Livestock Science 199 (2017) 25–30

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Effects of grazing and feedlot finishing duration on the performance of three beef cattle genotypes in Uganda

Denis Asizua[a,b], Denis Mpairwe[a], Fred Kabi[a,*], David Mutetikka[a], Torben Hvelplund[c], Martin Riis Weisbjerg[c], Jørgen Madsen[d]

[a] Department of Agricultural Production, College of Agricultural and Environmental Sciences, Makerere University, P.O. Box, 7062 Kampala, Uganda
[b] Livestock and Fisheries Research and Development program, Abi Zonal Agricultural Research and Development Institute (Abi ZARDI), National Agricultural Research Organisation, P.O. Box 219, Arua, Uganda
[c] Department of Animal Science, AU-Foulum, Aarhus University, DK-8830 Tjele, Denmark
[d] Department of Large Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, DK-1958 Frederiksberg C, Denmark

ARTICLE INFO

Keywords:
Beef
Production systems
Grazing
Tropical cattle

ABSTRACT

Beef production in Uganda is progressing from the traditional pastoral practices to sedentary semi-intensive systems. Consequently, farmers are continuously crossbreeding the indigenous cattle with exotic genotypes to improve meat yield. This study was conducted on-farm to evaluate the effects of feeding systems and feeding durations on performance of three locally available genotypes. A 2×3×3 factorial experiment was used to randomly allot 108 young bulls (9–15 months old), 36 for each of the three genotypes; Ankole x Holstein Friesian (AXF) (175 ± 22 kg), pure Boran (208 ± 34 kg) and a composite genotype (212 ± 35 kg). The bulls were allotted to two feeding systems and three finishing durations. The feeding systems comprised sole grazing as the control where animals only grazed natural pastures and feedlot finishing where animals were fed a locally formulated total mixed ration containing 200 maize stover, 300 maize bran, 447 brewers' spent grain, 50 molasses and 3 salt (NaCl) as g/kg on dry matter (DM) basis. The three durations were 60, 90 and 120 days excluding 14 days of adaptation period. Data was collected on feed intake, growth, slaughter and carcass characteristics. The Boran consumed less DM per kg of body weight gain than the AXF and composite. Feed conversion ratio (kg DM/kg body weight gain) ranged between 6.3 ± 0.6 to 8.2 ± 1.5 at the feedlot and 11.1 ± 4.1 to 17 ± 4.0 for all genotypes and all durations. Growth and slaughter characteristics did not vary ($P > 0.05$) between genotypes. However, carcass quality grade scores were higher ($P < 0.05$) in the pure Boran and the composite genotypes than in the AXF crossbreds at 120 days of finishing. Average daily live weight gain (ADG) for all genotypes was approximately twice under feedlot finishing compared to sole grazing while hot carcass weight under feedlot was only higher than that of sole grazing by 30 kg in AXF, 37 kg in Boran and 45 kg in composite genotype at 120 days of finishing. Hot carcass weight and dressing percentages were similar ($P > 0.05$) between genotypes irrespective of the feeding system for all durations but hot carcass weight was higher ($P < 0.05$) at the feedlot for all durations. Therefore, intensification through feedlotting is a viable option for improving beef production. However, understanding the appropriate levels of crossing between genotypes is needed to achieve the desired improvement in productivity from crossbreds.

1. Introduction

Beef production in Uganda is progressing from the traditional pastoral practices to sedentary semi-intensive systems on private ranches (Wurzinger et al., 2009; Mbabazi and Ahmed, 2012). Traditionally, pastoral communities within the cattle corridor of Uganda practiced nomadism and transhumance on communal lands to sustain animals, which provided beef to both the rural and urban populations. However, due to changing human population patterns with the consequential increase of pressure on communal grazing land, traditional pastoral production practices are becoming less practical. For example, increasing human population pressure is increasingly limiting flexibility of livestock movement due to loss of corridors between wet and dry season grazing areas (Byenkya et al., 2014). While forages are adequate during the wet season, the dry season forage is characterized by limited availability and accessibility coupled with low nutritive

