chard managed by Mr. Des Kiernan. The following materials were used: Bordeaux 10-10-100; Bordeaux 8-8-100; COCS at 4 lbs per 100 gallons of water plus 1/4 lb of Z-1 spreader-sticker (Colloidal Products Corporation); 5-3-7-100 [copper sulphate pentahydrate ($CuSO_4 \cdot 5H_2O$)-zinc sulphate monohydrate ($ZnSO_4 \cdot H_2O$)-hydrated lime ($Ca(OH)_2$)-water]; and a check treatment with only water applied. The plot was arranged so that all of the trees were sprayed on October 13, and then half of the number of trees were sprayed again on February 15, 1966. Four trees were used per plot, and it was replicated five times. Each plot was surrounded by guard trees that were left unsprayed to prevent possible contamination of the various treatments. A John Bean sprayer was used to apply the materials at 300 lbs pressure per square inch. Approximately 15 gallons of material were used per tree to give full interior and exterior coverage.

Lesions

The number of lesions counted on a 2-ft band at shoulder height on the windward half of each tree, March 22, 1966, was as follows:

Treatment	Number of blast lesions on 20 trees	Average number of lesions per tree
Bordeaux 10-10-100	2623	131
Bordeaux 8-8-100	3954	198
5-3-7-100	5754	288
COCS 4 lbs	5825	291
Water check	9128	456

No significant difference was found between the two Bordeaux formulations (10-10-100 and 8-8-100), but both were significantly better than any of the other treatments. COCS and 5-3-7-100 were less effective than the Bordeaux treatments, but were significantly better than the check. No significant difference was noted between trees sprayed twice compared with those sprayed only once, in October. Less-than-normal rainfall during the season might account for the lack of difference between one or two sprays. Spray rates and formulations mentioned in this article are applicable only to citrus plantings in northern California.

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NITROGEN UTILIZATION

by growing lambs fed normal, low protein, or nitrogen-enriched cottonseed meal

N. H. HINMAN · G. P. LOFGREEN · W. N. GARRETT

This study indicates that the feeding of nitrogen-enriched low protein cottonseed meal had no apparent detrimental effects upon nitrogen retention or nitrogen and energy digestibility, as determined with growing lambs. On the other hand, the normal cottonseed meal and the nitrogen-enriched low protein cottonseed meal did not increase the nitrogen retention significantly beyond that resulting from feeding the low protein cottonseed meal.

DURING THE PRODUCTION of high protein cottonseed meals for poultry and swine feeding there may also be produced a significant quantity of meal having considerably less crude protein than the standard 41% commonly marketed. The nitrogen content of this low protein meal can be increased. This nitrogen enrichment may be economically feasible if the added nitrogen can be readily utilized by ruminants. This study was conducted to determine the utilization of the added nitrogen by growing lambs.

Eight growing wether lambs were randomly assigned to two groups of four pens each (two 4 × 4 Latin squares). The lambs in group 1 were fed a low protein basal ration ("A," table 1) and rations in which 8% of the basal ration was replaced by normal cottonseed meal (B_1), low protein cottonseed meal (C_1), or nitrogen-enriched low protein cottonseed meal (D_1). The lambs in group 2 were fed the same basal ration (A) and rations in which 14% of the basal ration was replaced by the normal meal (B_2), low protein (C_2), or nitrogen-enriched

TABLE 1. PROXIMATE ANALYSIS OF RATIONS,* DRY MATTER BASIS

Ration	Crude protein	Crude fiber	Ether extract	Ash	Gross energy
	%	%	%	%	kcal/g.
A Basal	7.3	14.0	0.9	8.3	4.05
LOW PROTEIN RATIONS					
B_1 normal meal	10.3	14.2	1.1	8.7	4.09
C_1 low protein meal	10.2	14.4	0.9	8.4	4.07
D_1 nitrogen-enriched meal	10.3	14.5	0.8	8.6	4.08
HIGH PROTEIN RATIONS					
B_2 normal meal	12.5	14.5	1.0	8.4	4.12
C_2 low protein meal	12.0	14.5	0.9	8.3	4.11
D_2 nitrogen-enriched meal	12.5	15.0	0.8	8.5	4.12

* Basal ration: oat hay, 35%; beet pulp, 10%; barley, 15%; starch, 15%; molasses, 15%; dextrose, 8%; trace mineral salt, 1%; dicalcium phosphate, 1%; vitamin A, 800 IU/lb. The low protein and high protein rations were formulated by replacing 8% and 14% of the basal with each of the three types of cottonseed meal.

TABLE 2. NITROGEN BALANCE*

Ration	Nitrogen intake	Fecal nitrogen	Urinary nitrogen	Nitrogen digested	Nitrogen retained: Total amount	Nitrogen retained: Per cent of digested
	g.	g.	g.	g.	g.	%
Basal	9.05	5.16	3.45	3.89	0.44	11.3
LOW PROTEIN RATIONS						
Normal meal	12.73	4.93	5.50	7.80	2.30	29.5
Low protein meal	12.27	5.08	5.14	7.19	2.05	28.5
Nitrogen-enriched meal	12.66	4.96	6.07	7.70	1.63	21.2
HIGH PROTEIN RATIONS						
Normal meal	15.42	6.63	6.01	8.79	2.78	31.6
Low protein meal	14.80	6.50	5.21	8.30	3.09	37.2
Nitrogen-enriched meal	15.42	6.40	5.31	9.02	3.71	41.1
BOTH RATIONS						
Normal meal	14.08	5.78	5.76	8.30	2.54	30.6
Low protein meal	13.54	5.79	5.18	7.75	2.57	33.2
Nitrogen-enriched meal	14.04	5.68	5.69	8.36	2.67	31.9

* All data adjusted by covariance to the same average dry matter intake of 767 grams per head per day.

cottonseed meal (D_2). The low protein basal ration was intended to be below the requirement for growing lambs, thereby inducing a need for additional nitrogen.

