lower percentages from roots or leaves. Infested refuse should be removed and burned to kill the microsclerotia, or disposed of in other ways.

As is usually true of programs for the control of crop diseases, a sustained, well-coordinated *combination of practices* is most effective. In the case of *Verticillium* wilt of cotton, grower losses may be reduced by adherence to the basic principles of disease control: (1) Continue to use seed freed of *Verticillium* by acid delinting, or by mercury (Panogen—Ceresan) treatment. (2) Rotate nonsusceptible, irrigated crops with cotton to decrease populations of the fungus already present in infested land. Soil fumigation or deep-inversion plowing offers possible additional means of lowering the inoculum load of microsclerotia in soil. (3) Practice sanitation to avoid the buildup of *Verticillium* in the soil. Avoid adding to the land large populations of the fungus that may be present in diseased cotton refuse.

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Testing effects of LOW- VS. HIGH-LEVEL PROTEIN CONCENTRATE MIXES FOR DAIRY MILK PRODUCTION

S. E. BISHOP · D. L. BATH

IT IS COMMON PRACTICE for dairymen in southern California to feed free-choice alfalfa hay containing 18 to 22% crude protein, supplemented with concentrate mixes containing 14 to 18% crude protein (90% dry matter basis). These rations provide more protein than recommended allowances for even exceptionally high producing cows. Even when part of the alfalfa hay is replaced by corn silage or cereal green chop, recommended allowances for crude protein are exceeded. With feed costs now amounting to about 55% of yearly expenses, and economic conditions demanding increased efficiency, the possibility of using lower-cost concentrate mixes should be considered.

Prices of the more common high-protein feeds used for dairy cattle, such as coconut oil meal and cottonseed meal, are usually higher than those for low-protein grains such as barley and milo which are high in energy. Under these conditions, partial replacement of high-protein feeds with grains will reduce feed costs. If the energy level is not lowered and the protein allowance is fulfilled, milk and milk fat production levels should be maintained. A feeding trial was conducted at La Sierra College Dairy, Riverside County, to evaluate possibilities for commercial application of the low-protein concept.

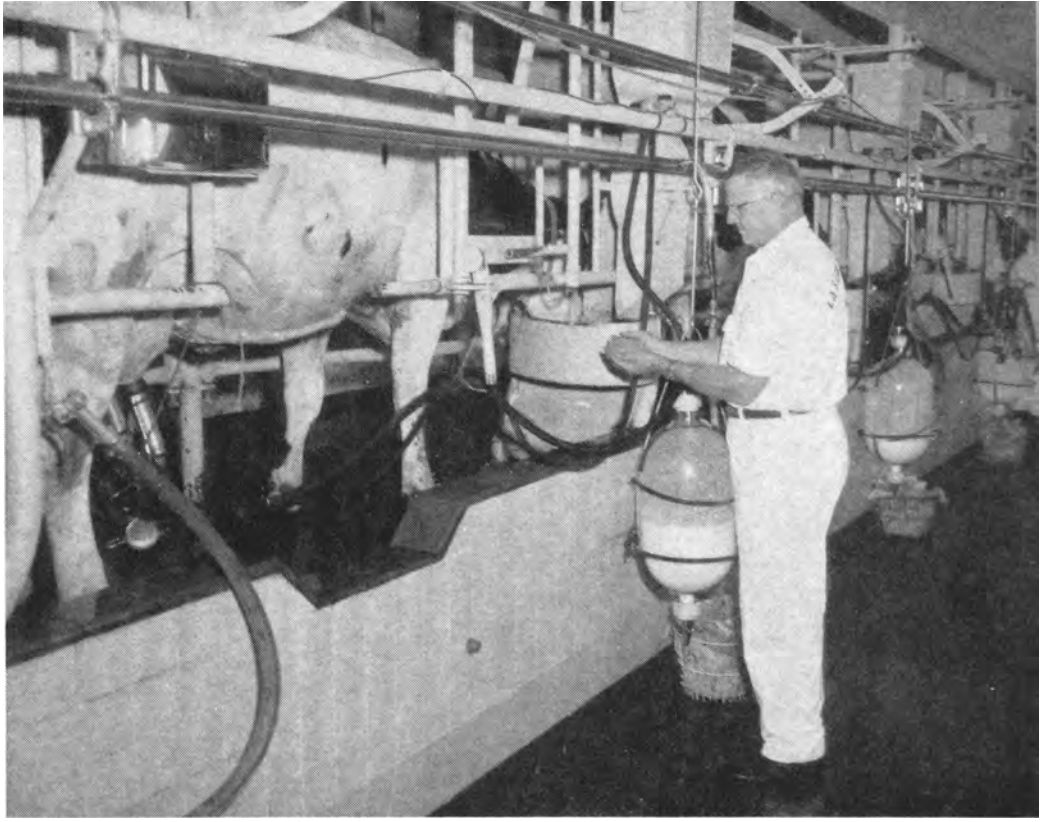
The milking herd was divided randomly into two groups. Twenty cows from each group were paired according to: (1) previous DHIA production or, in the case of first-calf heifers, predicted production from previous DHIA test-day data; (2) number of previous lactations; (3) number of days elapsed in present lactation; (4) last test-day production. All production data (see table 1) were adjusted to a 305-day mature equivalent basis and expressed as pounds of 4% fat-corrected milk (4% FCM).

