

FORAGE AND BEEF CATTLE RESEARCH

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EXTENDING THE DAYLENGTH BY ARTIFICIAL LIGHT AFFECTS REPRODUCTION IN FALL BRED BRAHMAN COWS

R. C. Rhodes III and R. D. Randel

SUMMARY

Adjusting the length of day to 14 hours (natural light + artificial light = 14 hours) during the fall breeding season of Brahman cows has the potential to increase their reproductive performance. Cows that were housed in barns with lights had both greater pregnancy and conception rates than cows that received only the natural light. Additionally, cows that received extra light during the fall had less silent heats (no observed standing heat) than those exposed to only natural light.

INTRODUCTION AND OBJECTIVES

The length of light has been shown to play an important role in the reproductive performance of farm animals. Generally, as the days get shorter (as in the fall), more problems are encountered by the rancher trying to get his Brahman cattle pregnant. The main causes for the drop in reproductive performance in the fall are thought to be due to: (1) decrease or total lack of an observed heat and/or (2) lack of the shedding of an egg from the ovary (ovulation). If the bull or A.I. technician fails to observe the cow in heat, there is no chance she will get pregnant. Also, even if the cow is observed in heat and is bred, if she does not shed an egg that can be fertilized, there is no chance she will get pregnant. Further, several scientific papers report that Brahman cows show marked variation of reproductive performance with respect to season.

Therefore, the objectives of this trial were to investigate the effect of increasing the daylength to 14 hours during the fall breeding season of Brahman cows. The measurements taken during this trial were: (1) number of animals exhibiting normal reproductive cycles, (2) pregnancy rates and (3) conception rates.

RATIONALE

Brahman cattle (which appear to be long day breeders) show a marked variation in reproduction during the different seasons. The fall breeding season in Brahman cattle is usually less successful than a spring breeding season (using either natural service or A.I.). Since the success of a breeding season partially determines the net dollar return to the rancher it is obvious that the more successful the breeding season, the greater the dollar return. Therefore, exposing Brahman cattle to additional light during the fall breeding season could potentially increase the reproductive performance of Brahman cattle. This would be done by providing the cow with the "illusion" that she is being maintained in a long day situation.

MATERIALS AND METHODS

A field trial was conducted at the McKellar Ranch, Mt. Pleasant, Texas during the fall of 1978. Fifty lactating Red Brahman cows and 87 dry Red Brahman cows were assigned to either a control or light-treated group. Twenty-six lactating cows and 52 dry cows were placed in the control group while 24 lactating cows and 35 dry cows were placed in the light treated group. Cows in the control treatment were exposed to the natural daylength with covered shelters available at night. Cows in the light treatment were exposed to the natural light by day. At 5:00 p.m. the light-treated cows were "called up" and were housed in a barn with artificial lighting. The additional lighting increased the daylight length to 14 hours. Artificial lighting was provided by evenly spaced strings of 200 watt incandescent lights such that a newspaper could be easily read anywhere in the barn. (Note: It appears that any source of lighting, that is, florescent, mercury vapor, etc., would be just as effective as the incandescent lights in this study). The lights were turned off and on by a heavy duty poultry house timer with multiple time stops. All cows were fed adequate diets in order to maintain good body condition. The cows were kept in the treatment groups for two weeks before the 45 day artificial insemination season began. All cows were palpated before the breeding season and midway through the breeding season in order to assess reproductive function. Forty-five days after the end of the breeding season

all cows bred were palpated for pregnancy. When the experienced A.I. technician observed a cow standing for mount by an infertile heat check bull or another cow, the cow was considered in heat and bred using frozen semen 8 hours later.

RESULTS

The light-treatment did not appear to affect the numbers of animals exhibiting normal reproductive function as determined by palpation of the reproductive tract (Table 1). Results showed that 79.7% of the light treated animals and 82.0% of the control animals had normal reproductive structures indicative of normal estrous cycle activity. However, more animals in the control treatment (17.9%) had silent heat periods than those in the light treatment (5.1%, table 2). This was assessed by palpation of a corpus luteum (the structure that develops on the ovary at the egg rupture site and maintains pregnancy) without observation of standing heat. The pregnancy rates (pregnancies/all cows) and conception rates (pregnancies/all cows bred at) are shown in table 3. Generally, pregnancy and conception rates were higher in the light exposed dry and lactating cow groups than those exposed to only natural light. Overall, the light treatment appeared to increase pregnancy rates by 6.2% and conception rates by 12.9 percent.

Therefore, adding light during the fall breeding season of Brahman cows has the potential to increase reproductive capabilities and hence, economic return. The amount of light needed per day (natural + artificial) appears to be at least 14 hours/day but not more than 20 hours/day. The artificial light can be from any illuminative source (incandescent, florescent, mercury vapor, etc.). However, the light must be bright enough to read a newspaper easily anywhere in the light treatment pen. It should be noted that the results of this trial are preliminary findings and further studies need to be undertaken. At present, this type trial is being repeated at several ranch locations and data is, at the time of this printing, being analyzed.

Table 1. The number of animals exhibiting and not exhibiting reproductive cyclicity in the control and light treated groups.

Treatment	Production status	# Animals	Reproductive status			
			# Cycling (%)		# Not cycling (%)	
Light	Dry	35	28 (80.0)		7 (20.0)	
	Lactating	24	19 (79.1)		5 (20.8)	
Control	Dry	52	45 (86.5)		7 (13.4)	
	Lactating	26	19 (73.0)		7 (26.9)	
Light		59	47 (79.7)		12 (21.0)	
Control		78	64 (82.0)		14 (17.9)	

Table 2. The number of animals that ovulated^a but did not exhibit estrus.

Treatment	Production status	# Animals	# Animals ovulating but not exhibiting estrus (%)	
Light	Dry	35	3	(8.6)
	Lactating	24	0	(0.0)
Control	Dry	52	9	(17.3)
	Lactating	26	5	(19.2)
Light		59	3	(5.1)
Control		78	14	(17.9)

^aThis was assessed by rectal palpation of a CL and no A.I. estrus date.

Table 3. The pregnancy^a and conception^a rates in the control and light treated groups.

Treatment	Production status	# Animals	Reproductive Parameters			
			# Pregnancies (%)	# Animals A.I.'d	Conception Rate %	
Light	Dry	33	14 (42.4)	24	58.8	
	Lactating	24	9 (37.5)	19	47.4	
Control	Dry	52	18 (34.6)	45	40.0	
	Lactating	26	8 (30.8)	19	42.1	
Light		57	23 (40.4)	43	53.5	
Control		78	26 (34.2)	64	40.6	

^aThis was by palpation at 45 days following the end of the trial.