Utilizing irrigated pasture for beef heifers to be bred as yearlings

John L. Hull ■ Charles A. Raguse

Although irrigated pasture is a good diet, energy supplementation will increase the average daily gain of growing heifers after weaning.

Heifers prefer molasses supplement to pasture.

Breeding beef heifers as yearlings to calve at 2 years old has been an accepted practice for many years (see UC Leaflet 2309, "Breeding Yearling Beef Heifers").

In the system of fall calving (October-November), used in annual grassland range areas of California, 8-month weaning weights of heifer calves from predominantly English breeds range from 175 to 200 kg. For heifers to reach an ideal weight of 275 kg or more by 14 to 15 months old, the average daily gain required is more than .5 kg per head per day. Because calves are weaned at the end of the spring range forage season, heavy supplementation on the residual dry forage or transfer to irrigated pasture is usually necessary to obtain the desired growth rate.

Many studies have shown irrigated pasture to be a good growing ration. Others have shown better results with grain used to supplement irrigated pasture. In preliminary trials at Davis, beef calves on irrigated pasture barley, supplemented at the rate of 20 percent of their expected total dry matter intake (approximately 1 kg/day), did not improve gains significantly, but supplementation did permit a marked increase in stocking rate.

Additional irrigated pasture studies have been conducted at the University of California Sierra Foothill Range Field Station, Browns Valley, California, during four grazing seasons with predominantly Hereford replacement heifers (7 to 8 months old). The pasture consisted of 15 percent clover, 74 percent grass, and 11 percent other species. A two-field system of grazing management was used; the cattle were rotated weekly.

Grazing season I

Animals in four supplementation treatments were fed ground barley at the rate of .8 percent of live body weight (LBW). The treatments were: (1) none; (2) three times per week (MWF); (3) fed weekly—intake limited by salt to be consumed over 7 days; and (4) same amount as treatments 2 and 3 would consume in 1 month but hand fed for consumption in 2 weeks. The amount fed was adjusted monthly when the cattle were weighed. Stocking rates, based on previous experimental data from the same pastures, were 12.4 and 9.9 heifers per ha. for the supplemented and nonsupplemented treatments, respectively.

Grazing season II

All treatments and supplements were the same as in grazing season I, except that the ground barley was fed at the rate of 1.0 percent LBW and the stocking rate was 9.9 and 7.4 heifers per ha. for the supplemented and nonsupplemented treatments, respectively.

Grazing season III

The supplement treatments were: (1) none; (2) same as the previous season's treatment 4 (*i.e.*, animals were fed a month's amount of supplement within the first 2 weeks); and (3) same amount of supplement as treatment 2 but fed only during the trial's last 56 days. Supplements were fed at the rate of 1.0 percent of LBW, adjusted monthly, using rolled barley. All treatments were stocked with 9.9 heifers per ha.

Grazing season IV

Supplements were fed using the method described in III. The treatments were: (1) none; (2) 1 percent of LBW; (3) 1 1/4 percent LBW; (4) 1 1/2 percent LBW; and (5) cane molasses free choice (molasses adjusted to 10 percent crude protein by addition of urea). Supplements were adjusted monthly and rolled barley was used. Irrigated pastures were stocked by treatment as follows: (1) 7.4, (2) 9.9, (3) 9.9, (4) 12.3, and (5) 9.6 animals per ha.

During the third and fourth grazing seasons pasture height, botanical composition, dry matter, digestibility of the ingested forage, and 24-hour behavioral observation data were obtained.

The results of barley supplementation during the grazing season showed a significantly increased average daily gain (ADG) of between 10 and 20 percent. In most cases, however, the feeding of the barley supplement, although significantly increasing ADG, did not give the desired level of gain, at least .5 kg ADG.

Supplement fed heavily for 2 weeks, followed by no grain for 2 weeks, significantly increased ADG over the other supplemental methods within years. Perhaps, with this method of supplementation, which supplied extra energy (barley), a high level of forage intake was maintained, and, thus, a higher ADG.

The heifers supplemented only during the last half of the experimental grazing period did not gain as rapidly as those on full supplementation. It took until approximately halfway into their 56-day supplemental period before consumption of the supplement stabilized. From this time on, although more supplement per day was offered, gains were only equal to the other treatments. The basis for this treatment, where supplementation was initiated midway through the grazing season, was that the heifers would be larger and thus would consume more efficiently more dry matter. Slow forage growth later in the season would then be offset by supplement, thus maintaining a high ADG. This, however, did not occur. It also appeared that increasing the rate of supplementation from .8 to 1.0 or 1.25 percent of body weight was beneficial, as an increase in daily gain of .12 kg over corresponding previous treatments was obtained.

Forage heights (7 to 15 cm) and species composition showed that adequate forage was available during the grazing season.

A comparison of the digestibility of the esophageal fistula samples (54 percent digestible organic matter) to known digestibility of alfalfa showed the pasture forage to be equivalent to 90 percent of the energy value of a 21 percent crude fiber alfalfa, indicating that the forage available was of very good quality.

Calculations were based on the California New Energy System, assuming an energy value for the pasture forage of 63 megcal for maintenance and 36 megcal for gain (90 percent of the value of 21 percent CF alfalfa). A daily consumption of 2.2 kg barley, with an ADG of .56 kg, gave a daily intake of 4.5 kg of forage DM for a 220 kg heifer. Assuming the same daily consumption of barley but with an ADG of .75 kg, a heifer would need to consume daily 5.1 kg of forage DM, a 12 percent increase equivalent to adding 1.0 kg of barley daily. This would then give the desired ADG to obtain the 275 kg weight generally accepted as needed by breeding time. Total intake, therefore, is the major factor limiting the performance of the growing heifer.

