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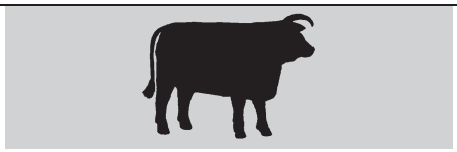

Differences in lifetime productivity of beef heifers that conceived to first-service artificial insemination (AI) or a clean-up bull via natural service (NS) as a yearling and among females that were offspring of an AI or NS mating

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ABSTRACT

The objectives of this study were to compare lifetime productivity between heifers that conceived to AI or a clean-up bull via natural service (NS) as yearlings, and among females that were offspring of an AI or NS mating. Records (n = 6,693) on 1,173 females subjected to estrus synchronization and AI, with NS beginning approximately 10 d later, at one location from 1991 to 2010 were used. For the first objective, females were classified as conceiving to AI or NS as yearlings based on a 290-d gestation length added to the AI date. For the second objective, females were grouped into 1 of 4 dam classifications if they were the offspring of a 1) primiparous heifer that conceived to AI, 2) primiparous heifer that conceived to NS, 3) multiparous cow that conceived to AI, or 4) multiparous cow that conceived to NS. Lifetime revenue was calculated using price and weaning weight data for each calf produced. Actual and average market prices, as well as synthetic price regimens representing extreme weight–price interactions, were used. As yearlings, females that conceived to AI had greater ($P < 0.0001$) lifetime weight weaned, calves weaned, and revenue under all price scenarios and greater ($P < 0.05$) calf weaning weight than did females that conceived to NS. Dam classifications did not differ ($P > 0.10$) for any variables. In conclusion, when estrus synchronization and AI are used before NS, yearling heifers conceiving earlier to AI can achieve greater lifetime productivity than can heifers conceiving later to NS.

Key words: artificial insemination, beef heifer, estrus synchronization, lifetime productivity

INTRODUCTION

Using AI and estrus synchronization offers many benefits to beef producers. Artificial insemination provides access to elite genetics that may not otherwise be available to a breeding program. And, AI in combination with estrus synchronization can

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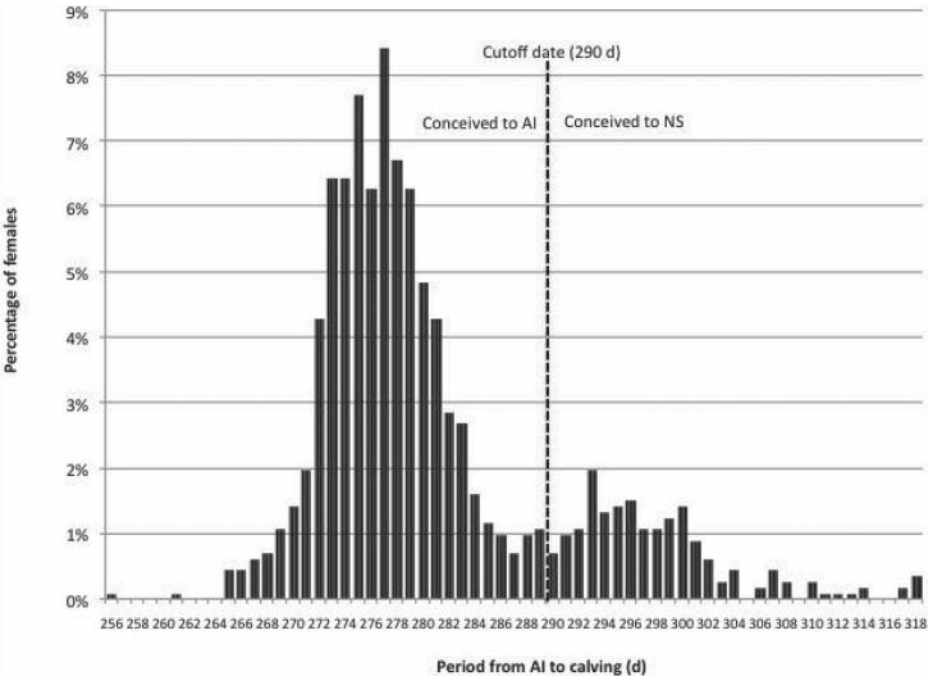

