Nitrogen Timing in Timothy Seed

Several different methods and timings are used to fertilize timothy seed crops with nitrogen (N). Economics, practicality, and effectiveness are all considered when deciding on the best way to apply N. Three of the most commonly used timings include: 1)100% spring applied, 2) 100% fall applied, and 3) 50% spring/50% fall applied. All three timings were compared in this study, using broadcast urea as the N source. This study should help farmers decide on the most effective timing to use when applying N.

Methodology and Materials

An established timothy field in Arnes, Manitoba, on the NW 27-21-4E, was selected to be used in this study. The treatments can be seen in table 1 below:

Treatment	Urea (lbs/A)
100% spring applied	230
100% fall applied	230
50% spring/50% fall applied (split)	115 and 115

Table 1: List of treatments used in nitrogen timing trial.

The fall application took place on November 7th, 2012, and the spring application took place on May 10th, 2013. This was a field scale trial and a valmar was used to apply the fertilizer. In addition to the N, 30 lbs/A of $P_2 0_5$ were applied to all treatments. The treatments were replicated twice, and the plot design can be seen in figure 1 below.

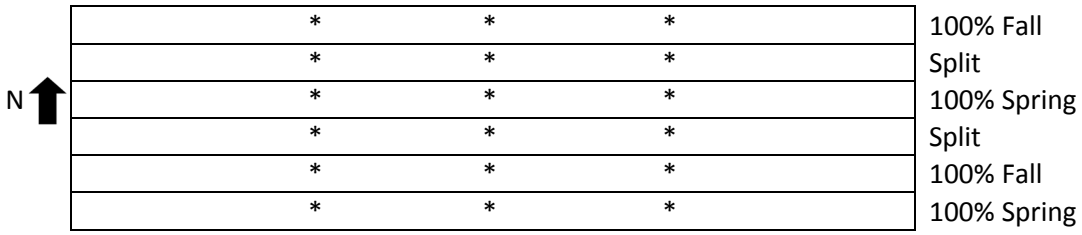

Figure 1: Plot design used in nitrogen timing trial.
**= location of subsamples*

Soil samples were taken in the fall of 2012, prior to any fertilizer application, and then again in 2013 post harvest. At swath timing, 1x3 meter subsamples were hand cut from each treatment as shown in figure 1 above. Samples were allowed to dry, and eventually harvested with a Wintersteiger plot combine. The results were analyzed using paired t-tests, to compare the individual treatments to one another.

Results and Discussion

The results from the soil analysis can be seen in table 2 below. This data represents an average value for each treatment.

Treatment – time of sampling	Nitrate 6" (lb/A)
100% fall applied – fall 2012	5
100% spring applied – fall 2012	4
Split applied – fall 2012	5
100% fall applied – fall 2013	2
100% spring applied – fall 2013	2
Split applied – fall 2013	1

Table 2: Nitrate levels from the 2012 and 2013 soil samples

The N levels were very low in both 2012 and 2013. This would indicate very little variability of soil N within the field, as there simply was no N in this field. The uniform soil test N levels make this site a good location to conduct a N study. It is clear that regardless of the timing of the N application, the grass used up all applied N, and there was no N remaining in the soil.

Yield data was collected and 3 paired t-tests were then conducted, comparing the individual treatments. For purposes of this study, the spring treatment was selected to be the check, and therefore all other treatments are expressed as a percentage of the check. Please see the tables below for the results obtained from the study. A critical P value of 0.1 was chosen for this study, and therefore any P values reported, that are less than 0.1, indicate a statistical difference between treatments.

Treatment	100% spring applied	100% fall applied
Seed yield - % of check	100	105
Number of Samples	6	6
P value	.843	

Table 3: Paired T-test seed yield comparison between 100% fall applied and 100% spring applied treatments.

Treatment	100% fall applied	Split applied
Seed yield - % of check	105	148
Number of Samples	6	6
P value	.038	

Table 3: Paired T-test seed yield comparison between 100% fall applied and split applied.

Treatment	100% spring applied	Split applied
Seed yield - % of check	100	148
Number of Samples	6	6
P value	.075	

Table 3: Paired T-test seed yield comparison between 100% spring applied and split applied.

As can be observed in the yield results, the split treatment was the highest yielding treatment. The paired T-test showed that there was a significant difference, with the split treatment yielding higher than either the fall or spring treatments. No notice was observed between the fall and spring treatments. The reasons for the split application yielding significantly higher than both of the other treatments are unknown. Both of these N applications were followed by adequate rainfall events, which would have moved most of the N into the soil. There are benefits to both fall applications, and spring applications. For example, a fall application of N will result in more fall growth, and better winter hardiness. Also there is a guarantee that N will be available to the crop early spring when growth starts. Whereas a spring application, could be delayed due to excess moisture, resulting in an early season N deficiency. A disadvantage to the fall application is that the losses could be greater. For example, heavy fall rains could result in large amounts of N leaching. Also, standing water in the spring, for long periods of time can cause significant N losses from denitrification. The split application reduces the risk of losing significant amounts of N, which could result, from all of the N being applied at once, in the fall or spring.

In summary, there was no difference between spring or fall applied N. However, the split treatment out yielded both spring and fall treatments. It must be mentioned that this is only one year of data, at one site, and it is unknown whether similar results would be obtained another year. Nonetheless, this study suggests that a split application is something that timothy seed growers may need to look at more carefully. It is a good method to use to reduce the risk of N loss.