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Sire effect on the pregnancy outcome in beef cows synchronized with progesterone based Ovsynch and CO-Synch protocols

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Abstract

The objective was to determine the sire effect on the pregnancy outcome in beef cows in which stage of estrus was synchronized with progesterone based fixed-time artificial insemination (AI) protocols. Three Angus sires with more than 300 breedings were evaluated for differences in pregnancy outcome from 1868 inseminations. Angus cross beef cows ($N = 1868$) were synchronized with Ovsynch-CIDR or CO-Synch-CIDR protocols for fixed-time AI. Cows in both groups that showed estrus on day 9 before 1500 h were designated to Selectsynch-CIDR group and were inseminated according to AM-PM rule. Results indicated that Sire 2 had lower fixed-time AI pregnancy rate compared to Sire 3 (48.1% versus 58.7%; $P = 0.01$). Significant sire × synchronization program and sire × location interactions were observed for fixed-time AI ($P < 0.05$). Sire 2 had a lesser fixed-time AI pregnancy in both Ovsynch-CIDR and CO-Synch-CIDR groups compared to Sire 3. In two of four locations, Sire 2 had a lesser fixed-time pregnancy rate compared to Sire 3. No sire differences were observed in AI pregnancy for cows in Selectsynch-CIDR group. In conclusion, evidence in this study suggest that there are differences in sire fertility when they were used in fixed-time AI protocols, possibly due to the sire differences in sperm capacitation process. Further studies are needed to investigate association of the sire differences in fixed-time AI protocols with sire differences in the sperm capacitation process.

Keywords: Sire fertility; Beef cows; Synchronization; Pregnancy rate

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1. Introduction

The reproductive performance of the individual beef herd is extremely important and plays a major role in its financial success. Currently, most commercial beef cows and a large proportion of purebred beef cows are bred by bulls. To improve genetics within a herd, the use of artificial insemination (AI) utilizing proven purebred bulls is of utmost importance (Barth, 1993). Success with AI has been highly dependent on accurate heat detection, timing of insemination, use of high quality semen, and proper insemination technique. Numerous studies with embryo quality, pregnancy and non-return rate have investigated the optimal time of AI relative to the stage of estrus and concluded that 12–16 h after the onset of estrus is the optimal time for breeding (Schiewe et al., 1987; Pursley et al., 1998; Dalton et al., 2000, 2001; Sartori et al., 2004;). In dairy cattle, Dalton et al. (2001) showed a 98% fertilization rate for 0 h natural service after onset of estrus compared to 67% and 79% for 0 and 24 h for AI after the onset of estrus, respectively. Also in the same study another experiment reported a greater (82%) fertilization rate for 24 h AI compared to 0 h AI (66%). Similar fertilization rates and transferable embryo rates have been reported by Schiewe et al. (1987) in beef cows when AI was performed with high quality semen at 24 h after the onset of estrus compared to AI at 12, 36 and 48 h after onset of estrus. Macmillan and Watson (1975) studied the effects of the time interval from estrus to AI on non-return rates of sires. They have selected groups of sires with different fertility to AI cows at different stages of estrus and concluded that the fertility varied between sires within each estrus to AI interval. The lack of a decline in non-return rate at early insemination among above average fertility sires compared to average and below average fertility sires indicates sire fertility is closely associated with sperm longevity in female reproductive tract. This indicates that fixed-time AI (AI) may magnify the differences in sire fertility due to variation in time from AI to ovulation (DeJarnette et al., 2004). This fertility difference can potentially be utilized to select a specific sire for a particular synchronization program which may result in a higher pregnancy rate.

The objective of the present study was to determine the sire effect on the pregnancy outcome in beef cows synchronized with progesterone based Ovsynch and CO-Synch fixed-time AI protocols.

2. Materials and methods

2.1. Estrous synchronization and insemination

Data used in this study were retrospectively collected from 2004 and 2005 AI breedings that occurred on four Virginia correctional center beef farms. Sires ($N = 3$) with satisfactory semen variables, which had more than 300 fixed-time AI breedings were selected and their breeding data were used for the present study. The cows selected for the analysis were synchronized with progesterone based protocols (Fig. 1). Briefly, Angus crossbred suckled beef cows ($N = 1868$) at four locations were estrous synchronized with 100 μg of gonadotropin releasing hormone (GnRH; Cystorelin®, Merial, Athens, GA, USA) + controlled internal drug release device (CIDR; Eazi-Breed™ CIDR®, Pfizer Animal Health, New York, NY, USA) on day 0, 25 mg of $PGF2_{\alpha}$ (Lutalyse®, Pfizer Animal Health, New York, NY, USA), Kamar device and CIDR device removal on day 7 and received either 100 μg of GnRH 48 h after $PGF2_{\alpha}$ on day 9 (Ovsynch-CIDR), and fixed-time AI 16 h after GnRH on day 10 (65.8 ± 2.3 from $PGF2_{\alpha}$) or 100 μg of GnRH on day 10 (CO-Synch-CIDR) at the time of AI (63.2 ± 4.2 from $PGF2_{\alpha}$). In both groups, cows that showed estrus by exhibiting activated Kamar devise before 1500 h on day 9 were designated to