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95. Breed differences in grazing behaviour of veal calves

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Introduction

Pasture-based rearing of youngstock or calves offers a sustainable and cost-efficient alternative to conventional calf management by reducing concentrate use and improving grassland utilization (Delaby et al., 2020). Further, keeping calves on pasture also supports better animal welfare, as the animals can express their natural feed intake behaviour and have a better health status (Leiber et al., 2025). Especially ethical and societal concerns surrounding male dairy calves can be mitigated, while supporting environmental goals, by raising and finishing these animals extensively on pasture for veal or beef, rather than losing organically born calves to the conventional production chain. Understanding breed-specific adaptability to pasture conditions can reform breeding and management strategies for more sustainable veal and beef production.

Methods

In this study, 18 male dairy calves representing three breeds (Brown Swiss, Limousin × Brown Swiss (Crossbred), and Swiss Fleckvieh) were equipped with noseband sensors to record grazing behaviour within three 24-h monitoring periods, repeated monthly from the 4th to the 6th month of life. Two calves per breed were kept on three farms located in lowland, midland, and highland regions. Before the experiment, all animals per farm were raised together without pasture access. During the first month on pasture, all animals were fed an average of 2.3 litres of milk replacer per day. Throughout the three-month fattening period, they had ad libitum access to hay and additionally received 0.5 kg of alfalfa and 1.3 kg of whole-plant maize cubes per animal each day, followed by 0.5 kg of concentrates per calf per day during the final four weeks. On average, these animals spent approximately nine hours per day on pasture. The bodyweight was measured every second week, and average daily weight gain (ADG) was compared via Kruskal-Wallis and Dunn's pairwise comparison. To compare behavioural differences of the animals while having pasture access, three behavioural parameters while having pasture access, were analysed using Generalized Linear Mixed Models (GLMMs) in RStudio, with farm and individual nested within farm as random effects.

Results

No statistically significant differences in ADG were observed among Brown Swiss, Crossbred and Swiss Fleckvieh calves ($P > 0.23$), indicating that all three genotypes achieved comparable growth performance under extensive pasture conditions (Fig. 1).

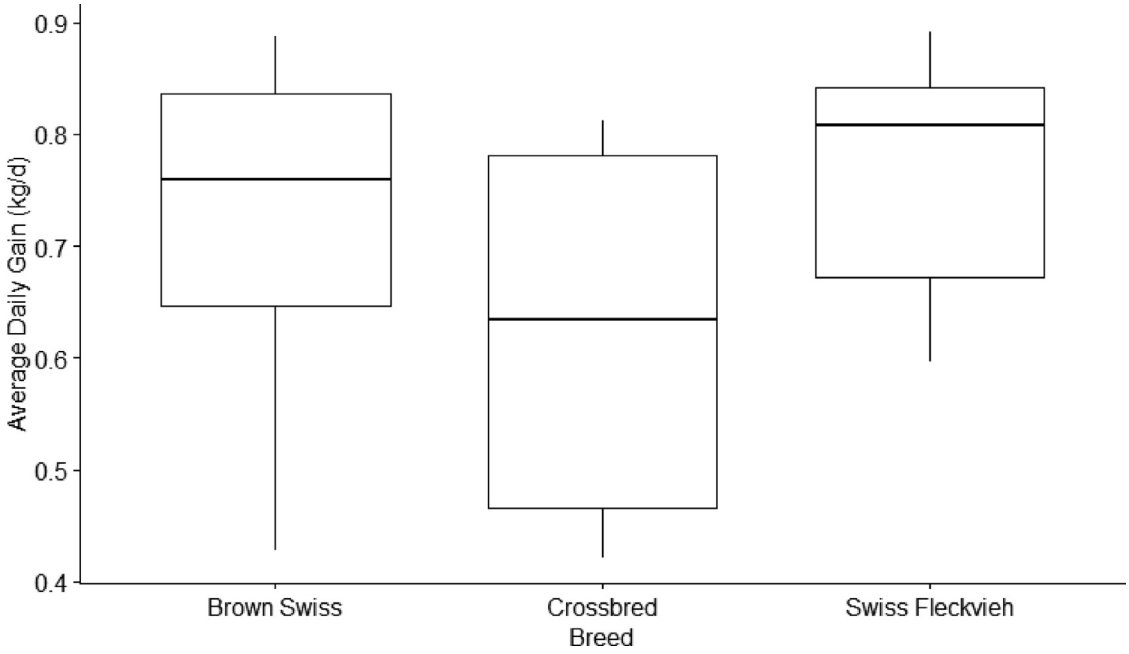

Fig. 1. Average daily weight gain in kg/day per breed (n = 6 per breed) over the three-month grazing period.

