican Pelibuey ewes with Rambouillet and Suffolk had positive effects on dressing parameters The dressing percentage were similar across the three genotypes. Crossing Pelibuey with the Rambouillet breed increased carcass fat content, therefore, the inclusion of the Rambouillet component in Pelibuey genotype is not recommended in Mexico [5].

The dressing characteristics of South Italian Gentile di Puglia breed were evaluated by crossbreeding with Ile de France rams. The crossbred lambs achieved heavier carcasses and commercial cuts, with a higher lean/bone ratio than purebred [1].

In order to evaluate the effects of crossbreeding in lambs fattened Romanov ewes were mated with Suffolk and Charollais. The Charollais crossbred lambs had higher birth weight, reached a higher growth rate and weight at slaughtering, therefore higher carcass weight, and weight of kidney fat, than that of Suffolk crossbreds. However, meat from the Suffolk crossbreds was lighter and yellower than meat from the Charollais crossbreds [7].

In Hungary the traditional lamb or mutton meat are cooked in the country (as a kind of stew), often in festivals, animal fairs, food

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exhibitions, while other kinds of foods are not really made. Wherefore the people are prejudiced against the mutton meat because of its fatty flavour, the meat must be altered to satisfy the consumer preferences and/or improve the knowledge about this kind of meat. The sensory values and quality of lamb meat are influenced by several factors: breed, nutrition, slaughter weight, and slaughter age.

The aim of this study was to evaluate the fattening and slaughtering performance of crossbred lambs, and the sensory evaluation of the manufactured lamb meat products.

MATERIAL AND METHOD

Indigenous Transylvanian Racka ewes were mated to rams of various breeds: Beltex, British Milk sheep, Charollais, Dorper, Ile de France, German Blackhead Sheep, German Mutton Merino, Suffolk and Texel to improve the meat production ability without changing the extensive production system. Forty crossbred lambs per genotypes (50-50% male and female) were fattened up to 30 kg of bodyweight or 130 days of age in 3 experiments: extensive, semi intensive, and intensive. The purebred Transylvanian Racka lambs were used as control group.

The lambs were weighed after birth, during suckling and fattening period (two weekly), and at the end body measurements (withers height; trunk length; chest depth; rump I width; rump II width) were taken. After fattening (at weight 24-27 kg, and 28-30 kg) CT measurement were done. During the experimental slaughtering the S/EUROP qualification, various data (weight at slaughtering, carcass weight, dressing %, the weight of head, skin, abdominal and kidney fat), and carcass measurements (spine length; length of leg; one leg girth; girth of two legs; chest girth; rump width, leg width; spine depth) were taken.

After bisection, dissection, boning and measuring, the meat were handled by genotypes, samples for different products were separately packed into plastic bags, and after slow cooling they were frozen and kept at -20°C temperature until preparation. Three products were manufactured similarly in all genotype: Wiener sausage; cured, smoked

and cooked ham; kitchen ready seasoned, cured, sliced and roasted lamb meat. The stringiness, flavour and odour of the products were judging in food sensory evaluation by a total of 265 (60% male and 40% female) randomly selected consumers. The consumers represented different age and professional groups.

RESULTS AND DISCUSSIONS

Fattening

The extensive fattening (on the pasture together with ewes) was not suitable to exploit the heterosis effect. However, the crossbred lambs fattened better (+19-70%) than purebred lambs, the fattening period were 6 weeks longer than in other methods.

The semi-intensive fattening method (in one flock in barn, pelleted feed and hay, with grazing possibility) did not reach the expected results. There was large deviation in slaughtering weight among genotypes. The body weight gain of crossbred lambs was 40-77% more than in control purebred group.

In intensive fattening the body weight gain of crossbred lambs was 20-42% more than in control. The British Milk sheep F₁ and Texel F₁ lambs had the highest body weight gain.

Slaughtering

The dressing percentage of purebred lambs was significantly lower than in crossbred lambs in all 3 fattening methods, and increased with fattening intensity. The semi-intensively fattened Beltex F₁ lambs had the highest value (48.70%), while in intensive fattening the Ile de France F₁ reached the best result (48.37%).

The quantity of abdominal fat increased with fattening intensity except in Beltex F₁. In semi-intensive fattening the abdominal fat of British Milk sheep F₁ lambs was significantly higher than that of control, while in extensive fattening the abdominal fat of Charollais F₁ and Suffolk F₁ lambs were lower than in control.

The same tendency was found in kidney fat (except Beltex F₁ and Dorper F₁). Only the kidney fat of Suffolk F₁ lambs was lower than the control in extensive fattening.

S/EUROP qualification

In extensive fattening the control Transylvanian Racka was qualified the worst (P-). The crossbred lambs did not reach the expected qualification, even if they were in O and P classes. The half of Beltex F₁ lambs were in O+, but it was also found in P- class. In the semi-intensive method the lambs were between R+ and P- classes. The 80% of control lambs were in P, 20% in O classes. The Ile de France, German Blackhead and Texel crossbred lambs were not found in P class. The 70% of Beltex F₁, 42.8% of Dorper F₁, 60% of German Blackhead F₁, 85.7% of Suffolk F₁, and 62.5% Texel F₁ lamb carcasses were classified as O+, while the 62.5% British Milkshope F₁ 55.6% of Charollais F₁, and 50.0% of Ile de France F₁ carcass were in O class. In intensive fattening all carcasses were classified in R, O, P classes. This result is similar than the average lamb slaughtered in Hungary, but compared with Transylvanian Racka, the crossbreeding was an increase in quality. The most of lambs are in O category, especially in O+, however the half of Texel F₁ was in the middle of O. The 20% of Charollais F₁, 16.7% of Ile de France F₁, 5.9% of German Blackhead F₁, 5% of German Mutton Merino F₁, and 5% of British Milkshope F₁ lambs were in R category. The 19% of control Transylvanian Racka lambs, 11.1% of Texel F₁, 10% of British Milkshope F₁, 5% of Charollais F₁ were found in P category.

