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A comparison of the growth of Brahman and F_1 Senepol × Brahman steers in an Indonesian feedlot

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Abstract. This study compares the performance of F_1 Senepol × Brahman steers (F_1 SEN) to Brahman (BRAH) steers in an Indonesian feedlot. The focus was to address concerns that crossbred cattle are discriminated against by live export cattle buyers due to a perception that they do not perform as well as Brahmans in Indonesian feedlots. F_1 SEN ($n = 54$) and BRAH ($n = 32$) steers that had grazed together since weaning at Douglas Daly Research Farm (Northern Territory) were exported to Indonesia and fed for 121 days in a feedlot near Lampung (Sumatra, Indonesia). The average daily gain of the F_1 SEN steers over the feeding period was 0.17 kg/day higher ($P < 0.001$) than the BRAH steers (1.71 vs 1.54 kg/day). As a result the F_1 SEN put on an average of 21.6 kg more over the 121-day feeding period and they did not have a higher mortality rate. Consequently, F_1 SEN steers performed better than BRAH in an Indonesian feedlot and these results should encourage live export cattle buyers to purchase this type of cattle (Brahman crossed with a tropically adapted *Bos taurus* breed) with confidence that they can perform at least as well as Brahmans in Indonesian feedlots, although it should be noted that growth rates are usually higher in F_1 crosses than in subsequent generations.

Additional keyword: Indonesia.

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Introduction

Most cattle in northern Australia have a high *Bos indicus* (usually Brahman) content as they are able to perform better in the harsh conditions than *Bos taurus* cattle (Davis 1993). However, *Bos indicus* cattle are generally regarded as having less tender meat than *Bos taurus* (Crouse *et al*. 1989; Johnson *et al*. 1990). As a result Brahman cattle from northern Australia often suffer price discrimination when they are sent to Australian domestic markets. It would be advantageous for north Australian producers to be able to produce cattle that are in demand in both the live export and Australian domestic markets so that they have more marketing options and are less vulnerable to live export market fluctuations. Crossbreeding also provides benefits in increased growth and fertility due to hybrid vigour, provided that the cross is sufficiently adapted to perform well in its environment (Frisch and Vercoe 1984; Frisch *et al*. 1987; Burrow 2006).

Crossbreeding with a tropically adapted *Bos taurus* breed has been shown to be a way of producing progeny with more tender meat from Brahman cows (Schatz *et al*. 2014), however there has been some reluctance by northern cattle breeders to adopt crossbreeding due to a perception that Indonesian feedlotters prefer high grade Brahman cattle as they believe that crossbred cattle do not perform as well under their conditions. As a result live export cattle buyers can reject or offer discounted prices for crossbred cattle. This study was conducted to test this perception by comparing the performance of F_1 Senepol × Brahman (F_1 SEN) and Brahman (BRAH) steers in an Indonesian feedlot.

Methodology

Senepol and Brahman bulls were randomly mated to commercial Brahman cows in Northern Territory Department of Primary Industry and Fisheries (DPIF) herds in the Katherine/Victoria River District. At Manbulloo station both Senepol and Brahman bulls were mated to Brahman cows in the same paddock, and at Victoria River Research Station both Brahman and Senepol bulls were mated to Brahman cows in some paddocks whereas in others only one breed of bull was present (in these cases the breed of bull was allocated to paddocks randomly). The cows were all commercial Brahman cows of similar genotype. The male progeny from these matings received the same management throughout their lives and were run together as one mob from weaning onwards. The male weaners were transported to the Douglas Daly Research Farm (DDRF) shortly after weaning in June 2013. DDRF is ~220 km south of Darwin, Northern Territory (13°50′S, 131°11′E). It has a monsoonal climate with an average rainfall of 1209 mm and most of the pastures have been improved (Schatz *et al*. 2007). At DDRF the male weaners were processed (branded, castrated, etc.) and then grazed together in a single mob that rotationally grazed 26 × 6-ha paddocks of Buffel grass (*Cenchrus ciliaris*) pasture at a stocking rate of 1.3 beasts/ha. They had *ad libitum* access to

mineral lick blocks year round and insecticidal fly tags were applied in the wet season.

