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Abstract

Three trials were conducted in the spring of 1985 to evaluate the effectiveness of MGA feeding and Prostaglandin (PGF) injection on estrus induction and synchronization. Trials 1 and 2 were both done on a Kansas ranch and involved 70 heifers and 86 cows, respectively. In both trials, all cycling and non-cycling females were fed MGA (7 days in trial 1, 9 days in trial 2) and half of the cows and heifers received a PGF injection. The estrus response was higher (P<.0l) for the cycling heifers with the combination treatment. Both treatments resulted in similar first service conception rates and both were effective in inducing estrus in noncycling heifers. Only a small percentage of the cows in trial 2 were cycling prior to the treatments and only a small percentage of the non-cycling cows responded to the MGA. In trial 3, half of the cycling heifers were fed MGA for 7 days and PGF was injected on day 7. Response to synchronization peaked 96 to 120 hr following MGA withdrawal. Among F1 Angus X Hereford heifers, the MGA-PGF treatment reduced (P<.0l) first service conception rates as compared to controls (55 vs 80%), although a reduction was not seen with F Brahman X Hereford heifers. Conversely, 45-day pregnancy rates tended to be higher among both groups of synchronized heifers (P>.05). The MGA treatment also initiated cyclicity in prepuberal females of both crosses.

Keywords

Cattlemen's Day, 1986; Kansas Agricultural Experiment Station contribution; no. 86-320-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 494; Beef; MGA; PGF; Estrus; Synchronization

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Effects of MGA[1] and PGF on Estrus Induction and Synchronization in Cows and Heifers[2]

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Summary

Three trials were conducted in the spring of 1985 to evaluate the effectiveness of MGA feeding and Prostaglandin (PGF) injection on estrus induction and synchronization. Trials 1 and 2 were both done on a Kansas ranch and involved 70 heifers and 86 cows, respectively. In both trials, all cycling and non-cycling females were fed MGA (7 days in trial 1, 9 days in trial 2) and half of the cows and heifers received a PGF injection. The estrus response was higher ($P<.01$) for the cycling heifers with the combination treatment. Both treatments resulted in similar first service conception rates and both were effective in inducing estrus in noncycling heifers. Only a small percentage of the cows in trial 2 were cycling prior to the treatments and only a small percentage of the non-cycling cows responded to the MGA.

In trial 3, half of the cycling heifers were fed MGA for 7 days and PGF was injected on day 7. Response to synchronization peaked 96 to 120 hr following MGA withdrawal. Among F_1 Angus X Hereford heifers, the MGA-PGF treatment reduced ($P<.01$) first service conception rates as compared to controls (55 vs 80%), although a reduction was not seen with F_1 Brahman X Hereford heifers. Conversely, 45-day pregnancy rates tended to be higher among both groups of synchronized heifers ($P>.05$). The MGA treatment also initiated cyclicity in prepuberal females of both crosses.

Introduction

Estrus synchronization increases the number of females showing heat within a short time span, thus making artificial insemination more practical. Synchronization also contributes to older and heavier calves at weaning and allows genetic improvement through the use of AI sires. However, most available synchronization products are costly, they do not work on non-cycling females, and they require large amounts of labor. Because of this, there has been renewed interest in using Melengestrol Acetate (MGA) to synchronize estrus in breeding cattle. MGA is a widely available oral progestin that has traditionally been used for suppressing estrus and increasing rate and efficiency of gain in feedlot heifers. Because MGA is inexpensive (2 to 3¢ per day), easy to administer, and effective in some non-cycling females, it appears to be a practical way to synchronize heat.

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[1] MGA is a progestational steroid that is approved for use in rations for feedlot heifers and is marketed by the Upjohn Company.

[2] Sincere appreciation is expressed to Joe Thielen, Dorrance, Kansas for providing cattle, facilities, and management for Trials 1 and 2.

[3] Fort Hays Branch Experiment Station.

We conducted three trials to determine the effectiveness of short duration MGA feeding combined with Prostaglandin (PGF) injection for estrus synchronization, to compare conception rates of synchronized vs. control heifers and to determine estrus response and subsequent conception rate following MGA feeding in non-cycling heifers.

Experimental Procedures

Trial 1: The objective was to compare the effect of MGA alone (MGA) or MGA + PGF (MGA-PGF) on rates of estrus synchronization and fertility of cycling and non-cycling heifers. The PGF injection (2 ml Bovilene®[4]) was given on the last day of MGA feeding. Reproductive status (cycling vs non-cycling) of the 70 crossbred heifers was determined by serum progesterone analysis of blood samples taken 10 days before and on the first day of treatment.