Fatness classes

The extensively fattened lambs were in class 1, but the class 2 (in the case of Suffolk F₁) and 2+ (in the case of Dorper F₁) were also observed.

In semi-intensive fattening the class 3 was reached by Beltex F₁, Ile de France F₁, Suffolk F₁, and Texel F₁; however the most of crossbred lambs were in class 2. The 40% of purebred Transylvanian Racka was in class 20% was in class 1.

In the intensively fattened groups, there were no lambs in class 1, while 15% of Charollais F₁, 6.3% Suffolk F₁, 5.6% of Ile de France F₁, and 5% of German Mutton Merino F₁ were in the worst class 4. The 85% of Charollais F₁ lambs was in class 2-, with 75.2% control lambs.

Sensory evaluation

In stringiness of **Wiener sausages**, women gave higher, which means worse scores than men, except for British Milkshope F₁, which sausage was the least stringy by women, while men gave the best (lowest) score to the sausage made from Charollais F₁ lambs. The lowest (best) score for flavour were given to Suffolk F₁ by men and to Texel F₁ by women, who also found its odour the best. On the contrary, men gave the lowest (best) odour score to sausage made from Transylvanian Racka lambs. Breed differences were found in toughness, odour and stringy in several studies [9, 4, 10], so our observations somewhat confirmed their findings. Peoples working in administrative department of State found the sausage the stringiest, while farmers observed the softest. In flavour there was strong difference between scores given by shepherds and most of the other occupations. It seemed that the age of panellists essentially influenced scores regarding stringiness and flavour. The young people under 20 years gave the best (lowest) scores to stringiness and flavour, and the worst (highest) to odour of sausage. The judgements of older panellists fundamentally differed from scores given by younger panel members in odour, as for the latter ones the lamb meat was dominantly unfamiliar.

There were significant differences between shepherds and other occupation groups evaluating **cured, smoked and cooked lamb ham**. This tendency could also be observed in odour; however, judgements of other agriculture group were closer to shepherds, than other animal farmers. The sheep farmers were the most critical as they found the ham the most stringy, less delicious, most insufficient odour. The people above 70 years gave the best (lowest) scores to ham in all three traits. In odour significant differences were observed among the two oldest panellist groups, as they gave the best (above 70 years) and the worst (61-70 years) scores.

The flavour of **roasted meat** from German Blackhead Mutton F₁ was the worst scored among genotypes by both men and

women, while women also found this meat the most stringy and its odour the least satisfying among genotypes. The men preferred roasted meat made from Ile de France F₁ lambs, giving the lowest scores to all three traits; however, women scored the best the stringiness and flavour of Charollais F₁ meat and odour of Texel F₁ meat. At the same time, there were significant breed (genotype) differences among the scores as mentioned by [3, 6, 2]. The occupation of panellists resulted less determining effects on stringiness and flavour as it was experienced concerning Wiener sausages. On the contrary, there were large differences among occupation groups concerning odour. Sheep farmers gave the worst (highest) scores for meat, as for ham, probably, because they preferred the stronger sheep meat taste. Studying age, panellists under 20 years gave the best (lowest) scores in all three traits, while the 21-30 years old panellist found the meat the most stringy and less delicious, and by 61-70 years old panellist the less sufficient odour among age groups.

Differences among genotypes could also be followed in the whole **roasted lamb leg (restaurant style)** product concerning all three quality traits. The roasted leg of Transylvanian purebred lambs was found the best among genotypes by both men and women. However, men preferred the flavour of Charollais F₁ lamb leg, this meat was scored the most stringy. The flavour of British Milk sheep F₁ lamb leg was less delicious than legs of other genotypes. Apart from them there were significant differences among breeds as in some previously mentioned studies.

Comparing occupation groups, students found this product the stringiest and the least delicious, against the panellist working in education. The odour was observed the best by panellist working in other agriculture sector.

Among age groups the worst scores were done by 41-50 years old panellist for all three traits, while the 31-40 years old panellist found the lamb leg the softest and delicious among age groups. The most sufficient odour was observed by 61-70 years old panellists.

In stringiness the differences were not significant, while in flavour definite age group differences were observed. Concerning odour scores groups above 40 years were significantly different from those ones originated from other age groups.

CONCLUSIONS

The extensive and semi-intensive fattening methods in pasture were cost savers methods, but slowed the growing and increase the fattening time. The conformation and fat coverage of crossbred lambs were better in semi-intensive and intensive fattening method, than in extensive method. The crossbred lambs of Texel, Beltex, Charollais, Dorper, and German Blackhead had higher impact on meat production than the other breeds. The dressing percentage and conformation of Transylvanian Racka F₁ lambs could be increased without changing the extensive keeping method.

The general acceptance of the various lamb meat foods was far beyond expectation; the acceptance of the lamb meat could be improved by introducing new kinds of foods. Strong differences could be followed in the evaluations of stringiness, flavour and odour according to the gender of the panellists. The women gave better score to odour, because they have less bad experiences consuming sheep meat as eating less frequently this product. The age and the occupation of the panellists have significant effects on the score given to various foods, as their preference and knowledge about various meats were different. There were significant differences among the panellists in evaluation of stringiness, flavour and odour values. The panellists were able to distinguish the various breeds (genotypes) in the evaluation of foods

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