Assessing feed efficiency in grazing dairy cows through infrared thermography

T. Haak[1,2], A. Münger[2], K.H. Südekum[1] and F. Schori[2]
[1]University Bonn, Institute for Animal Science, Edenicher Allee, 15, 53115 Bonn, Germany, [2]Agroscope, Ruminant Research Group Unit, Route de la Tioleyre, 4, 1725 Posieux, Switzerland; thorsten.haak@agroscope.admin.ch

Genetic selection for feed efficiency is constrained by cost and difficulty of measuring individual feed intake. An alternative is to measure biological proxies of feed efficiency, which can be implemented at farm-level. The objective of this study was to explore the use of infrared thermography (IRT) to predict feed efficiency in dairy cows. A group of 28 dairy cows (14 Holstein and 14 Swiss Fleckvieh) was investigated for two periods during mid and late lactation in a pasture-based system. During a 7-day measuring period, the individual herbage intake of each cow was estimated using the n-alkane marker technique. The surface temperatures (ST, average of surface, maximum and minimum) were recorded (FLIR T620, FLIR Systems, USA) after morning milking, indoors, at multiple body locations (i.e. nose, head, ear, eye, cheek, paralumbar depression, flank, udder, backside, vagina, leg and feet). The ability of the body ST to explain variation in feed conversion efficiency (FCE, energy-corrected milk yield / dry matter intake) and residual feed intake (RFI, effective minus requirements – modelled dry matter intake), was analysed. According to linear models, body ST were positively correlated with FCE (R^2: 0.10-0.50) and negatively with RFI (R^2: 0.06-0.32). At best, FCE and RFI were explained by left flank average ST (R^2=0.50) and flanks average minimum ST (R^2=0.32), respectively. Further, breed and measurement period were included as effects into multiple linear regression models. Predominantly, a significant effect of breed and measurement period was observed. Therefore, when fixed effects were considered, 55% of FCE was explained by backside maximum ST and 43% of RFI was explained by flank average ST and nose average ST. A relationship between surface IRT and feed efficiency was observed. However, ST deviations associated with changes in ambient temperature and/or general conditions could influence the IRT recordings. Standardisation of the IRT process and the conditions during measurement is necessary to accurately assess its potential use to predict feed efficiency.