Heifers with less than 1 ng/ml serum progesterone at both bleedings were considered non-cycling. MGA was fed for 7 days to both groups at 0.5 mg per head daily, incorporated into 1 lb of ground milo.

A 6-day AI breeding period was initiated the day after the last MGA feeding and was followed by a 40 day clean-up with bulls. Heifers were heat-checked three times daily and those detected in estrus were inseminated approximately 12 hours later. Pregnancy was determined by rectal palpation.

Trial 2: The objective of this study was the same as in trial 1, except 86 crossbred nursing cows were utilized. The reproductive status was determined as outlined in trial 1. The MGA-feeding period was 9 days for both MGA and MGA-PGF groups. A daily dosage of 0.75 mg MGA per head was incorporated into 1.5 lb of range cubes and fed on pasture.

The cows averaged 66 days postpartum on the first day of MGA feeding. A 6-day AI breeding period was initiated after MGA withdrawal, followed by 70 days of clean-up with bulls. Cows were heat-checked three times daily and those detected in estrus were inseminated approximately 12 hours later. Pregnancy was determined by rectal palpation.

Trial 3: A project comparing two different biological types of beef cattle was initiated during the fall of 1984 by the Fort Hays Experiment Station. The project involved 148 F_1 Angus x Hereford heifers and 148 F_1 Brahman x Hereford heifers obtained from 17 ranches in Kansas, Colorado and Oklahoma. All heifers were known F_1's with recorded birth dates.

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[4]Bovilene® is a prostaglandin analog manufactured by Syntex Animal Health Inc. which provided partial financial assistance for this trial.

Androgenized cows or marker bulls were used to aid in estrus detection. Criteria used to determine puberty were:

1) marked by a bull or androgenized cow, or seen in standing heat

2) presence of a palpable corpus luteum

3) progesterone levels $\geq$ 1 ng/ml of serum 6 to 10 days after observed estrus

At the start of the spring breeding season, heifers were classed as cycling or prepuberal based on the above criteria. All cycling heifers were randomly assigned to control or synchronized groups. Synchronized heifers were separated from controls and fed 0.5 mg MGA in 1 lb milo daily for 7 days. On day 7, all heifers in the synchronized group received 2 ml of Bovilene®. Heifers classed as prepuberal were treated the same as synchronized heifers, but received no Bovilene®. During the AI period, heifers were observed continuously during the daylight hours to detect visible signs of estrus and the use of marker bulls was continued. Heifers were inseminated 12 hours following the onset of estrus by one of two AI technicians using semen from a single sire.

Results and Discussion

Trial 1: Results shown in Table 14.1 indicate that the estrus response was higher (P<.05) and the degree of synchronization tended to be greater for the MGA-PGF group than the MGA-only group. Conception rates were similar between the groups. Both treatments were successful in inducing estrus in non-cycling heifers. Overall pregnancy rate was higher in non-cycling MGA-PGF heifers than in non-cycling MGA heifers.

Table 14.1. Reproductive Response of Cycling and Non-cycling Heifers Treated with MGA only or MGA and PGF

Treatment	Cycling Status	No. Heifers, %	Estrus Response[1]	Degree of Synchrony[2]	1st Service Conception Rate[3]	Overall Pregnancy Rate[4]
MGA	Yes	28/35=80%	12/28=46%[a]	4/13=31%	8/13=62%	24/28=86%
	No	7/35=20%	4/7=57%	2/4=50%	3/4=75%	3/7=43%
MGA-PGF	Yes	25/35=71%	21/25=84%[b]	11/21=52%	13/21=62%	22/25=88%
	No	10/35=29%	7/10=70%	3/7=43%	5/7=71%	7/9=78%
Overall	Yes	53/70=76%	34/53=64%	15/34=44%	21/34=62%	46/53=87%
	No	17/70=24%	11/17=65%	5/11=45%	8/11=73%	10/16=63%

[ab]Values with different superscripts within a column differ (P<.01).

[1]Estrus Response = Females in estrus/number treated

[2]Degree of Synchrony = Number in estrus in peak 24/hr/number in estrus

[3]Conception rate = Conceived to AI/number inseminated.

