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DRYLOT SHRINK OF CATTLE GRAZING SEMIDESERT RANGELAND DURING FEBRUARY, MAY, JULY, AND OCTOBER[1]

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Introduction

Selling cattle by liveweight is the preferred method for economic remuneration (Ares, 1942; Hall, 1977). As a research tool, liveweight is used extensively by scientists to describe treatment effects (Morris, 1967). Bone, tissue, pelage, various fluids, and digestive tract contents (fill) combine to give liveweight. Even though bone, tissue, and pelage vary between animals (Andersson et al., 1979; Murray, 1980), fill and fluids are the most variable components. Fill and fluids can change diurnally in response to forage quantity (Currie, 1975), forage quality (Ward, 1975), physiological status (Allen, 1946), handling method (Brownson, 1973), animal behavior (Arnold and Dudzinski, 1978) and weather (Fuquay, 1981), besides the interaction of one or more of these factors operating simultaneously (Hughes, 1976).

There is not unanimous agreement on the best method to reduce variability in liveweight between animals due to differences in fill and fluids. Matches (1981) advocates a dry lot shrink when liveweights are used to evaluate short-term grazing experiments. Harris et al. (1967) on the other hand, indicate that gathering animals prior to morning grazing followed immediately by weighing will give precise liveweights. Time of day when weighing is done is important if variability in fill and fluids is to be kept to a minimum. Water intake for example can occur any time during a 24 hour period as documented by Low et al. (1981).

This study was conducted to evaluate the liveweight profile resulting from a drylot shrink of cattle grazing semiarid rangeland during February, May, July, and October.

Materials and Methods

Forty-one Hereford and Hereford X Santa Gertrudis cattle representing three, four, and five year old animals were used to evaluate the liveweight profile during a dry lot shrink in February, May, July, and October 1981. The grazing cattle had access to 3,320 ha of unimproved semidesert mesquite (Prosopis juliflora var. glandulosa) dune rangeland on the Jornada Experimental Range located 37 km north of Las Cruces, New Mexico.

All animals were exposed to Brangus bulls during 1980. The three year old animals were to calve for the first time in 1981. A rectal palpation during the fall of 1980 indicated all but three of the 41 head were pregnant. Calving began after February 6 and continued through June 26. Between February and May, one of the four year old crossbred cows died, thereby reducing the population to 40 head.

Variability in liveweight resulting from different drinking patterns, was reduced during each of the four periods of drylot shrink by trapping animals (Anderson and Smith, 1980) into a pen without water. This pen was inside a corral in which well water for the grazing livestock, was located. Each period of shrink did not exceed 71 hrs. During this time the animals were weighed five times. On day one, the first animal weight and time was recorded automatically when the animals crossed an electronic identification-weighing system (Anderson et al., 1981) as they entered the corral.

The cattle were part of an ongoing study in which animal travel was being monitored using digital pedometers (Anderson and Kothmann, 1977). In order to calibrate the pedometer to a specific animal, the animals were walked (trailed) 1.2 km on day two of the shrink. This procedure was repeated during each of the four months. The second liveweight was taken immediately before walking the animals. The third weighing took place immediately after the walk. The animals were then moved back to the dry pen for a second overnight period of shrink. The following morning all animals were weighed out of the dry pen for a fourth shrunk weight and then released into the pen where they were allowed to drink water ad libitum. After all animals had been given an ample opportunity to drink, a fifth and final weight was taken; and the cattle were released back into the pasture.

No calves had been born prior to the February drylot shrink. However, during the following three periods, calves were allowed access to their dams throughout the drylot shrink to minimize stress to both cow and calf. Therefore, weight loss in the lactating dams represented the effect of suckling in addition to a reduction in fill and other fluids.

Analysis of the liveweight data was carried out in a factorial randomized complete block design. However, the time at which an animal was initially weighed as she passed through the electronic system and was trapped, represented an uncontrolled factor. To minimize the effect of outliers, the nonparametric Kruskal-Wallis and Mann-Whitney tests were used to evaluate main effects at the $\alpha=0.05$ significance level (Conover, 1971; Hald, 1952). The Kruskal-Wallis test was used to compare more than two treatments while the Mann-Whitney test was used when only two treatments were compared. Multiple comparisons were made by the method recommended by Lin and Haseman (1978). The usual analysis of covariance technique was not suitable because the sample size

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within cells (age, breed, and shrink time) was unbalanced.

