

The effect of dietary energy content and the provision of a β -adrenergic agonist in the diet, on the production and meat quality of South African Mutton Merino feedlot lambs

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Summary

Two studies were conducted on Elsenburg Experimental Farm, Western Cape, South Africa. The aim of these trials was to determine the following:

- 1) the effect of dietary energy as well as the inclusion of a β -adrenergic agonist (β -AA) on the production of South African Mutton Merino (SAMM) feedlot lambs
- 2) the effect of the trial diets on the rumen pH
- 3) the effect of varying dietary energy levels and the inclusion of a β -AA in the diet on the relationship between slaughter weight, commercial cut yield and bone:fat:muscle ratio of SAMM feedlot lambs
- 4) the effect of dietary energy as well as the inclusion/absence of a β -AA on the meat quality of SAMM feedlot lambs
- 5) the effect of dietary energy as well as the inclusion/absence of a β -AA on the sensory, physical and chemical characteristics of SAMM feedlot lambs.

To quantify the effects of these parameters the study was conducted in two separate experiments. In the first experiment one hundred and eight (108) SAMM lambs, weaned at *ca* 120 days of age of different gender (rams and ewes) were housed in individual pens for approximately 6 weeks. The treatments consisted of three different dietary energy level diets (high – 12.7 ME MJ/kg, medium – 12.0 ME MJ/kg and low 11.3 ME ME/kg) with either the inclusion or absence of a β -AA (Zilpaterol hydrochloride, at 8.6 g/ton) in the diet. The experiment was arranged as a 2 x 2 x 3 factorial design with gender (rams or ewes), β -AA (provided or not) and dietary energy level (low, medium or high) as main factors. In the second experiment one hundred and twenty (120) SAMM lambs, weaned at *ca* 120 days of age of different gender (wethers or ewes) were housed in individual pens for approximately 6 weeks. The treatments consisted of three different dietary energy level diets (low – 11.3 ME MJ/kg, medium – 12.0 ME MJ/kg and high – 12.7 ME MJ/kg). The experiment was arranged as a 2 x 3 factorial design with gender (wethers or ewes) and dietary energy level (high, medium or low) as main factors. Where no interaction occurred the data is presented as the effect of dietary energy level, β -AA and gender on parameters.

Three ruminally cannulated sheep were used for measuring the rumen pH. No differences were found between the three experimental diets on the rumen pH. Overall a gradual decline in pH from the time the animals were fed was observed. Dietary energy level only affected

the dressing percentage in the first experiment, while it affected several parameters in the second experiment. The β -AA had no significant ($P>0.05$) effect on any parameters. While gender significantly ($P<0.05$) effect several of the production and carcass yield parameters.

Main effects dietary energy and gender affected the leg yield and fat percentage in the bone:muscle:fat relationship respectively. While positive correlations between slaughter weight and the following parameters were observed: carcass weight, leg yield, shoulder yield, neck yield, flank yield and cranial fat thickness.

Beta-adrenergic agonists are commonly used in livestock production to enhance meat production and decrease the fat content of the body. Beta-adrenergic agonists normally improve growth performance and enhance a leaner carcass. The factors β -AA and dietary energy level had no effect on the proximate composition of the loin, fat thickness or the tenderness of the meat. The ewes had a significant higher fat content than the ram lambs. The meat of the ram lambs was less tender than the meat from the ewe lambs.

The acceptability of meat is dependent on the toughness (chewiness and resistance), flavour (aroma and taste) and succulence (juiciness) of the meat. It is known that dietary energy as well as the inclusion of a β -adrenergic agonist may influence the sensory, physical and chemical characteristics of the meat. No significant differences ($P>0.05$) due to dietary energy level or the inclusion of the β -AA were found for the physical characteristics of the meat. There were, however significant ($P<0.05$) differences found during the sensory testing for tenderness between gender (76.2% for ewes vs 72.9% for rams) and between the β -agonist groups (75.4% vs 72.9% for the inclusion of the β -AA). Sustained juiciness was also affected ($P<0.05$) by gender (68.0% for ewes vs 65.7% for rams) and the inclusion of a β -agonist groups (67.9% absent vs 65.8% included). Overall it was concluded that, of all three main effects, gender had affected the meat attributes the most.