[4]Overall Pregnancy Rate= Number conceived during the total breeding season/number treated

Trial 2: The results shown in Table 14.2 indicate that relatively few of the cows in either group were cycling prior to treatment. Although there were no significant differences for any of the variables among treatment groups, the average days postpartum were higher for the cycling cows in both groups compared to non-cycling cows. A low percentage of the non-cycling cows responded to either treatment.

The poor results in this trial might have related to inadequate MGA dosage, since daily cube consumption by the cows was irregular because of ready access to lush spring forage.

Table 14.2. Reproductive Response of Cycling and Non-cycling Cows Treated with MGA only or MGA and PGF

Treatment	Cycling Status	No. Cows, %	Days postpartum 5/18/85	Estrus Response[1]	Degree of Synchrony[2]	1st Service Conception Rate[3]	Overall Pregnancy Rate[4]
MGA	Yes	9/49=18%	71.3	6/9=67%	2/6=33%	2/6=33%	9/9=100%
	No	40/49=82%	63.2	9/40=23%	3/9=33%	3/9=33%	35/4=88%
MGA-PGF	Yes	11/37=30%	68.9	9/11=82%	5/9=56%	4/9=44%	11/11=100%
	No	26/37=70%	63.8	6/26=23%	2/6=33%	1/6=17%	24/26=92%
Overall	Yes	20/86=23%	70.0	15/20=75%	7/15=47%	6/15=40%	20/20=100%
	No	66/86=77%	63.4	15/66=23%	5/15=33%	4/15=27%	59/66=89%

[1,2,3,4] - Same as Table 1.

Trial 3: First service conception rate of the synchronized Angus X Hereford heifers was lower ($P<.01$) than that of controls, however, this difference disappeared at second service (Table 14.3). There was no significant reduction in first service conception rate because of synchronization among the F_1 Brahman x Hereford heifers, but, in general, their first service conception rates were low.

A trend was seen in both synchronized breed groups toward higher pregnancy rates than the controls at the end of the 45-day breeding period. This difference, although not statistically significant, probably occurred because the synchronized heifers had three chances at AI vs. two for the controls.

The prepuberal or non-cycling heifers' response to MGA is also shown in Table 14.3. Response to MGA, as measured by observable estrus, was favorable; 60 to 70% cycled. In addition, their pregnancy rates were comparable to cycling heifers over the 45-day AI period.

Table 14.3. Effect of MGA on Reproductive Parameters of Heifers

Angus X Hereford F_1 Females				Conception Rate[2]						Pregnancy Rate[3]	
				1st Service		Overall 1st Service[6]		45 Day		45 Day	
Treatment[4]	Exposed (No.)	Estrus (No.)	Response[5] (%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
Control	69	—	—	51/64[a]	79.7	—	—	56/64[a]	87.5	56/69[a]	81.2
Synchronized	68	62/68	91.2	34/62[b]	54.8	35/64	54.6	59/64[a]	92.2	59/68[a]	86.8
Prepuberal	11	7/11	63.6	3/7[b]	42.9	4/9	44.4	9/9[a]	100.0	9/11[a]	81.8

Brahman X Hereford F_1 Females				Conception Rate						Pregnancy Rate	
				1st Service		Overall 1st Service		45 Day		45 Day	
Treatment[4]	Exposed (No.)	Estrus (No.)	Response (%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
Control	47	—	—	8/42[a]	19.0	—	—	28/42[a]	66.7	26/47[a]	59.6
Synchronized	50	34/50	68.0	4/34[b]	11.7	9/44	20.1	36/44[a]	81.8	36/50[a]	72.0
Prepuberal	49	33/49	67.3	3/33[a]	9.1	7/48	14.6	26/48[a]	54.2	26/49[a]	53.1

[1]Breeding season began May 12, 1985. Results based on rectal palpation on August 30, 1985.

[2]Conception rate = Number pregnant/number inseminated

[3]Pregnancy rate = Number pregnant/number inseminated

[4]Treatment groups= Control = cycling heifers inseminated 12 hours following onset of spontaneous estrus.
Synchronized = cycling heifers fed .5 mg MGA/hd/d for 7 days, followed by 2 ml Bovilene® on day 7.
Prepuberal = noncycling heifers fed .5 mg MGA/hd/d for 7 days.

[5]Estrus response = Number of heifers observed in estrus within 120 hours after MGA withdrawal/number treated. (pertains only to sychronized and prepuberal treatment groups)

[6]Includes heifers conceiving to a first insemination that failed to exhibit estrus within the synchronized time period.

[a,b]Numbers with different superscripts differ ($P<.05$).