

AMINO ACID PROFILE OF LAMB CARCASS AND DUODENAL DIGESTA CONTENT

by

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Summary

The essential amino acid composition of carcasses and duodenal digesta content of South African Mutton Merino ram lambs fed a high degradable ($\pm 80\%$) basal diet was investigated. Twenty lambs were randomly allocated to four pre-assigned average slaughter weights (30, 35, 40 and 45 kg live weight). The lambs were fed a basal diet consisting (%) of 30 lucerne, 8 wheat straw, 56.25 maize meal, 3.5 molasses, 1 urea, 0.5 salt and 0.75 ammonium chloride. The chemical composition of the basal diet was as follows: 93.26% dry matter; 14.72% crude protein; 13.96% crude fibre; 4.99% ether extract; 7.93% ash; 0.52% calcium; 0.34% phosphorus and 10.79 MJ/kg metabolizable energy. The chemical composition (moisture, fat, protein and essential amino acids) of the carcass, three rib cut, *M. longissimus dorsi*, *M. infraspinatus*, flexor and *M. biceps femoris* were determined. The essential amino acid profile of the duodenal digesta was also determined.

The moisture concentration of the three rib cut and muscles were significantly correlated ($P < 0.05$) with that of the carcass. Significant correlations ($P < 0.05$) also occurred for fat, with the flexor being an exception. The moisture and fat concentration of the three rib cut revealed the highest correlation when compared to that of the carcass. Non-significant correlations ($P > 0.05$) occurred between the carcass protein and the protein content of the three rib cut and each of the muscles. Low coefficients of determination (r^2) occurred in an effort to formulate prediction equations for individual essential amino acids from the protein concentration of the carcass.

When the essential amino acid composition was examined, significant correlations ($P < 0.05$) were observed for isoleucine and phenylalanine when the *M. longissimus dorsi* and *M. infraspinatus* were compared to that of the carcass ($r^2 = 0.20 - 0.27$). Non-significant correlations ($P > 0.05$) occurred for the remaining essential amino acids in all the muscles examined as well as the

three rib cut when compared to that of the carcass. Similarly, with stepwise regression no combinations of cuts and muscles met the significance level ($P < 0.05$) for entry into a model which could predict the essential amino acid composition of the carcass. The essential amino acid composition of the carcass, three rib cut and muscles remained similar regardless of slaughter weight.

Isoleucine, lysine, methionine, phenylalanine and valine concentrations were significantly different ($P < 0.05$) either in the three rib cut or at least in one of the muscles when compared to the carcass. The carcass essential amino acid composition (g AA / 100 g protein) was as follows: 6.94 arginine; 2.61 histidine; 3.19 isoleucine; 7.19 leucine; 7.03 lysine; 2.08 methionine; 4.15 phenylalanine; 3.79 threonine and 4.28 valine. This composition can serve as an example of the ideal protein requirements for carcass growth of South African Mutton Merino ram lambs fed a high degradable basal diet.

With the exception of histidine, leucine and threonine, relatively large differences occurred between the average essential amino acid concentrations of the basal diet and duodenal digesta. Significantly lower ($P < 0.05$) concentrations of arginine, histidine, methionine and threonine and significantly higher ($P < 0.05$) concentrations of leucine and phenylalanine occurred when the duodenal digesta was compared to the carcass. According to chemical score, it was concluded that the duodenal digesta was first-limiting in histidine and second-limiting in threonine, followed by arginine and methionine for the carcass growth of South African Mutton Merino lambs fed a basal diet.

Opsomming

'n Onderzoek is ingestel na die essensiële aminosuur samestelling van Suid-Afrikaanse Vleismerino ramlamkarkasse en duodenale-inhoud wat 'n basale dieet ontvang het. Twintig lammers is ewekansig aan vier voorafbepaalde slagmassas (30, 35, 40 en 45 kg lewende gewig) toegewys. Die lammers het 'n basale dieet bestaande uit 30% lusern, 8% koringstrooi, 56.25% mielies, 3.5% melasse, 1% ureum, 0.5% sout en 0.75% ammoniumchloried ontvang. Die chemiese samestelling van die basale dieet was as volg: 93.26% droëmateriaal; 14.72% ruproteïen; 13.96% ruvesel; 4.99% eterekstrak; 7.93% as; 0.52% kalsium; 0.34% fosfaat en 10.79 MJ/kg metabolismiese energie. Die chemiese samestelling (vog, vet, proteïen en essensiële aminosure) van die karkas, drie-ribsnit, *M. longissimus dorsi*, *M. infraspinatus*, flexor, en *M. biceps femoris* is bepaal. Die essensiële aminosuur profiel van die duodenale inhoud is ook bepaal.

Die voginhoud van die drie-ribsnit en spiere was betekenisvol gekorreleerd ($P < 0.05$) met dié van die karkas. Met die uitsondering van die flexor, het soortgelyke betekenisvolle korrelasies ($P < 0.05$) vir vet voorgekom. Die drie-ribsnit het die hoogste korrelasie met vog- en vetpersentasie in die karkas getoon. Die korrelasies tussen die drie-ribsnit of elk van die spiere en die proteïenpersentasies in die karkas was nie statisties betekenisvol ($P > 0.05$) nie. Lae lineêre verwantskappe (r^2) tussen persentasie individuele essensiële aminosure en die proteïeninhoud van die karkas is verkry.

Die isoleusien- en fenielalanienkonsentrasies (g / 100 g proteïen) van die *M. longissimus dorsi* en *M. infra spinatus* het betekenisvolle korrelasies ($P < 0.05$) met dié in die karkas getoon ($r^2 = 0.20 - 0.27$). Daarenteen is nie-betekenisvolle korrelasies ($P > 0.05$) vir die oorblywende essensiële aminosure waargeneem. Soortgelyk, is met stapsgewyse regressie geen betekenisvolle kombinasies ($P < 0.05$) van drie-ribsnit en spiere met aminosuurkonsentrasies

in die karkas gevind nie. Die essensiële aminosuorkonsentrasies (g / 100 g proteïen) van die karkas, drie-ribsnit en spiere is nie deur slagmassa beïnvloed nie.

Daar was betekenisvolle verskille ($P < 0.05$) in die konsentrasies van isoleusien, lisien, metionien, fenielalanien en valien van die drie-ribsnit of ten minste een van die onderskeie spiere in vergelyking met dié van die karkas. Die essensiële aminosuursamestelling van die karkas (g AA / 100 g proteïen) was soos volg: 6.94 arginien; 2.61 histidien; 3.19 isoleusien; 7.19 leusien; 7.03 lisien; 2.08 metionien; 4.15 fenielalanien; 3.79 trionien en 4.28 valien. Hierdie samestelling kan as voorbeeld van die idiale proteïenbehoefte vir karkasgroei van Suid-Afrikaanse Vleismerino ramslammers dien.

Met histidien, leusien en trionien as 'n uitsondering, het relatief groot verskille tussen die gemiddelde essensiële aminosuorkonsentrasie van die basale dieet en duodenale-inhoud voorgekom. Betekenisvolle laer ($P < 0.05$) konsentrasies van arginien, histidien, metionien en trionien, en betekenisvolle hoër ($P < 0.05$) konsentrasies van leusien en fenielalanien het in die duodenale-inhoud, in vergelyking met die karkas, voorgekom. Volgens die chemiese telling, is histidien die eerste beperkende en trionien die tweede beperkende aminosuur in die duodenale-inhoud, gevolg deur arginien en metionien vir karkasgroei van Suid-Afrikaanse Vleismerino's wat 'n basale dieet ontvang het.