Results and Discussion

A straight line was fitted to the data for each cow. When individual slopes were compared, shrink was not significantly associated with either breed or age of the cattle used in this study. The rate of weight loss was not uniformly influenced by initial liveweight throughout the year. Initial liveweights were ranked and individual slopes of animals having weights above the median were compared to animals having liveweights below the median. The data indicated that heavier cattle lost weight at a significantly faster rate in February and July when compared to lighter cattle. However, no trend was found on the individual slopes for the May and October shrink.

The animals lost significantly faster before the 1.2 km walk than after the walk, except in February when there was no significant difference (Table 1). Low ambient air temperatures (Table 2), a dormant standing crop, and the physiological state of the cattle were responsible for the liveweight profile obtained in February. Weight loss was not linear over time since the weight loss before and during the walk was significantly greater than after the walk, except in February when weight loss was greater during the walk. In February weight loss during the walk was greater than before the walk; this was not true for the other three months. Four weight loss curves, $y = a(1-e^{-bx})$, are shown in Figure 1 for February, May, July, and October; they seemed to fit the data well and appeared to be theoretically plausible (passed through the origin, were smooth and monotonic, and possessed a horizontal asymptote possibly corresponding to carcass weight).

Shrink and animal behavior appeared to be dynamic throughout the year (Table 2). The high ambient air temperatures characteristic of July on the Jornada Experimental Range may have been partially responsible for the animals' early, frequent behavior pattern to attempt to water when compared to the other three months. The highest rate of weight loss (-1.45 kg/hr) occurred in July, the period when the perennial standing crop, mesa dropseed (*Sporobolus flexuosus*), was actively growing and there was a physiological requirement for milk production. Likewise the lowest rate of weight loss (-0.54 kg/hr) was recorded during February when the standing crop was dormant, no calves had been born, and ambient air temperatures were the lowest.

The four time periods differed significantly with respect to rate of weight loss. The average (pooled slope) weight losses were -0.54 kg/hr for February, -0.81 kg/hr for May, -1.45 kg/hr for July, and -1.10 kg/hr for October. These trends agree with the data of Wagnon et al. (1962). In the case of July, the slopes of all the animals could be considered equal. During October the slopes were equal if one high value was removed. For February and May the slopes were not equal but the distribution of the slopes was symetric so that the average slope summarized the data well.

Water intake following each shrink was not significantly influenced by breed, age, initial liveweight or length of time during which the animals were given ad libitum access to water. The difference between mean liveweight at the end of the shrink and mean liveweight after the animals had been given access to water, was 24.2, 48.0, 67.4, and 50.0 kg during February, May, July and October, respectively. The increase in weight after water intake returned the individual animal's liveweight to a value statistically equal to its initial liveweight recorded on day one.

Differences in pre-calving and post calving shrink were not investigated because of incomplete data.

Summary

Obtaining accurate liveweight of grazing cattle is difficult because the rate of liveweight loss during a drylot shrink is not constant between animals or seasons. If a drylot shrink is given to cattle before they are to be weighed, the season of the year must be considered when interpreting the results. The highest rates of weight loss occurred during high ambient air temperatures which characterize the active summer growth of the perennial standing crop.

The method of handling livestock may affect shrink; therefore, trailing of livestock should be minimized before weighing to increase the accuracy of liveweight data.

Since the rate of weight loss varies throughout the year, a uniform number of hours of drylot shrink appeared to be an inappropriate method of improving the accuracy of liveweight measurements taken on grazing cattle.

Water consumption after a drylot shrink differed between seasons and appeared to replace fill and fluid losses which took place when a drylot shrink did not exceed 71 hrs.

Based on our data, if liveweight is to be an accurate indicator of production, periods of drylot shrink should be longer when the major forage species are actively growing, compared to periods of dormancy. There is a need for further research into quantifying the proper length of time that feed and water should be withheld from cattle to improve the precision and accuracy of liveweight data within and between seasons.