* Correspondence to: Department of Agricultural Production, School of Agricultural Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda.
E-mail address: fred.kabi@gmail.com (F. Kabi).

http://dx.doi.org/10.1016/j.livsci.2017.03.006
Received 15 August 2016; Received in revised form 3 March 2017; Accepted 4 March 2017
1871-1413/

quality (Selemani et al., 2013). As a result, weight gained by animals during the wet season is often eroded by weight loss resulting from low nutrient intake and higher maintenance requirements for walking longer distances in search for feeds and in many cases water during the dry season. Mwilawa (2012) reported weight loss of 45 g per day for grazing Tanzanian Short Horn Zebu and Boran during the dry season. To cope with the negative effects of feed scarcity on animal performance, many farmers often sell some of their livestock. In Uganda, young bulls and old cows are reported to account for over 80% of the animals sold during such periods (Ruhangawebale, 2010). The young bulls are slaughtered at low live body weights resulting in very low carcass weights compared to bulls from established beef production systems where young animals are finished on high concentrate diets and slaughtered at higher slaughter and carcass weights (Piedrafita et al., 2003).

While the indigenous genotypes are well adapted to the tropical production environment characterized by heat, endemic diseases and seasonal forage quantity and quality fluctuations, their slow growth rates and smaller mature live body weights limit their potential for meat production. However, lack of selection programs in the production systems also in part contributes to the low production levels of the indigenous genotypes. Average daily gain of 270 g for grazing Ankole cattle and its crossbreds with Boran and Friesian has been reported (Asizua et al., 2009) compared to 517 g per day reported in Creole breed, a tropical breed in USA (Agastin et al., 2013). Arguably, many progressive farmers in their attempt to improve the genetics of the indigenous genotypes, indiscriminately crossbreed (Mbabazi and Ahmed, 2012) with improved beef genotypes such as the improved Boran (550–850 kg mature body weight (Rege et al., 2001)) and Bosmara (544 − 950 kg mature live body weight (Animal Genetics Training Resources (AGTR), 2009)) and dairy exotic genotypes, especially Holstein Friesian whose bulls can weigh 750 kg at 26 months (Geay and Micol, 1989). Moreover, it has been argued that as livestock production systems evolve through intensification, support to smallholder farmers to provide more efficient beef and dairy genotypes and improvement of animal management practices may be an appropriate option for improved pro-poor livestock production (McDermott et al., 2010; Rege et al., 2011). However, the extent to which crossbreeding is improving productivity of beef cattle in the pastoral and agro-pastoral communities still remains uncertain. Similarly, information as to whether the crossbreds outperform the indigenous genotypes in terms of meat yield and efficiency of feed utilization under the intensive systems is still limited. Although various studies have demonstrated positive influence of crossbred genotypes on beef production (Asizua et al., 2009; Mwilawa, 2012; Asimwe et al., 2015), information on the influence of duration of feeding on body weight gain and carcass yield under different production systems remains limited. This study, therefore, sought to evaluate growth, feed utilization and carcass characteristics of the three beef cattle genotypes (*i.e.* Ankole x Holstein Friesian, pure Boran and a composite genotype comprising Ankole, Holstein Friesian, Boran and Bonsmara) under grazing and feedlot finishing.

