gram has shown that there are differences in rootstock susceptibility, and that some small-fruited species of the genus *Persea* (native to Latin America) are immune to the disease, but not graft-compatible with our commercial avocado species. Discovery of the primary role of *P. cinnamomi* in the disease has led to research on control of the fungus by both chemical and biological means. Effective fumigants have been found, and a non-phytotoxic chemical for use in irrigation water gives additional promise for control. Much is now known about the fungus; further research (under way) is needed before the problem can be considered solved.

Enzymes

The project by University researchers started in 1947 to study the role of enzymes in the processing of fruits and vegetables has resulted in "... more advances in this field during the past 20 years than were made during the preceding 100 years" according to the author of the original article in CALIFORNIA AGRICULTURE. The problems were attacked by plant physiologists, plant biochemists, food microbiologists, and enologists. Controlled-atmosphere storage, improved ripening procedures, and improved methods of inhibiting and controlling undesirable enzymatic changes during processing and storage were developed and introduced—all resulting in the reduction of losses during harvest, storage, processing, and distribution of foodstuffs.

Foreign aid

Another development in the aftermath of World War II was the interest in helping the emerging nations. The production of food and fiber being of major concern nearly everywhere, agricultural scientists have been called upon to supply information, technical assistance, and training programs for the underdeveloped parts of the world. California scientists have been outstanding participants in the foreign assistance programs while continuing to help produce more and better food and fiber for the greatly increased population of this country. CALIFORNIA AGRICULTURE has played its part in the international exchange of scientific information by offering a continuous report of progress in California agricultural research to scientists and students in all areas of the world.

Influence of... Shaded Mangers, And Increased On Reducing Heat

V. E. MENDEL · W. N. GARRETT

FEEDLOT PERFORMANCE of British breeds of beef cattle fed during the summer months in the irrigated desert valleys of California averages 15% less than the performance of those fed during the cooler portion of the year. Heat stress is the major factor responsible for this lower performance.

The experiment reported here was designed to study three independent methods for improving feedlot performance during the period of heat stress at the Imperial Valley Field Station, El Centro. The methods were based on the following assumptions: (1) that a reduction in the amount of heat re-radiated from the feeding area to the animals as they ate could reduce heat stress; (2) that a reduction in the density of the hair coat might enhance convective and evaporative heat losses from the surface of the skin to reduce heat stress and, (3) that an ample supply of readily digestible calories (in the form of fat) could reduce the heat increment (waste heat associated with an animal utilizing a feed) and thereby reduce the total heat load.

The methods tested included shading the mangers; clipping the hair (from the entire upper portion of the body), and feeding a medium energy (4,333 gross cal/gm dry matter), high protein (15% crude protein) ration for comparison with a high energy (4,725 gross cal/gm dry matter), high protein ration.

Digestion trials

Ninety-six animals were used in this experiment, of which half were steers and half heifers, separately penned. Digestion trials were conducted with steers during the fall following comple-

TABLE 1. COMPARATIVE TEMPERATURES OF FEED SURFACES IN SHADED AND UNSHADED CONDITIONS

Time	Shaded	Unshaded
	°F in manger	
7 A.M.	84.9	86.0
1 P.M.	102.2	131.0
3:30 P.M.	102.9	119.1
	°F in feed storage box	
7 A.M.	87.4	86.9
1 P.M.	103.1	131.8
3:30 P.M.	102.4	115.7

TABLE 2. COMPARATIVE RESPONSE OF HEREFORD CATTLE, FED RATIONS OF TWO ENERGY LEVELS, TO SHADES OVER THE FEED MANGER OR TO CLIPPING THE HAIR FROM THE UPPER PORTION OF THE BODY

	Intermediate energy		High energy		Intermediate energy		High energy	
	Shaded	Unshaded	Shaded	Unshaded	Clipped	Not clipped	Clipped	Not clipped
No. of animals	24	23	24	23	23	24	23	24
Initial weight, lb	626	622	622	624	625	623	618	627
Daily weight gain, lb	2.87	2.82	1.90	1.97	2.82	2.86	1.94	1.93
Daily energy gain, megcal.	6.41	6.45	4.49	4.93	6.48	6.38	4.77	4.64
Slaughter data:								
Dressing, %	60.8	60.5	58.9	59.6	60.5	60.9	59.7	58.8
Body fat, %	22.1	22.7	21.8	23.0	22.6	22.2	22.4	22.5
Corrected carcass,* lb	675	673	596	630	675	673	617	608
Feed intake and utilization:								
Daily feed consumption, lb (DM)	18.99	18.94	15.01	15.22	18.91	19.02	15.19	15.03
Feed weight/gain, lb (DM)	6.63	7.00	7.89	7.73	6.98	6.65	7.82	7.81
Energy gain/100 lb, megcal	32.09	31.06	28.21	29.27	31.24	31.91	28.37	29.12

* Carcass weights adjusted to equivalent caloric content.