Despite the similar ADG, pronounced breed effects were detected in grazing behaviour. Swiss Fleckvieh calves exhibited significantly longer grazing times (31.2 min/h) and considerably higher bite rates (1285 bites/h) compared with Brown Swiss (22.7 min/h; 844 bites/h) and Crossbred calves (22.8 min/h; 839 bites/h). These behavioural differences suggest a greater motivation or efficiency in forage acquisition among Swiss Fleckvieh calves on pasture. In contrast, rumination time did not differ significantly among breeds, indicating comparable digestive processing across genotypes. The absence of breed differences in rumination time also suggests that Swiss Fleckvieh calves maintained adequate fibre intake compared to the other breeds, likely supported by using similar ad libitum hay provision when housed indoors. Thus, the key behavioural advantages observed in Swiss Fleckvieh calves, namely their longer grazing times and higher bite rates, may enable greater forage intake at pasture.

Conclusions

Swiss Fleckvieh calves showed greater adaptability to pasture-based rearing through enhanced grazing activity, characterised by significantly higher grazing times and bite rates. While growth performance did not differ among breeds, the behavioural distinctions highlight the importance of considering genetic and behavioural traits when selecting breeds for low-input veal and beef systems. Integrating such breed-specific characteristics into breeding and management decisions may help optimise the use of permanent grasslands, improve animal welfare, and support more sustainable and socially accepted production systems for male dairy calves.

Declaration of interest

The authors declare no conflict of interest.

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96. Greenhouse gas emissions from laying hens in mobile barns – Influence of the birds on N_2O emissions in the outdoor run

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Abstract

Organic laying hens kept in mobile barns deposit manure both inside the house and across the outdoor run, complicating nitrous oxide (N_2O) accounting. We conducted weekly static-chamber measurements at four distances from a mobile barn, covering four weeks with hens and four weeks after relocation, using a photoacoustic analyser to derive fluxes and cumulative emissions. N_2O showed pronounced spatio-temporal variability with hotspots near the barn, strong day effects, and elevated fluxes that persisted after relocation, indicating legacy effects of nitrogen inputs and soil disturbance. Breed-related patterns were apparent but not statistically significant. Overall, our distance-stratified design provides position-specific N_2O emission profiles for mobile systems, fills a key measurement gap for outdoor runs, and highlights the need for future work to disentangle nitrogen inputs from hen behaviour.

Central question

Mobile barns are increasingly used in organic egg production to meet the EU requirement for regular outdoor access (European Commission, 2018). This management shifts a substantial share of nutrient loading and associated emissions to the outdoor run through manure deposition, with implications for nitrous oxide (N_2O), ammonia (NH_3), and methane (CH_4) dynamics (Gržinić et al., 2023). In addition to higher nitrogen (N) inputs, hen-related processes may further stimulate N_2O formation. For example, reduced plant N uptake following vegetation loss and greater oxygen availability from scratching and soil disturbance (Zoli et al., 2023; Meda et al., 2012). Yet direct emission measurements from outdoor runs remain scarce. One of the few field studies reporting fluxes found extremely high spatial and temporal variability in N_2O emissions from organic broiler runs, with clear hotspots close to the house (Meda et al., 2012). Similarly, behavioural studies in mobile systems show that hens concentrate their activity near the barn, implying strong nutrient gradients and a high potential for N_2O hotspots. Against this background, position-resolved measurement approaches, such as static chambers combined with distance stratification, are essential to generate reliable emission estimates. At the same time, broader replication across sites, seasons, and flock sizes will be necessary to strengthen inference and develop evidence-based recommendations for practice. Here, we measured greenhouse gas fluxes weekly at four distances from a mobile barn using static chambers to (i) improve the empirical basis for emissions from outdoor runs and (ii) illustrate methodological options for sampling these highly heterogeneous environments.

Elaboration of the argument

We conducted a field experiment with laying hens of the lines "ÖTZ Coffee" and "Lohmann Sandy" housed in a mobile barn and fed a typical organic diet supplemented with insect protein from black soldier fly larvae (*Hermetia illucens*). The barn was moved every 4–5 weeks. Greenhouse gas emissions were measured weekly at four distances within the run using a photoacoustic analyser (Innova 1512, LumaSense). We used a closed static-chamber system: chambers were placed on permanently installed soil collars, and headspace air was transported via PTFE tubing to the analyser. Fluxes were calculated from repeated concentration measurements by linear interpolation and then integrated to cumulative emissions. Measurements covered eight weeks at one barn position and continued for a further eight weeks after