The steers were weighed (unfasted) on 26 February 2014 and those weighing more than 300 kg were considered for this study. Some steers that were not considered to be good examples of their type or that had features that exporters might reject (e.g. scars from wild dog attacks, horns and so forth) were not selected. As a result 32 BRAH and 54 F_1 SEN steers were selected for export and were weighed again on the evening of 26 February 2014 following a 12-h curfew with no feed or water, and fat depth was measured ultrasonically at the P8 site. They were then placed in a holding paddock overnight before being transported by a commercial trucking company to the Berrimah export yards on 27 February 2014.

A collaborative partnership was formed between the Northern Territory DPIF and Elders Indonesia who agreed to purchase these cattle and allow a DPIF researcher to study their performance in the Elders feedlot in Lampung Province (Sumatra, Indonesia). The steers spent several days at the Berrimah export yards while the shipment of cattle was being assembled before leaving the port of Darwin on 6 March 2014. After going through the quarantine process in Indonesia they were transported to the Elders feedlot at Lampung and introduced to a starter ration on 12 March 2014. They were inducted into the feedlot on 15 March 2014 when individual unfasted liveweights were recorded and the wellbeing of each animal was assessed. The wellbeing assessment resulted in five steers being moved to a 'sick pen' for observation and to receive extra care as necessary.

The steers were all housed in the same pen while in the feedlot and were fed the normal commercial rations for a period of 121 days from induction. While in the feedlot the steers were managed as per the normal feedlot management. They were fed various levels of starter rations for 3 weeks before receiving the finishing ration for the rest of the feeding period. The major ingredients of the ration were tapioca waste, tapioca chip, DDGS (distillers dried grains plus solubles), copra meal, palm kernel cake, Napier grass and molasses. Feed intake of the pen was recorded by the feedlot staff. Final weight and P8 fat depth (measured ultrasonically) were recorded on 14 July 2014. The steers were not curfewed in the feedlot before weighing.

Of the five steers (three F_1 SEN and two BRAH) placed in the 'sick pen' at induction, three remained there for a short time whereas one BRAH steer was euthanised and one F_1 SEN steer remained in the sick pen for most of the feeding period (110 days) and so was excluded from the analysis. Feedlot staff conducted regular health checks during the feeding period and any steers that appeared sick or lame were taken to the 'sick pen' until they recovered. This resulted in one other BRAH steer being removed from the pen and euthanised on 6 June 2014 due to illness. As a result a final count of 30 BRAH steers and 53 F_1 SEN steers was included in the analysis.

Statistical analyses

Mean initial liveweights recorded at induction (BRAH vs F_1 SEN) were compared with an ANOVA model. Means for average daily gain in the feedlot (kg/day) and final liveweight (kg), both corrected for initial liveweight, and final P8 fat depth (mm) either when it was corrected or not corrected for final weight, were compared with ANCOVA models and reported means adjusted for the covariate. The type I error rate was set at 0.05. Loss rate during the export and feedlot period (i.e. steers that were removed and euthanised) for the two steer groups was analysed with a two-sample test for equality of binomial proportions with continuity correction (Snedecor and Cochran 1989).

Results

Both genotypes lost weight over the post-weaning dry season at DDRF (F_1 SEN = –12 kg, BRAH = –16 kg) but grew rapidly from the start of the wet season (in November) so that by 26 February 2014 the F_1 SEN had gained 101 kg and the BRAH had gained 93 kg since 30 June 2013 (when they were weighed at DDRF following a recovery period after branding and castration). When the mob of steers was weighed on 26 February 2014 at DDRF, 38 of 159 (24%) BRAH steers and 64 of 112 (57%) F_1 SEN steers were heavier than 300 kg and the average weight of the F_1 SEN steers (301 kg) was 29 kg heavier than the BRAH (272 kg). The average curfewed weight of the steers selected for export was 322.5 kg for the F_1 SEN (n = 54) and 312.7 kg for the BRAH (n = 32), and the average P8 fat depth was 2.4 mm for BRAH and 1.6 mm for F_1 SEN.

Data comparing the performance of the two genotypes of steers in the feedlot in Lampung is summarised in Table 1. The average daily gain of the F_1 SEN steers over the 121-day feeding period was significantly higher ($P < 0.001$) than the BRAH (1.71 kg/day and 1.54 kg/day, respectively). As a result the F_1 SEN put on an average of 21.6 kg more weight while in the feedlot and their average final weight at the end of the feeding period was significantly higher ($P = 0.002$) (+25.4 kg) than the BRAH. The difference in average final P8 fat depth between genotypes was not significant either when it was

Table 1. The mean and standard error (in brackets) performance measures of Brahman and F_1 Senepol steers in the Elders feedlot near Lampung (Sumatra, Indonesia)