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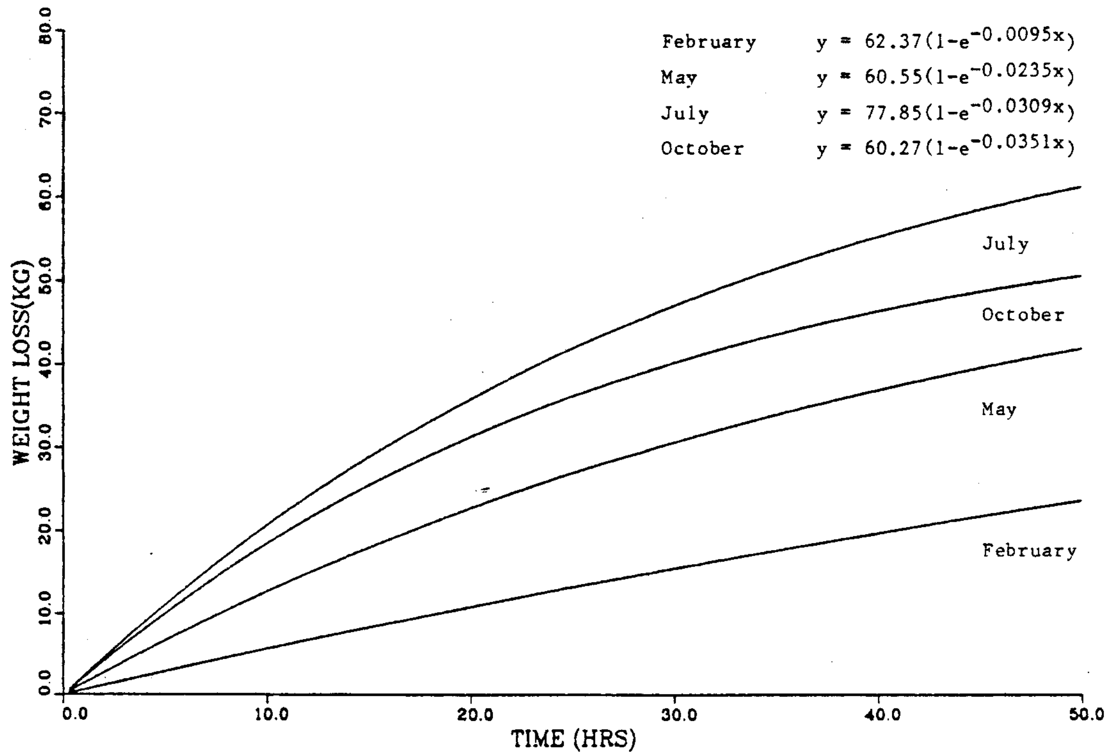

Figure 1. Estimated weight loss curves of cattle, grazing semidesert range during a drylot shrink in February, May, July, and October 1981 on the Jornada Experimental Range.

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Table 1. Mean weight loss (kg/hr) before, during, and after a 1.2 km walk in February, May, July, and October 1981.

Month	Weight loss[1]		
	Before	During	After
February	-0.35	-2.41	-0.29
May	-2.03	-2.04	-0.62
July	-2.28	-2.95	-0.78
October	-1.70	-1.59	-0.47

[1]The maximum hours elapsed before, during, and after the walks were 24, 7, and 40, respectively.

Table 2. The mean time interval and standard deviation (hrs) and time of day, for grazing livestock to enter a pen, with water, during February, May, July, and October 1981.

Month	Hours[1]		Ambient air temperature[2]	
	Frequency to the pen	Time of day	Minimum (C)	Maximum (C)
February	45.4 ± 2.5	1300	-6.5	17.7
May	47.4 ± 1.7	1100	9.2	28.7
July	34.4 ± 3.3	0600	18.0	35.4
October	46.8 ± 2.0	0800	5.6	24.7

[1]Values are modal frequency and modal hours given in military time.

[2]Mean monthly maximum and minimum ambient air temperatures (C) were obtained at Jornada Experimental Range Headquarters.