CONTROLLED RELEASE FERTILIZERS ON ONIONS, 1999

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Introduction

Controlled release fertilizers have been used for many years, beginning with the sulfur coated ureas. The early sulfur coated materials did not always give a uniform response, because the coating sometimes would crack or the coating would be of uneven thickness, allowing the fertilizer granules to break down at different times. However, newer generation of controlled release fertilizers have resin coats that better control the release of the fertilizer.

Although controlled release fertilizers are generally 3 to 4 times more expensive than traditional materials, there are some possible advantages to using them, particularly in furrow irrigated, high value crops such as onions. One advantage is the possibility of applying all of the fertilizer in the fall when the beds are formed. Since controlled release fertilizers generally do not release nitrogen under cool fall or winter conditions, the nitrogen would not leach with the winter moisture. Most fertilizer nitrogen is applied in two or three sidedress applications, plus a small amount is applied in the fall when the field is bedded. A one-time application would save the cost of the sidedress applications. Finally, onions are irrigated heavily and nitrogen easily can be leached, requiring the application of more nitrogen than the crop actually requires. Controlled release fertilizers could match the fertilizer application more closely with the amount actually needed for plant growth.

Materials and Methods

The treatment and application data are included in Table 1. The controlled release treatments were fixed at 65 and 80 percent of the standard commercial application rate for the area.

Table 1. Material and application data for the controlled release fertilizer trial, Ontario, Oregon, 1999.

Treatment	Nutrients applied			Date applied *
	N	P_2O_5	K_2O	
	--------lbs/acre---------			
Meister 25-10-8 (80% of standard)	183	75	59	1/14/99
Meister 25-10-8 (65% of standard)	150	60	48	1/14/99
Meister 26-11-9 (80% of standard)	190	80	66	4/5/99
Meister 26-11-9 (65% of standard)	156	66	54	4/5/99
Standard Treatment	38	0	0	4/15/99
	100	80	66	5/26/99
	100	0	0	6/16/99
	238	80	66	
Unfertilized Check		------		--------

*All fertilizer materials were shanked in at 2 in depth and 3 in to each side of the row.

The fall application treatment could not be applied until January 14 because of problems obtaining the materials. There were 4.1 in of precipitation between January 16 and February 28, giving the applied fertilizer opportunity to leach. The spring applied fertilizers were applied 2 days before the planting date of April 7.

The soil type was an Owyhee silt loam with 1.4 percent organic matter that had been cropped to wheat the previous year. The wheat stubble was shredded, and the field was deep-chiseled, disked, irrigated, moldboard-plowed, roller-harrowed, fumigated with Telone C-17 at 24 gal/acre, and bedded-up the previous fall.

The onion variety Vision (Petoseed) was planted at 153,000 seeds/acre in double rows spaced 22 in apart. Lorsban 15G at 3.7oz/1000 ft of row was applied to the soil surface at planting. Plots were 40 ft long, eight double rows wide, and replicated five times.

To test for nitrate-N, tissue samples were taken on July 1 and July 23 by cutting the roots from five plants in each plot.

The onions were lifted on September 10 and topped on September 16 and 17. Thirty ft from the four center rows were harvested. They were placed into storage until they were graded on October 27 and 28.

Results and Discussion

The root tissue samples taken on July 1 showed significant differences between some of the treatments. The standard fertilizer treatment had significantly higher nitrate-N levels than any other treatment. The controlled release 80 percent fall applied treatment and both the 80 percent and the 65 percent controlled release spring applied treatments had significantly higher nitrate-N than either the unfertilized check or the 65 percent controlled release fall applied treatments.

The foliage of the unfertilized check and the 65 percent controlled release, fall applied treatments was visibly lighter than the other treatments throughout the season. The 80 percent fall and the spring controlled release treatments were all within the sufficiency range for that time of the growing season.

Table 2. Root tissue readings for controlled release fertilizers on onions, Ontario, Oregon, 1999.

Treatment			Root tissue nitrate-N July 1	July 27
			----------PPM----------	
Controlled Release (80% of Standard)	Fall Applied	183-75-59	4,608	4,669
Controlled Release (65% of Standard)	Fall Applied	150-60-48	1,892	4,362
Non Fertilized Check			1,353	4,654
Controlled Release (80% of Standard)	Spring Applied	190-80-66	4,224	5,085
Controlled Release (65% of Standard)	Spring Applied	156-66-54	4,564	5,046
Standard treatment		238-80-66	8,347	5,847
LSD (0.05)			2,198	n.s.

By the July 27 root tissue reading, there were no significant differences between any of the treatments. Previous work at the Malheur Experiment Station has shown the soils there mineralize between 100 and 150 lb of nitrogen, which could explain the high root nitrate readings in the unfertilized check on July 27.

The onions were taken out of storage and graded on October 27-28. Overall, yields were very high, corresponding to the long growing season (Table 3). Yield of medium onions was lower than normal for all treatments, but the unfertilized check had significantly more medium onions than the other treatments. The unfertilized check also had significantly lower yields of colossal and jumbo sized onions.

There was a trend for the standard fertilizer treatment to have a lower yield of colossals, but the trend was not significant. This may be due to the high amount of nitrate-N in the soil during the peak of the mineralization process. Using a lower nitrogen rate for the standard may have compensated for this. The lower nitrogen rates used in the controlled release fertilizer treatments gave good results, with a tendency towards higher colossal yields. The spring applied fertilizers had a slight increase in overall yield, but this was not significant.

Table 3. Yield of onions treated with controlled release fertilizer, Ontario, Oregon, 1999.

Treatment		Onion Yield by Market Class				
Rate	Application Timing	Colossal	Jumbo	Colossal & Jumbo	Medium	Total Yield
		----------	----------	cwt/acre	----------	----------
183-75-59 (CR)	Fall	249	704	953	15	968
150-60-48 (CR)	Fall	301	674	975	16	991
Nonfertilized check		113	594	707	43	750
190-80-66 (CR)	Spring	286	755	1,041	11	1,052
156-66-54 (CR)	Spring	318	664	982	13	995
238-80-66 (S)	Growing Season	252	745	997	11	1,008
LSD (0.05)		110	96		13	

CR = Controlled release
S = Standard fertilizer materials

Conclusions

Application of controlled release fertilizers as a one-time application appears effective. Controlled release fertilizers did not increase yields over the standard fertilizer practice. However, they were as effective at the standard fertilizer treatment and were only applied once with 20 to 35 percent less fertilizer. A rate of 65 percent of the standard did not decrease yield. Controlled release fertilizers are generally 3 to 4 times more expensive than current fertilizer materials, but the ability to apply all of the fertilizer in the fall and to eliminate spring sidedress applications helps defray part of that expense. Also, being able to apply 65 percent or less of the current application rate would help reduce costs. Since onions require high soil moisture levels for maximum production, this can be accomplished with slow release fertilizers with little danger of nitrogen leaching into the ground water.