ALFALFA:

Effects of seeding rates and Rhizobium *inoculations*

WILLIAM D. MC CLELLAN

TABLE 1. STAND PERSISTENCE IN ALFALFA SEEDING RATE AND RHIZOBIUM INOCULUM TRIAL, TULARE COUNTY, 1973

Seeding rates and inoculation	Dates and number of plants per square foot*				
Inoculated with Rhizobium inoculum	1/30	3/5	3/16	5/21	11/1
1. 14.4 lbs/A	27.0 a	15.8	13.8 a	11.8 ab	7.3
2. 24.6 lbs/A	37.2 c	20.1	17.7 bc	13.8 bc	8.5
3. 33.0 lbs/A	41.1 cd	22.4	18.9 bc	15.1 c	8.8
Not inoculated with Rhizobium inoculum					
4. 15.15 lbs/A	29.1 ab	18.1	16.0 ab	10.7 a	7.2
5. 25.6 lbs/A	34.8 bc	19.7	16.9 abc	13.1 bc	8.8
6. 31.2 lbs/A	45.3 d	21.4	19.7 c	14.2 c	8.5
		NS			NS

* Means followed by the same letter(s) are not significantly different at the 5% level of probability. Mean separations are for within dates, not between dates.

TABLE 2. YIELDS OBTAINED IN ALFALFA SEEDING RATE AND RHIZOBIUM INOCULUM TRIAL, TULARE COUNTY, 1973

Treatments	Dates of harvest (yields in tons per acre)				
Inoculated	6/13	7/14	8/14	9/15	Total (4 cutings
1. 14.4 lbs/A	1.03	1.36	1.30	0.95	4.64
2. 24.6 lbs/A	0.92	1.28	1.31	1.01	4.52
3. 33.0 lbs/A	1.07	1.27	1.33	0.93	4.60
Uninoculated					
4. 15.5 lbs/A	1.02	1.32	1.31	0.91	4.55
5. 25.6 lbs/A	0.98	1.24	1.20	1.01	4.51
6. 31.2 lbs/A	0.98	1.28	1.32	0.99	4.57

A SEEDING-RATE AND *Rhizobium*-inoculation trial with alfalfa was established in Tulare County in 1972–73. The purpose of the trial was to examine stand persistence under three different seeding rates, and also to look at the effectiveness of inoculating the seed with the proper *Rhizobium* sp. (nitrogen fixing bacteria). The *Rhizobium* bacteria infect the root hairs of the alfalfa plant and develop into nodules in the roots. These nodules are responsible for "fixing" atmospheric nitrogen and changing it into a form that can be utilized by the plant.

Most soils in the San Joaquin Valley have a native population of nitrogen-fixing bacteria—probably because either alfalfa or bur clover existed previously in these fields and allowed a buildup of bacteria in the soil. The *Rhizobium* strains which fix nitrogen for alfalfa are the same strains that fix nitrogen for burclover. In soils with such a crop history, there normally is no need for inoculating the alfalfa seed with the bacteria.

A large scale trial was planted December 1 and 2, 1972, on a Chino clay loam soil at the M. Curti and Sons Dairy, near Waukena, Ca. There were six treatments composed of three seeding rates (15, 25 and 35 lbs per acre), with and without *Rhizobium* inoculum. The values for seeding rates were based on noninoculated seed, so that the same amount of seed would be used whether or not it was inoculated. Each treatment was replicated four times, with each plot representing 1.5 acres. The plots were planted with a grain drill using six-inch spacing and the seeds were placed in the top inch of soil. Planting was followed by a light harrowing.

The plots were harvested separately with field cubers and the yields were recorded for all harvests in the first year except the first and last cuttings when the field was green chopped. Within each plot three areas (representing 4 sq ft each) were staked to be used for making stand counts throughout the season. Quality determinations were made on alfalfa cubes sampled from the July, August, and September cuttings.

With 100% emergence, the number of plants per square foot for each seeding rate would be: 15 lbs/A—64 plants; 25 lbs/A—107 plants; 35 lbs/A—150 plants. On January 30, two months after planting, the low-seeding-rate plot (15 lbs/A) produced only 42% of the plants possible under optimum germination and seedling emergence conditions. The 25 lbs/A plot showed only 34% survival and the 35 lbs/A rate, only 29% survival on the same date.

Table 1 gives the results of the stand counts made during the season. Two months after planting there were significant differences among the different seeding rates. The differences were the same whether the seed was inoculated with the *Rhizobium* or not. On March 5, and at the end of the season (November 1), there were no significant differences in stand counts between the different treatments. Thus, the higher seeding rate, inoculated or not, did not lead to better stand persistence, even though the higher rates led to higher plot populations in the initial stand establishment.

Table 2 gives the yields recorded from the various seeding rates. There were no significant differences among any of the treatments, either on the individual harvests or on the total season yields.

Quality analyses made from the July, August, and September cuttings showed no differences among treatments. The average protein and modified crude fiber, respectively, for all treatments were as follows: July—19.8, 25.4; August—18.6, 25.1; September—21.7, 21.4. These results might have been expected since plant populations had become nearly the same at the time of the first harvest.

This study reaffirms the data of previous researchers that seeding rates as low as 15 lbs per acre are more than adequate for providing a good stand of alfalfa where there is good seed bed preparation. Higher seeding rates produce a greater plant population initially, but lose their stand at a more rapid pace than the lower rates. In this particular study, the use of the *Rhizobium* inoculum improved neither the initial stand establishment, stand persistence, nor the yields, as compared with the uninoculated seed at the same rate of seeding. It should be noted that the land used for this test had alfalfa plantings prior to this trial and it should have had an adequate supply of the proper *Rhizobium* sp. already present in its soil.

William D. McClellan is Farm Advisor, Tulare County. *T. Watt, M. Bailey, L. Shuklian, and M. Curti and Sons Dairy (Waukena, Ca.) provided assistance in this trial.*