Means followed by a different letter are significantly different ($P < 0.05$)

Performance measure	BRAH (n = 30)	F_1 SEN (n = 53)	Difference (F_1 SEN – BRAH)
Feedlot induction weight on 15 March 2014 (kg)	308.5 (3.83)a	312.3 (2.88)a	3.8
Final feedlot weight on 14 July 2014 (kg)	501.3 (6.38)a	526.7 (4.80)b	25.4
Final P8 fat depth on 14 July 2014 (mm)	10.6 (0.59)a	10.5 (0.44)a	–0.1
Average daily gain (kg/day)	1.54 (0.04)a	1.71 (0.03)b	0.17

corrected for final weight (P = 0.903) or when it was not (P = 0.909), even though the average final weight of the F_1 SEN was heavier (+25.4 kg).

Feed intake averaged 13 kg/head.day as fed (10.4 kg dry matter/head.day). This was the average of all animals in the pen and so it was not possible to compare feed intake between genotypes.

Two BRAH steers were euthanised due to illness in the feedlot whereas all F_1 SEN steers survived. There was no significant difference (P = 0.263) in loss rate between the genotypes.

Discussion

The higher proportion of F_1 SEN steers weighing more than 300 kg at DDRF on 26 February 2014 and hence selected for the study in Indonesia highlights how heavier weaning weights and higher post-weaning growth led to a higher proportion of F_1 SEN steers being turned off earlier than BRAH steers (57% vs 24%). This supports previous research conducted at DDRF comparing the growth of F_1 SEN and BRAH steers, which found that on average F_1 SEN steers were 28 kg heavier at weaning and grew a further 10 kg more over the post-weaning year (Schatz *et al*. 2014). These results are consistent with numerous other studies, which have shown that due to hybrid vigour, *Bos taurus* × *Bos indicus* crossbred animals are heavier at weaning and have higher post-weaning growth than pure *Bos indicus* animals if the crossbred has enough stress resistance for the environment (e.g. Frisch and Vercoe 1984; Frisch 1987; Chase *et al*. 1998; Prayaga 2003).

Both genotypes performed well in the feedlot with average daily gain of more than 1.5 kg/day, which is similar to feedlot performance in Australia (Forster 2012). The F_1 SEN steers had a significantly higher average average daily gain (+0.17 kg/day) and put on more weight than the BRAH steers during the feeding period. This is most likely the result of hybrid vigour and the 50% composition of *Bos taurus* genes, as *Bos taurus* and *Bos taurus* cross cattle usually have a higher growth potential than *Bos indicus* when in favourable environments and on high quality diets (Frisch and Vercoe 1984; Burrow 2006). It should be noted that hybrid vigour is a major factor contributing to the higher growth of crossbred steers reported in this study and that hybrid vigour is highest in the F_1 generation and reduced in subsequent generations. Although a stabilised two breed composite only retains 50% of the original hybrid vigour, the amount of hybrid vigour retained can be increased by using a rotational crossbreeding system or by incorporating more breeds into the composite (Gregory and Cundiff 1980).

Two BRAH steers removed from the feedlot due to illness had to be euthanised whereas all F_1 SEN steers survived the export and feedlot processes. This difference in loss rate was not significant but, combined with their higher growth suggests that the F_1 SEN have a sufficient level of tropical adaption to perform at least as well as Brahmans in an Indonesian feedlot environment.

The average fat depth of F_1 SEN steers was not significantly different to BRAH despite them having a significantly heavier average weight (+25 kg) at the final measurement. This indicates that the F_1 SEN have greater value adding potential in feedlots as they can be grown to heavier weights before they exceed fatness specifications.

This study found that F_1 SEN steers had a higher growth rate than BRAH steers and did not have more illness or mortalities, which shows that they have a sufficient level of tropical adaption to perform well in this environment. These results indicate that when Brahmans are crossed with a tropically adapted *Bos taurus* breed such as the Senepol, that the steers produced should perform at least as well as Brahmans in Indonesian feedlots. Therefore, live export cattle buyers should be able to purchase this type of cattle and be confident that they will perform well in Indonesian feedlots. If this removes the threat of price discrimination against such crossbred cattle, then it should also remove one of the impediments to northern cattle producers adopting crossbreeding and taking advantage of the benefits that it offers such as hybrid vigour and the combination of desirable characteristics from different breeds resulting in improved meat quality and increased marketing options.

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