Table 1 shows the proximate analysis and gross energy content of the rations. The normal protein, low protein, and nitrogen-enriched meals contained 44.6, 36.7 and 42.4% crude protein respectively on a 92% dry matter basis. The usual standard for cottonseed oil meal is 41% crude protein; therefore, the normal protein and nitrogen-enriched cottonseed meals were mixed with ground cottonseed hulls to bring each to a calculated 41.3% crude protein level.

Each lamb within a four-pen group was fed a single ration for the duration of one period (a period consisted of seven days of preliminary feeding and seven days of total urine and feces collection). Thus, over the four periods, each lamb received all four rations. Three or four days were allowed between periods for the lambs to adjust to their new ration. The lambs differed in their acceptance of the rations, causing variations in consumption of dry matter and, therefore, of crude protein. To obtain a clearer comparison of the meals, a covariance analysis was used to adjust nitrogen retention data to equivalent dry matter intakes.

The results (table 2) indicate that the basal ration was deficient in protein (as planned), since the addition of any of the cottonseed meals caused a significant increase in nitrogen retention. The addition of 14% meal resulted in even greater retention than did addition of 8% meal.

TABLE 3. DIGESTIBILITY OF NITROGEN AND ENERGY FROM ADDED COTTONSEED MEAL

Item	Kind of meal			Means
	Normal	Low protein	Nitrogen enriched	
		8% meal		
Nitrogen intake, g. per day	4.03	3.89	4.04	
Nitrogen digested, g. per day	3.83	3.34	3.82	
Digestibility of nitrogen, %	95	86	95	92
		14% meal		
Nitrogen intake, g. per day	8.38	7.89	8.59	
Nitrogen digested, g. per day	5.94	5.61	6.71	
Digestibility of nitrogen, %	71	71	78	73
		8% meal		
Energy intake, kcal. per day	248	244	253	
Energy digested, kcal. per day	286	207	258	
Digestibility of energy, %	115	85	102	101
		14% meal		
Energy intake, kcal. per day	534	537	547	
Energy digested, kcal. per day	268	279	351	
Digestibility of energy, %	50	52	64	55

TABLE 4. DIGESTIBLE PROTEIN AND DIGESTIBLE ENERGY CONTENT OF THE THREE MEALS

Item	Kind of meal		
	Normal	Low protein	Nitrogen enriched
Heat of combustion, kcal. per g. dry matter	4.50	4.36	4.48
Digestion coefficient, %	50	52	64
Digestible energy, kcal. per g. dry matter	2.25	2.27	2.87
Crude protein content, % of dry matter	44.9	39.9	44.9
Digestion coefficient, %	71	71	78
Digestible crude protein, % of dry matter	31.9	28.3	35.0

There were no significant differences among the three types of cotton seed meal but each increased nitrogen retention over the basal ration. Data from the two levels of protein can be combined since there was no significant interaction between kinds of meal and protein level. Apparent differences in nitrogen retention between meals, when the low and high levels are considered separately, did not prove to be statistically significant. There are obviously no significant differences when both levels are combined.

Nitrogen digestibility (table 3) was measured by determining the digestibility of the nitrogen in the basal ration, adding the meals to the basal ration and again determining nitrogen digestibility of the combined feeds. The digestibility of the respective meals was determined by differences shown. Using this method, the digestion coefficients determined at the higher intake of meal were probably more accurate since the inherent errors were reduced as the proportion of the experimental feed was increased in the ration. The digestible energy values were determined in the same manner as the nitrogen digestibility. A value greater than 100 indicated the amount by which the meal enhanced the digestibility of the basal ingredients.

Table 4 shows the digestible protein and digestible energy content of the three meals calculated from the digestion coefficients, as determined at the 14% level of feeding.

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THE IMPERIAL VALLEY includes approximately 430,000 cultivated acres of fertile land located adjacent to the U. S.-Mexican border. Its climate is characterized by high summer temperatures and relatively mild, sunny winters. About 55,000 acres of this land is in sugar beet prόduction and, because of the unique climate and processing requirements, seed must be planted between August and October. During this period when dry soil temperatures at ½-inch depth may reach 70°C, growers have difficulties establishing a satisfactory stand of sugar beets, especially in the late-August to early-September period. The problem decreases in plantings made during the period from mid-September through October—leading to the theory that high temperature might be the cause of the problem.

These experiments were conducted to explore the possibility of overcoming the temperature problem by use of chemicals. The assumption was made that it might be possible to increase germination at elevated temperatures by leaching out some inhibitor or adding some stimulant which might allow germination to proceed.

Four varieties of sugar beets, all of which are grown commercially in the Imperial Valley, were used in the experiments: HH3, US 75, and HC-1 (multigerm varieties); and HH4, a monogerm variety which is somewhat slower to germinate. Germination percentages for the four varieties at various temperatures are shown in graph 1. Preliminary to the chemical tests, optimum conditions for temperature, moisture, and leaching were established and these conditions were followed throughout the experimental procedure.

Seeds were germinated on Kimpak germinating paper, enclosed in plastic germinating dishes, and placed in a Mangelsdorf germinator. Approximately 60 ml of water or germinating solution provided the free moisture necessary for germination.

For the purpose of establishing germination percentage, only normal healthy