Figure 1. Distribution of the time period (in days) from AI to calving for all females in the data set, and determination if conception as a yearling was to AI or natural service (NS) based on a 290-d cutoff date. Figure includes data from 1,173 females from 1991 to 2010.

allow a greater number of females to be inseminated at one time and result in females that conceive earlier in the breeding season (Dunn and Kaltenbach, 1980). The authors reported that this resulted in older and, therefore, heavier calves the following year and increased the postpartum recovery period. Synchronizing estrus has also been shown to produce calves that were on average 13 d older and 9.5 kg heavier than nonsynchronized females (Schafer et al., 1990). Thus, estrus synchronization and AI can result in a more concentrated calving season, in turn creating a more uniform calf crop. Additionally, AI can reduce bull maintenance and purchase costs (Johnson and Jones 2004; Ellis, 2005).

Use of AI has been shown to increase short-term revenue by $70 per head over natural service (**NS**) by increasing weaning weight and reducing bull costs (Anderson and Deaton, 2003). Additionally, the increased weaning weight in AI-sired calves from estrus synchronization protocols with AI produced greater returns than did NS (Johnson and Jones, 2004).

Despite these benefits, only 7.6% of beef producers used AI in 2008 (USDA, 2009). One reason for this low level of implementation could be the lack of data documenting long-term benefits of having females conceive earlier in the breeding season. The immediate benefit of early-calving females is well documented—heifers born early in the calving season have greater lifetime productivity than do those born later (Lesmeister et al., 1973; Funston et al., 2011) and early-calving cows wean more weight than late-calving cows (Garcia Paloma et al., 1992). However, little has been published regarding lifetime productivity of females that conceived earlier in the breeding season to AI as a yearling or were the offspring of an AI sire. Therefore, the objectives of the study were to 1) determine the effect of conception to AI or NS as a yearling on lifetime productivity and 2) compare lifetime productivity among females that were the offspring of an AI or NS sire.

MATERIALS AND METHODS

Classification of Females

Data for the study included a historical data set from the John E. Rouse Colorado State University Beef Improvement Center (**BIC**; Saratoga, WY). Calving and breeding records were acquired from 1991 to 2010 and resulted in 6,693 records from 1,173 purebred Angus females. Weaning weights were also recorded for each cow annually until they were culled from the herd. Data also included yearling weight and age at AI for every female in the data set.

For the first objective, heifers were classified as conceiving to AI or NS as yearlings using calving and breeding records. A 290-d gestation length was added to the AI date for a given year to create a cutoff date upon which the classification was made. Using data on Red Angus, Angus, and Hereford cows in Iowa, Bourdon and Brinks (1982) reported an average gestation length of 282.9 ± 4.7 d based on calving records from 5,691 cows. Cows on the BIC typically had shorter gestation lengths of approximately 280 d (R. M. Enns, unpublished data). Therefore, based on data reported by Bourdon and Brinks (1982), a value equal to 2 SD (9.4 d) was added to 280 d to account for approximately 95% of the gestation lengths. This resulted in the 290-d gestation length used to calculate a cutoff date. Any female calving before the cutoff date was classified as conceiving to AI, and any female calving after the cutoff date was classified as conceiving to NS. This method to determine conception to AI or NS was used because complete pregnancy diagnosis results to confirm date of conception were not available.

To accomplish the second objective, females were classified as being the offspring of an AI or NS mating using the same criteria described above. Any female born before the cutoff date (290-d gestation length added to the AI date) was classified as being sired by AI, whereas any female born