CONTROLLED RELEASE FERTILIZERS FOR ONIONS IN THE TREASURE VALLEY

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ABSTRACT

Controlled release fertilizer trials were conducted two years at the Malheur Experiment Station to test two Meister slow release fertilizer formulations on onion growth. One of the formulations was fall applied and the other spring applied. They were compared to a standard fertilizer program and to an unfertilized treatment. The controlled release fertilizer materials were shanked into both sides of the bed prior to planting, except that in 2000 an extra treatment was added where the fall formulation was applied directly below the future seed row. The standard fertilizer program had higher root nitrate-N levels than the other treatments early in the growing season, but this did not increase yields. The 2000 application of the fall controlled release formulation directly under the seed row increased colossal onion production. All of the treatments were better than the unfertilized check in 1999 but there was no yield response to total yield in any of the treatments in 2000.

OBJECTIVES

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 would sometimes crack or the coating would be of uneven thickness, allowing the fertilizer granules to breakdown at different times. However, the newer generation of controlled release fertilizers have resin coats that are better in controlling the release of the fertilizer.

Although controlled release fertilizers are generally three to four times more expensive than traditional materials, there are some advantages to using them, particularly in furrow irrigated, high value crops such as onions. One of these 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. Fertilizer nitrogen is generally 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 heavily irrigated and nitrogen can be easily leached, often requiring the application of more nitrogen than the crop actually requires. Controlled release fertilizers could more closely match the fertilizer application with the amount actually needed for plant growth.

METHODS

The replicated trial was conducted over the 1999-2000 growing seasons at the Malheur Experiment station. Treatments included a standard fertilizer rate common in commercial onion fields and treatments with two Meister controlled release fertilizer formulations. The two formulations were Meister 25-10-8 and 26-11-9 applied at 80% and 65% of the standard nitrogen rate. The fertilizer treatments were sidedressed into the bed on both sides of the row except for

the treatment placed directly under the seed row. Phosphate and potash were applied in the standard treatment at a rate equal to the amount supplied by the 80% Meister 25-10-8 treatment. The standard phosphorus and potassium fertilizer treatment was fall applied (Table 1). The nitrogen was applied in two sidedress applications of 100 pounds nitrogen /acre each during the early part of the growing season. The Meister 25-10-8 was applied as a spring treatment. The 2000 season included Meister 25-10-8 applied in the fall directly below the seedbed at the 80% rate.

Table 1. Application data for the controlled release fertilizer trial. Ontario, OR, 1999 - 2000.

1999		Nutrients Applied			Date
Treatment		N	P_2O_5	K_2O	Applied
		-------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	4-05-99
Meister 26-11-9	(65% of standard)	156	66	54	4-05-99
Standard Fertilizer Rate		38	0	0	4-15-99
		100	80	66	5-26-99
		100	0	0	6-16-99
		238	80	66	
Unfertilized check		0	0	0	
2000					
Meister 25-10-8	(80% of standard)	183	75	59	12-22-99
Meister 25-10-8	(65% of standard)	150	60	48	12-22-99
Meister 25-10-8	(80% of standard)	183	75	59	12-22-99
Meister 26-11-9	(80% of standard)*	190	80	66	3-22-99
Meister 26-11-9	(65% of standard)	159	66	54	3-22-99
Standard Fertilizer Rate		50	100	0	11-18-99
		100	0	0	5-30-00
		100	0	0	6-22-00
		250	100	0	
Unfertilized check		0	0	0	

* All fertilizer treatments were placed 2 inches to each side of the row and two inches deep except treatment 4 (year 200) which was placed two inches deep directly under the seed row.

The soil type was an Owyhee silt loam that had been cropped to wheat the previous year. The wheat stubble was shredded and the field deep-chiseled, disked, irrigated, moldboard-plowed and roller-harrowed the previous fall. The 1999 plots were fall fumigated with Telone C-17 at 24 gal/acre. The soil test data is summarized in table 2.

Table 2. Soil test data for controlled release fertilizer trial. Ontario, OR, 1999-2000.

Year	Soil Type	pH	% O.M.	NO_3-N	NH_4-N	P	K
				----------ppm----------			
1999	Silt loam	7.7	1.6	7	6	28	308
2000	Silt loam	7.2	2.3	15	4	45	180

The onion variety Vision (Petoseed) was planted at 153,000 seeds/acre in double rows spaced 22 inches 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.

The onions were sampled for nitrate-N by clipping the roots from 5 plants in each plot and analyzing the roots. Two nitrate-N samples were taken in 1999 on July 1 and July 23; only one sample was taken on July 11th in 2000.