Clipped Hair Ration Caloric Content Stress in Fattening Cattle

TABLE 3. MEAN RESPONSE OF HEREFORD HEIFERS AND STEERS FED AN INTERMEDIATE ENERGY OR A HIGH ENERGY RATION

Ration	Intermediate energy		High energy	
Sex	Heifers	Steers	Heifers	Steers
No. of animals	23	24	23	24
Initial weight, lb	578	670	577	669
Daily weight gain, lb	2.61	3.07	1.87	1.99
Daily energy gain, megcal	6.21	6.64	4.78	4.63
Slaughter data:				
Dressing, %	60.39	61.00	58.51	59.93
Body fat, %	23.3	21.9	24.0	21.5
Corrected carcass,* lb	630	718	590	634
Feed intake and utilization				
Daily feed consumption, lb (DM)	18.16	19.78	14.70	15.52
Feed/weight gain, lb (DM)	6.96	6.43	7.84	7.78
Energy gain/100 lb, megcal	32.44	33.30	30.12	29.48
NE_m, megcal/100 lb	78.2	77.6	76.7	76.0
NE_p, megcal/100 lb	46.8	46.8	48.9	51.8

* Carcass weights adjusted to equivalent caloric content.

tion of the experiment. The average ambient air temperature was 82°, 81° and 89°F during June, July and August, respectively; the mean maximum was 99°, 105° and 103°F during these months.

Feed for the pens with shaded mangers was stored in a building and moved outside only when the animals were fed, morning and evening. The feed for the unshaded pens was stored in open boxes placed in front of the pens. All experimental animals had adequate shade available in other areas of the corral.

Surface temperatures of the feed at two pens with shaded mangers and two pens without shades were measured three times during the day at 2-week intervals. Similar measurements were made of the feed in the storage boxes. The results shown in table 1 indicate a marked difference in the surface temperatures of the feed in the shaded and unshaded feed bunks and storage boxes. However, shading the manger had no effect on animal response (table 2).

Clipping the cattle had no effect on any parameters of animal production investigated in this trial (table 2).

Ration effects

Ration effects on average daily gain, daily energy gain, corrected carcass weight, and feed consumption were highly significant ($P < .01$). Both sexes stored more energy per 100 lb of dry matter more efficiently when fed the intermediate energy ration than when fed the high energy ration (table 3). The high energy ration contained 10% stabilized animal tallow. This level of tallow has been previously shown to depress food intake as it did in this experiment.

The depression of food intake in the higher energy ration is at least partly responsible for the poorer performance of the cattle consuming this feed. Evidence from the digestion trial (table 4) indicates the gross energy of the higher energy (10% fat) ration was less digestible than that of the intermediate energy ration. Dry matter, crude protein, and crude fiber digestibilities were also lower on the high energy ration but digestibility of the ether extract was increased. These effects of high levels of fat on digestibility have been previously observed in some experiments. The combined effect of lower feed intake and decreased energy digestibility on the high fat ration effectively eliminates valid conclusions concerning the possibility of increasing feedlot animal response under heat stress conditions by reducing heat increment.

TABLE 4. DIGESTION COEFFICIENTS OF VARIOUS RATION FRACTIONS AND DIGESTIBLE ENERGY CONTENT OF RATIONS

Item	Ration: Intermediate energy	Ration: High energy
Dry matter, %	76.8	72.4
Protein, %	74.5	69.6
Ether extract, %	67.4	83.3
Crude fiber, %	71.8	49.4
Nitrogen free extract, %	80.9	79.8
Gross energy, %	75.8	70.0
Digestible energy, megcal/lb DM	1.49	1.50

Three valid conclusions are possible from this experiment: (1) shade over the feed bunk and over the stored feed was not an important factor in increasing animal performance under heat stress conditions, when adequate shade was available at other locations; (2) clipping hair from the entire upper portion of heat-stressed, feedlot animals was not reflected in increased performance; and (3) increasing the gross energy content of a nutritionally well balanced feedlot ration by the addition of 10% animal tallow resulted in a depressed feed intake and lower digestibility of the various ration fractions, except ether extract.

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