Opsomming

Twee afsonderlike proewe is uitgevoer op Elsenburg Proefplaas, Wes-Kaap, Suid-Afrika. Die doel van die proewe was om die volgende te bepaal:

- 1) die effek van verskillende dieet-energievlakke tesame met die teenwoordigheid/afwesigheid van 'n Beta-adrenergiese agonis (β -AA) op die produksie van Suid-Afrikaanse Vleismerino (SAVM) voerkraallammers;
- 2) die effek van die proefdiëte op die rumen pH;
- 3) die effek van verskillende dieet-energievlakke met die teenwoordigheid/afwesigheid van 'n β -AA op die verhouding tussen slagmassa en die opbrengs van kommersiële vleissnitte sowel as op die van been:spier:vet-verhouding van SAVM voerkraallammers;
- 4) die effek van dieet-energie met die teenwoordigheid/afwesigheid van 'n β -AA op die vleis kwaliteit van SAVM voerkraallammers;
- 5) die effek van dieet-energie sowel as die teenwoordigheid/afwesigheid van 'n β -AA op die sensoriese, fisiese en chemiese eienskappe van SAVM voerkraallammers.

Twee afsonderlike proewe is uitgevoer om die effek van die parameters te kwantifiseer. Een honderd en agt (108) SAVM lammers is tydens die eerste eksperiment gebruik, hierdie lammers het bestaan uit beide ooie en ramme. Die lammers is gespeen op 'n ouderdom van ongeveer 120 dae, en gehuisves in individuele hokkies vir 'n tydperk van ongeveer 6 weke. Die proef het uit 6 behandelings bestaan: 'n lae (11.3 ME MJ/kg), medium (12.0 ME MJ/kg) en 'n hoë (12.7 ME MJ/kg) dieet-energievlakke, met of sonder 'n β -AA (ingesluit teen 8.6 g/ton). Die eksperiment was 'n 3 (dieet-energievlakke) $\times$ 2 (β -AA) $\times$ 2 (geslag) faktoriaal ontwerp. Een honderd en twintig (120) SAVM lammers is tydens die tweede eksperiment gebruik, hierdie lammers het bestaan uit beide hammels en ooie.. Die lammers is gespeen op 'n ouderdom van ongeveer 120 dae, en gehuisves in individuele hokkies vir 'n tydperk van ongeveer 6 weke. Die proef het uit 3 behandelings bestaan: 'n lae (11.3 ME MJ/kg), medium (12.0 ME MJ/kg) en 'n hoë (12.07 ME MJ/kg) dieet-energievlak. Die eksperiment was 'n 3 (dieet-energievlakke) $\times$ 2 (geslag) faktoriaal ontwerp. Die data word aangebied as die effek van dieet-energievlakke, β -AA en geslag op die verskeie parameters. Waar daar egter interaksies waargeneem was, is die data aangebied as die effek van die interaksies op gemete parameters.

Drie fistel skape was gebruik tydens die meet van die rumen pH. Geen betekenisvolle verskille is gevind tussen die drie proef diëte op die pH van die rumen nie. Op 'n geheel oorsig is daar 'n geleidelike afname in pH waargeneem, vandat die diere gevoer was. Dieet-energievlakke het slegs die uitslag persentasie in die eerste proef beïnvloed, terwyl dit 'n verskeidenheid parameters in die tweede proef beïnvloed het. Die β -AA het geen betekenisvolle verskil ($P>0.05$) op enige parameter gehad nie. Terwyl geslag 'n verskeidenheid produksie en karkas opbrengs parameters betekenisvol ($P>0.05$) beïnvloed het.

Die hoof effekte, dieet-energievlakke en geslag, het beide die boud opbrengs en die vet persentasie in die been:spier:vet verhouding afsonderlik beïnvloed. Positiewe korrelasies is waargeneem tussen slagmassa en die volgende parameters: karkas gewig, boud opbrengs, skouer opbrengs, nek opbrengs, rib/lies opbrengs en die kraniale vet dikte.

Beta-agoniste word algemeen gebruik in die voere van vee, om die vleis produksie te verbeter en terselfdertyd die vet inhoud van die karkas te verlaag. Die hoof effekte, β -AA en dieet-energievlak, het geen effek op die proksimale samestelling, vet dikte of die sagtheid van die vleis gehad nie. Die ooie het 'n betekenisvolle hoër vet inhoud gehad as dié van ram lammers, terwyl die vleis van die ram lammers weer taaier was as dié van ooi lammers.

Die aanvaarbaarheid van vleis is afhanklik van die taaierheid, geur, smaak en sappigheid. Die sensoriese, fisiese en chemiese eienskappe van vleis word deur beide dieet-energievlakke en die teenwoordigheid/afwesigheid van 'n β -AA beïnvloed. Beide die dieet-energievlak en die teenwoordigheid van die β -AA het geen betekenisvolle ($P>0.05$) verskille gehad op die fisiese eienskappe van die vleis nie. Daar was wel betekenisvolle verskille ($P<0.05$) gevind tydens die sensoriese toetse op die vleis. Die vleis van die ramme (76.2% vs 72.9%) teenoor dié van die ooie, sowel as die vleis van die lammers wat die β -AA ontvang (75.45% vs 72.9%) het teenoor dié lammers wat nie die β -AA ontvang het nie, was taaier.