The onions were grown with practices similar to those used by commercial onion growers except for fertility rates and controlled irrigation to minimize leaching. The onions were lifted in early September, field cured for seven days, then topped, bagged and placed into storage. The onions were taken out of storage in late October, graded and weighed.

RESULTS AND DISCUSSION

The foliage of the 65%, fall applied treatment and the unfertilized check was lighter than the other treatments during the 1999 growing season and appeared nitrogen deficient through most of the year. In 2000, only the unfertilized check appeared visibly different. These observations are reflected in the root tissue nitrate-N values (Table 3).

Table 3. Root tissue readings for controlled release fertilizers on onions. Ontario, OR, 1999 - 2000.

		Root Tissue Nitrate-N		
		1999		2000
Treatment		July 1	July 27	July 11
		----------ppm----------		
Meister 25-10-8	(Fall 80%)	4608	4669	4974
Meister 25-10-8	(Fall 65%)	1892	4362	3691
Meister 25-10-8	(Fall 80%) Appl. under seed bed	----	----	5586
Standard Fertilizer		8347	5847	9279
Meister 26-11-9	(Spring 80%)	4224	5085	3932
Meister 26-11-9	(Spring 65%)	4564	5046	3152
Unfertilized check		1353	4654	2984
	LSD (0.05)	2198	n.s.	1770

During both years, the standard fertilizer treatments gave early high nitrate-N readings. In neither year did these high nitrate readings result in higher yield, suggesting that these root tissue nitrate-N levels were in excess of that needed for maximum yield.

The unfertilized check had the lowest nitrate-N readings on the first sampling date in 1999 and also in 2000. The onion root nitrate levels were much lower on the July 1st, 1999 reading than on the July 27th date. The readings for 2000 were not significantly lower than any of the spring applied Meister treatments or the fall 65% treatment.

The spring-applied treatments in 2000 had lower nitrate-N levels than the fall applied treatments, but this was not the case in 1999. In 1999 the 65% treatment had significantly lower nitrate-N levels than either the 80% fall treatment or the spring treatments on July 1st. Onion bulb results for 1999 and 2000 are shown in tables 4 and 5 respectively.

Table 4. Yield of onions treated with controlled release fertilizer. Ontario, OR. 1999.

Treatment Rate	Application Timing	Onion Yield by Market Class Colossal	Jumbo	Colossal & Jumbo	Medium	Total Yield
		----------cwt/acre----------				
Meister 25-10-8	(Fall 80%)	249	704	953	15	968
Meister 25-10-8	(Fall 65%)	301	674	975	16	991
Standard Fertilizer		252	745	997	11	1008
Meister 26-11-9	(Spring 80%)	286	755	1041	11	1052
Meister 26-11-9	(Spring 65%)	318	664	982	13	995
Unfertilized check		113	594	707	43	750
	LSD (0.05)	110	96	122	13	205

Table 5. Yield of onions treated with controlled release fertilizer. Ontario, OR. 2000.

Treatment Rate	Application Timing	Onion Yield by Market Class Colossal	Jumbo	Colossal & Jumbo	Medium	Total Yield
		----------cwt/acre----------				
Meister 25-10-8	(Fall 80%)	117	643	760	20	780
Meister 25-10-8	(Fall 65%)	111	630	741	41	782
Meister 25-10-8	(Fall 80% Appl. under seed bed))	388	450	838	10	848
Standard Fertilizer		56	652	708	26	734
Meister 26-11-9	(Spring 80%)	163	664	827	22	849
Meister 26-11-9	(Spring 65%)	154	625	779	21	800
Unfertilized check		187	585	772	26	798
	LSD (0.05)	167	n.s.	n.s.	n.s.	n.s.

The unfertilized check produced significantly lower colossal and jumbo grades; and total yield during the 1999 growing season. The medium onion grade was significantly increased. There were no significant differences between the other treatments.

The 2000 growing season did not produce differences except that when the slow release fertilizer was placed directly under the seed, there was a significant difference in colossal onions.

CONCLUSIONS

Meister controlled release fertilizers performed as well as standard fertilizer treatments in 1999, at lower total rates of applied nitrogen. There was a tendency for the spring applied controlled release fertilizers to release slower than the fall applications in 2000, but this did not significantly affect yield. There was enough carry over nitrogen and mineralized nitrogen in 2000 to produce a good crop without any fertilization. There appears to be some value to applying the slow release fertilizers directly below the seed. This practice did not affect total yield, but did affect the amount of colossal onions produced.

Applying these slow release fertilizers at half to two thirds the standard rate reduces the cost of these materials substantially.