Behavioral trials were initiated to determine why total intake was not increased when supplements were fed.

The grazing behavior of the supplemented heifers varied considerably from the nonsupplemented. Animals supplemented with barley had a significantly shorter grazing period, with the total feeding time (grazing and eating barley) being shorter than that of the nonsupplemented control animals. Total ruminating time decreased markedly for the supplemented treatments, while idling time increased compared with the control treatment. It is generally considered that ruminating time is related to the amount of fiber in the diet; if so, this indicated a much lower intake of forage for the supple-

mented treatments. Barley consumption tended to occur at the two peak times of grazing, dawn and dusk, with little consumption during the night. This behavior suggested that the supplemented animals did not eat barley in addition to grazing, but instead ate supplements at a time normally spent grazing.

The use of molasses-urea mix as a pasture supplement gave poor results. This was unexpected. However, observations of behavior indicated that the heifers spent a large amount of normal grazing time licking the wheel of the barrel-wheel type molasses feeder used. These heifers also had a very definite grazing-eating supplement period (see figure) compared with other treatments. Molasses-urea, as a supplement to young cattle grazing irrigated pasture, cannot be recommended on the basis of our studies as, apparently, total intake is decreased because of the cattle's preference for molasses over irrigated forage.

As the heifers used in this study were from University herds, performance data before and after the grazing season were available. The heifers were allotted at random according to their pregrazing trial ADG, *i.e.*, on the basis of above or below average ADG from birth to weaning. These data showed that 80 percent of the heifers with above average ADG at weaning time and supplemented during the pasture season made sufficient weight gains to reach a minimum of 275 kg by breeding season, 60 days following the end of the pasture trial. This was comparable to only 60 percent of the heifers of average or below average ADG up to weaning.

From these and other studies, it is evident that although supplementation of growing heifers may be economically marginal when interpreted solely on the basis of weight gains, other considerations such as presupplemental ADG, increased stocking rate of irrigated pasture, and specific breeding weight and time goals would determine the most appropriate management practice to be used during the growing phase.

The data reported here indicate that although irrigated pasture is a very good diet, energy supplementation will increase ADG; however, an optimal system of supplementation, such as feeding heavily for 2 weeks followed by no grain for 2 weeks, should be employed. The increased gain from supplementation is partially offset by decreased forage utilization and season-long maintenance of forage quality.

In conclusion, phases of management, genetics, and nutrition must be considered if rearing replacement heifers for early breeding is to be successful. If replacement heifers are to be managed for early breeding (bred as yearlings to calve as 2-year-olds) a good preweaning diet is necessary to insure optimal weaning weights. Only the heifers exhibiting above average ADG at weaning should be selected for replacements and fed a diet for continued rapid growth, if they are to reach 275 kg by 14 to 15 months old.

J. L. Hull is Specialist, Department of Animal Science, and C. A. Raguse is Associate Professor and Agronomist, Department of Agronomy and Range Science, UC, Davis.

TABLE 1. Results of 112 Day Level of Supplementation Heifer Grazing Trial

Supplement fed, % of LBW	0	1	1¼	1½	Molasses & urea *ad lib**
Animals per ha.	7.4	9.9	9.9	12.3	9.6
Initial weight, kg	190	186	188	192	183
Final weight, kg	237	239	248	250	224
ADG, kg	0.42b†	0.47^{ab}	0.53^{a}	0.51^{a}	0.37^{b}
Supp. per animal per day per kg	0	2.1	2.7	4.0	3.1

*Urea added to give equal N content of barley fed.
†Treatment means having different superscripts differ significantly (P < .05).

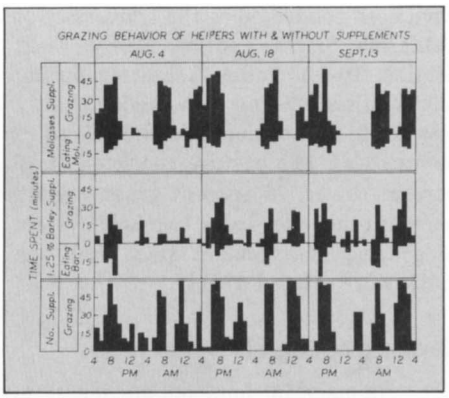

TABLE 2. Influence of Supplementation Method During Three Grazing Seasons on Growth Rate of Weaner Beef Heifers

Method of supplementation													
Treatment	No supplement			Daily			3 x 5 per week			2 week			Last ½
Year	1974	1975	1976	1974	1975	1976	1974	1975	1976	1974	1975	1976	1976 only
Length of trial, day	84	106	112	84	106	—	84	106	—	84	106	112	112
Animals per ha.	9.9	7.4	9.9	12.3	9.9	—	12.3	9.9	—	12.3	9.9	9.9	9.9
Initial wt., kg	172	201	191	170	199	—	173	200	—	178	199	189	189
Final wt., kg	207	233	237	209	243	—	199	237	—	220	247	253	237
ADG, kg	0.30^{b}*	0.30^{b}	0.41^{b}	0.34^{a}	0.41^{a}	—	0.24^{ab}	0.35^{ab}	—	0.39^{a}	0.45^{a}	0.60^{a}	0.43^{b}
Supplement per head per day, kg	—	—	—	1.50	2.23	—	1.50	2.18	—	1.41	2.23	2.18	3.14
Total supplement fed, kg per head	0	0	0	126	236	—	—	—	—	118	236	231	175

*Treatment means having different superscripts differ significantly (P < .05) within years.