The control group received a 17% crude protein concentrate mix which had been used regularly by the dairy, and the test group was fed a mix containing 12% crude protein. Both mixes contained the same ten ingredients but amounts of four ingredients were adjusted to obtain a lower protein level in the experimental mix (table 2).

Each group was fed its concentrate mix in pelleted form in an elevated parlor barn. The parlor was divided into two one-sided units, each with four stalls. The cows on high protein concentrate were milked on one side, those on the test feed on the other. All cows were offered concentrates free choice while in the milking parlor.

Both groups received identical forage allowances. Alfalfa hay was fed throughout the trial. When available, corn silage, oat silage, barley green chop and alfalfa green chop were fed free choice in corral mangers in addition to alfalfa hay. At any given time the amount of alfalfa hay was varied according to the amount of silage or green chop available. Core samples of hay and grab samples of silage, green chop, and the concentrate mixes were obtained periodically for proximate analyses.

A low-protein concentrate mix fed to part of the dairy herd in these tests resulted in a saving of $16.15 per cow per year as compared with costs of a high-protein mix —while maintaining at least equal milk production.



Concentrate mix being fed to cows in milking parlor at La Sierra College Dairy, Riverside, during tests reported in this article.

The trial started on December 11, 1963, after a one-week preliminary period, and ended on February 1, 1965. During this time 305-day production records were kept on all cows in the experiment. Individual milk weights were recorded and samples analyzed for milk fat percentage two days each month.

For the first five months average test-day production of the cows in the low protein group was slightly lower than that of the cows in the control group. After the sixth month, average production by the low protein group exceeded that of the control group for the remainder of the trial. Average 305-day mature-equivalent production from the low protein group was 16,737.4 lb of 40% FCM, or 488.3 lb greater than that from the controls (16,249.1 lb). A correction factor of 161.9 lb was deducted to adjust for the greater previous production of the cows on the low protein mix. This left an adjusted difference of 326.4 lb FCM in favor of the cows on the low protein mix. (One cow from each group was removed from the herd due to breeding problems during the trial. Production records from these cows and their pair-mates were not considered in analyses of the results, leaving 18 cows per treatment in the trial.)

Differences in production were tested for statistical significance by comparing data from pair-mates in an analysis of variance. The apparent greater production from the low protein group was not statistically significant at the 5% level.

Average amount of concentrate mix consumed per cow in the entire 360-cow herd was 17.1 lb on the control mix and 16.5 on the low protein mix. Concentrate costs for the control mix at $65 per ton amounted to $0.55575 per cow day, or $202.85 per cow year—as compared with $62 per ton for the low protein mix, amounting to $0.51150 per cow day, or $186.70 per cow year.

The average difference of 0.6 lb per cow per day or 219 lb per year and the difference in price would amount to a savings of $16.15 per cow per year from feeding the low protein mix. If this figure were extrapolated to the entire 360-cow operation at La Sierra College Dairy, the savings in concentrate mix cost would be $5,814.45 per year. The results of the present experiment indicate that this savings in feed cost could be obtained while maintaining at least equal milk production from cows on a low protein concentrate mix.

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Thomas M. Little, Extension Biometrician, U.C. Riverside, conducted the statistical analysis for this study.

Herald Habenicht and the staff and students of La Sierra College assisted in this feeding trial conducted at the La Sierra College Dairy.

TABLE 1. PREVIOUS MILK PRODUCTION DATA COMPARISON BETWEEN GROUPS

Group	Past or predicted production (4% FCM)	Last month's production (4% FCM)	Days in milk	Lactation number
	lb	lb		
Low protein	14,110.2	1,757.3	106.3	2.1
Control	13,948.3	1,747.3	103.7	2.1
Difference	161.9	10.0	2.6	0

TABLE 2. INGREDIENTS AND AVERAGE ANALYSES OF TWO CONCENTRATE MIXES

	Control ration	Low protein ration
	lb	lb
Barley	250	550
Milo	250	550
Hominy feed	500	300
Cottonseed cake 41% (exp)	450	50
Coconut oil meal 21% (exp)	50	50
Wheat mixed feed	100	100
Beet pulp, molasses dried	200	200
Molasses, cane	150	150
Minerals	30	30
Salt	20	20
	2,000	2,000
Price per ton	$65.00	$62.00
Crude protein (90% D.M.)	17.5%	12.0%
Crude fat (90% D.M.)	3.8%	3.2%
Crude fiber (90% D.M.)	7.0%	5.4%
TDN (calculated)	73.6%	74.6%

TABLE 3. AVERAGE COMPOSITION PERCENTAGES FOR FORAGES FED

	Dry matter	Crude protein	Crude fat	Crude fiber	Calculated TDN
Alfalfa hay	91.6	21.1	2.3	22.3	53.1
Corn silage	34.2	3.3	1.0	8.1	22.8
Oat silage	33.5	3.0	2.2	9.8	18.1
Barley green chop	18.4	3.7	0.6	3.8	11.1
Alfalfa green chop	27.0	5.4	0.9	6.1	16.9