2. Materials and methods

2.1. Study site

This study was conducted between February and August 2012 at Betar Ranchers, a private ranch located in Mubende district found within the cattle corridor in central Uganda. Mubende district lies along the longitude 31° 40′ E and latitude 00° 30′ N at an altitude of 1300 m above sea level. Annual rainfall in the area ranges between 850 mm and 1300 mm distributed between two wet seasons of April-May and September-November. Annual temperatures range was between 15 to 28 °C. The predominant grass pasture species in the area include Signal grass (*Brachiaria brizantha, Brachiaria ruziziensis),* Rat's tail (*Sporobolous pyramidalis*), Star grass (*Cynodon dactylon*), Couch grass (*Digitaria scalarum*) with sparse distribution of legumes such as Glycine (*Neonotonia wightii*), Greenleaf desmodium (*Desmodium intortum*) and Silverleaf desmodium (*Desmodium uncinatum*). Predominant tree species included Acacia (*Acacia hockii*), Albizia (*Albizia coriaria*, *Albizia zygia*) and Bushwillow trees (*Combretum* spp.).

2.2. Experimental design and treatments

A 2 × 3 × 3 factorial experiment was used to randomly allocate 108 young bulls, of three genotypes aged between 9 and 15 months, to two feeding systems and three finishing durations. The three genotypes comprised Ankole x Holstein Friesian (AXF), pure Boran and a composite genotype consisting of crosses between Ankole, Holstein Friesian, Boran and Bonsmara genotypes. The initial live weights of the bulls were 175 ± 22, 208 ± 34 and 212 ± 35 kg for AXF, pure Boran and the Composite genotypes, respectively. The feeding systems to which bulls were allocated comprised of sole grazing, a practice commonly used by farmers as a control, and feedlot finishing. The durations of feeding included 60, 90 and 120 days after which bulls were removed for slaughter. Each of the two feeding system was randomly allocated 54 young bulls, 18 from each of the three genotypes of Ankole x Holstein Friesian (AXF), pure Boran and the composite genotype. For each genotype, animals were stratified by initial weight and assigned to the three durations of finishing such that bulls in each stratum were randomly allocated to each treatment. While for growth, slaughter and carcass characteristics the individual animal was considered as the experimental unit, for feed intake, pens were used as the experimental unit. For each genotype, duplicate pens with 3 bulls each were used for the different durations of finishing. The experimental pen provided 12 m^2 per bull irrespective of the genotype. All the bulls of the different genotypes at the feedlot were first subjected to a 14-day adaptation period during which they were allowed to get used to confinement in the pens and feedlot diets. Data from the adaptation period were excluded from data for the different durations of finishing.

2.3. Experimental feeds and feeding

Natural pastures with watering points distributed at random points with an average of at least one trough per square kilometre provided water for the grazing animals. The natural pastures were maintained through routine bush clearing and weeding especially during the wet season. Grazing animals were released from the night kraal at 08:00 h and returned by 18:00 h. Meanwhile, feedlot bulls were offered a locally formulated total mixed ration (TMR) consisting of maize stover, wet brewers spent grain, maize bran, molasses and salt. The maize stover was chopped to pieces of about 3–6 cm using John Deere forage chopper. For ease of uniform mixing, the molasses was diluted with water in a ratio of 1:1. Maize bran (375 g/kg DM), brewer's spent grain (558.75 g/kg DM), molasses (62.5 g/kg DM) and salt (3.75 g/kg DM) were formulated and blended to form a concentrate that was later used as a premix. The premix was then blended with maize stover to form the TMR. The TMR was comprised of g/kg DM: 200 maize stover, 300 maize bran, 447 brewers' spent grain, 50 molasses and 3 salt. The TMR was formulated to provide 130 g/kg DM of CP and 10 MJ/kg DM of ME. The formulated ration targeted to meet requirements for ADG of 1000 g/animal/day (NRC, 1984). The TMR was offered *ad libitum* by adding 10% of the previous day's intake to the daily offer. Throughout the experimental period, free access was provided to water and Maclik mineral block, which consisted of the following elemental components (%): Ca (2.6), P (1.4), Na (31.93), Cl (49.28), Mg (1.8), Cu (0.32), Co (0.04), Fe (0.5), K (0.006), I (0.02), Zn (0.36), Mn (0.28) and S (0.36); and compounds (%): CaO (3.64), P_2O_5 (3.21) and NaCl (81.21); and Ca:P ratio (1.8:1).