

# INFLUENCE OF NITROGEN FERTILIZER APPLIED IN WINTER ON ALFALFA YIELD AT THE FIRST CUTTING IN SPRING

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## *Abstract*

*Some growers feel that nitrogen (N) fixing nodules found on the roots of the alfalfa plant are ineffective in cold soil during the winter and early spring. Thus, starter N fertilizer is commonly applied in late winter to established alfalfa to enhance growth until spring when the soil warms up and alfalfa begins actively fixing atmospheric N<sub>2</sub>. Established alfalfa normally does not benefit from applications of N fertilizer since it is a leguminous crop that is capable of fixing its own N from atmospheric N<sub>2</sub>. A field experiment was conducted to determine the effect of N fertilizer applied in winter on alfalfa hay yield at the first cutting in spring. Two treatments consisted of an unfertilized check plot and UAN 32 water run at a rate of 35 lbs. N/acre to three year old 'CUF 101' alfalfa grown on a silt loam soil testing deficient in nitrate-N. Maximum alfalfa hay yield (1 ton/acre) was obtained at the first spring cutting without N fertilizer application. However, since the field has a known yield potential of 1.5 ton/acre, factors other than fertility influenced the alfalfa hay yields observed in this study.*

## **Introduction**

Nitrogen (N) fertilizer applications to alfalfa are a controversial practice since alfalfa is a leguminous crop that fixes its own nitrogen from the atmosphere. Well nodulated alfalfa does not benefit from N fertilizer applications, however alfalfa nodules are believed to be ineffective during winter through early spring due to cold soil temperatures. Starter N fertilizer is commonly water run in irrigation water to established stands of alfalfa to enhance growth until spring when the soil warms up and the crop begins actively fixing atmospheric N. However, this fertilizer practice can contribute to the growth of weeds such as bermudagrass and nutsedge, and may inhibit the formation of nitrogen fixing nodules on alfalfa roots.

Previous research conducted by the University of Arizona has shown that established alfalfa normally does not respond to N fertilizer. Furthermore, assuming alfalfa hay is worth \$100 per ton and N fertilization costs \$0.35 per pound of N, a late winter application of 35 pounds N per acre would require an alfalfa hay yield increase of 245 pounds (0.12 tons) at the first spring cutting to recover the expense of a N fertilizer application.

Recent research in Yuma County, AZ (Tickes and Ottman, 1992) and Pima County, AZ (Ottman, 1995) showed that N fertilizer applications to established alfalfa increased hay yield by approximately 100 pounds (0.05 ton) per acre. Ottman (1995) concluded that the observed 5% hay yield increase would not recover the expense of N fertilization, and that alfalfa hay yield increases from N fertilizer are most likely at the first cutting of the year. Thus, a field experiment was conducted in Mohave Valley, AZ to determine the effect of N fertilizer applied in late winter to established alfalfa on hay yield at the first spring cutting.

## **Materials and Methods**

A field experiment was conducted during 1996 in Mohave Valley, AZ located in western Mohave County to determine the effect of late winter nitrogen (N) fertilization on three year old basin irrigated 'CUF 101' alfalfa hay yield at the first spring cutting. The experiment was conducted on a silt loam soil with an average preapplication soil nitrate-N concentration of 5.5 ppm. Average soil temperature at the 2 inch depth was 51, 59, 65, and 74 degrees F during January, February, March, and April, respectively. Individual plots were one irrigation basin wide (200 feet) by 800 feet long (3.67 acres). Two treatments consisted of: 1) an unfertilized check plot; and 2) UAN 32 applied in the irrigation water at a rate of 35 lbs. N/acre on February 27. The two treatments were replicated six times in randomized complete blocks. The first spring alfalfa hay cutting occurred on April 13, and each individual plot was baled on April 19. Following baling, within each plot, bales were counted, hay was loaded on a trailer, and then weighed at the field moisture percentage which was not determined. Statistical analyses were performed on the data using ANOVA and the least significant difference (LSD) test at the 0.05 level of probability when appropriate.

## **Results and Discussion**

An average preapplication soil nitrate-N test result of 5.5 ppm is normally considered deficient for field crop production, and an application of 35 lbs. N/acre was suggested by Stanworth Crop Consultants (Blythe, AZ) for this field based on this soil test. Nitrogen (N) applied to established alfalfa at a rate of 35 lbs. N/acre in late winter resulted in no significant increase in hay yield at the first spring cutting in this experiment (Table 1). Below normal hay yields of approximately 1 ton/acre were observed at this site which has a known historic hay yield potential of 1.5 tons/cutting in early spring. Prolonged hot, windy weather occurred in Mohave Valley from late winter through early spring resulting in moisture stress to alfalfa, and relatively low hay yields at the first two spring cuttings.

Since moisture stress was a limiting factor for alfalfa hay yield potential in this experiment, N fertilizer application did not result in a hay yield increase. A yield increase due to N fertilization might have resulted at a higher hay yield potential if the response of alfalfa to N fertilization was not limited by factors other than fertility.

## **References**

- Ottman, Michael J. 1995. Influence of nitrogen fertilizer on alfalfa harvested on short intervals. 1995 Forage and Grain Report. College of Agriculture Report, Series P-102. University of Arizona. Tucson, AZ. pp. 19-20.
- Tickes, Barry R., and Michael Ottman. 1992. Alfalfa response to water and nitrogen. 1992 Forage and Grain Report. College of Agriculture Report, Series P-92. University of Arizona. Tucson, AZ. pp. 17-18.

Table 1. Response of the first alfalfa hay cutting on April 13 to nitrogen (N) fertilizer water run as UAN 32 at a rate of 35 lbs. N/acre on February 27.

N Rate	Alfalfa Hay Weight	Total Bales	Bale Weight
lbs. N/acre	ton/acre	#/acre	lbs./bale
0	0.99 a	16 a	121 a
35	0.99 a	17 a	120 a
LSD (0.05)	N.S.	N.S.	N.S.

Means within columns followed by the same letter are not significantly different at the 0.05 level of probability according to the LSD method.