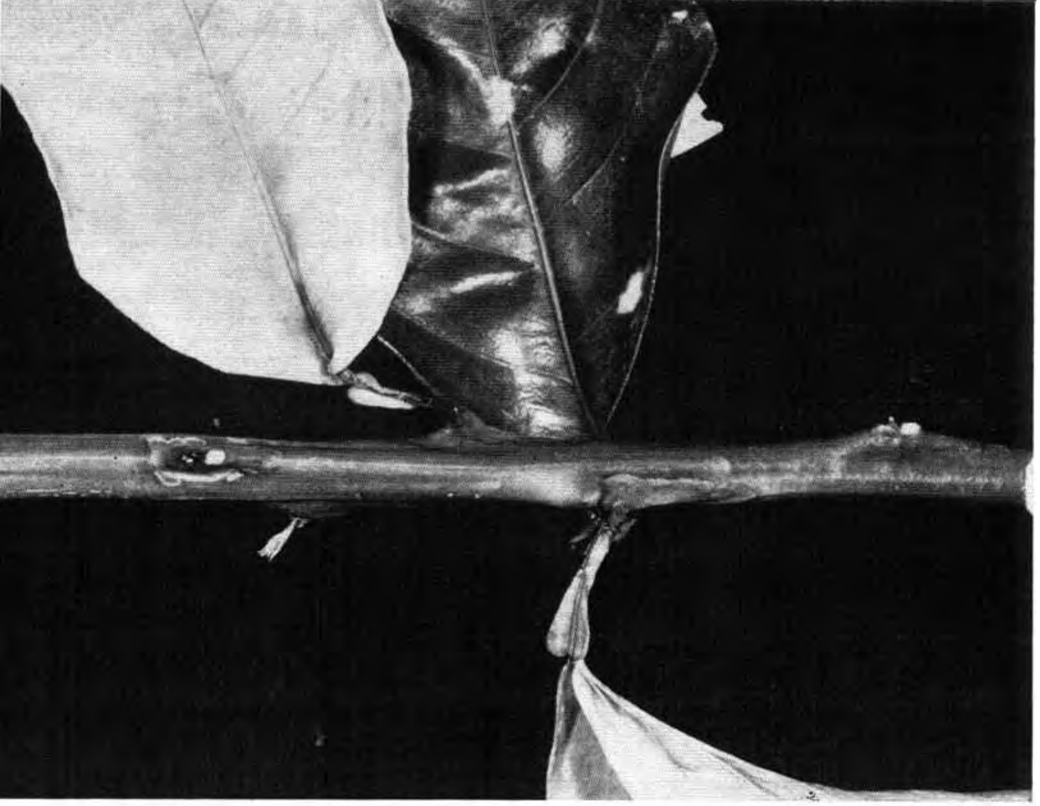

T. A. DEWOLFE

H. C. MEITH

A. O. PAULUS

F. SHIBUYA

L. J. KLOTZ

R. B. JETER

M. J. GARBER

Navel orange twig showing leaf and stem tissue killed by Pseudomonas syringae. Slight tears in petioles are often caused by wind whipping of leaves which allows bacteria to enter and spread causing blast of both leaves and twigs.

CONTROL OF CITRUS BLAST IN NORTHERN CALIFORNIA

CITRUS BLAST, resulting from infection by the bacterium *Pseudomonas syringae*, can cause severe damage to citrus orchards in northern California. Sprays applied to experimental plots in Butte and Glenn counties have not shown clearly delineated differences between treatments because the blast is not very damaging in many seasons.

Heavy rains combined with strong winds and low temperatures are ideal for citrus blast. Although this organism is capable of entering the plant through such natural openings as the leaf stomate, its progress in plants is associated with natural or artificial wounds in the tissues of the plants, such as are caused by strong winds breaking leaf petioles or the tearing off of leaf parts, and subsequent contamination of the wounds by the disease-producing organism. The severity of the disease depends on the number of injuries on the plant, and climatic conditions favorable to the development of the disease.

Sprays applied in 1957 and 1958 in Glenn County gave some control of citrus blast; but because of lack of sufficient disease no recommendations could be made from the data. Although no accurate counts were taken of the number of lesions per tree in 1958, visual observations indicated that Bordeaux mixture 10-10-100 [copper sulphate pentahydrate ($CuSo_4 \cdot 5H_2O$)-hydrated lime ($Ca(OH)_2$)-water] and Agrimycin 500 ($3\frac{1}{3}$ lbs per 100) were most effective.

Citrus blast was severely damaging during the 1964–65 season, almost completely defoliating small, succulent, young trees and removing nearly all of the leaves on the windward side of many older trees. An inspection tour was made in the spring of 1965, and experimental sprays were applied again in the fall and winter of 1965–66.

Laboratory evaluations of several spray mixtures were made in the Department of Plant Pathology, University of California, Riverside, during the summer of 1965. Results of these experiments indicated that after exposure to 32 inches of artificial rain, 10-10-100 Bordeaux mixture still had marked bactericidal properties; Bordeaux mixture 8-8-100 was effective to a lesser degree than the 10-10-100 mixture; other copper-containing materials including COCS (50% copper expressed as metallic—copper in the form of basic sulphates and chlorides), and tribasic copper sulphate (copper as metallic 53%—commercial 4:1 basic copper sulphate) were appreciably less effective than the Bordeaux mixtures.

Plots were established during the fall of 1965 near Oroville at the King Orchard 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.

T. A. DeWolfe is Specialist, and L. J. Klotz is Emeritus Professor of Plant Pathology, Department of Plant Pathology; A. O. Paulus is Extension Plant Pathologist; F. Shibuya is Extension Laboratory Technician; M. J. Garber is Professor of Biometry, University of California, Riverside. H. C. Meith is Farm Advisor, Butte County; and R. B. Jeter is Farm Advisor, Glenn County.

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 x 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.