

# **CONTROLLED-RELEASE FERTILIZERS FOR ONIONS IN THE TREASURE VALLEY**

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## **Abstract**

Controlled-release fertilizer trials were conducted for 2 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 fertilizers 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 total yield response 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 have better control over the release of the fertilizer.

Although controlled-release fertilizers are generally three to four times more expensive than traditional fertilizers, there are some 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 winter moisture. Nitrogen fertilizer 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

Replicated trials were conducted during the 1999 and 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 percent and 65 percent of the standard nitrogen rate (Table 1). 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 percent Meister 25-10-8 treatment. The nitrogen for the "standard fertilizer rate" treatment was applied in two sidedress applications of 100 lb N/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 percent rate.

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 are summarized in Table 2.

The onion variety 'Vision' (Petoseed, Payette, ID) was planted at 153,000 seeds/acre in double rows spaced 22 inches apart. Lorsban 15G at 3.7oz/1,000 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 five 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, on July 11, was taken 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 7 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 percent, fall-applied treatment and the unfertilized check was lighter colored than the other treatments during the 1999 growing season and appeared nitrogen deficient through most of the year. In 2000, only the onions in the unfertilized check treatment appeared visibly different. These observations are reflected in the root tissue nitrate-N values (Table 3).

During both years, the standard fertilizer treatments resulted in early high nitrate-N readings. In neither year did these high nitrate readings result in greater yield, suggesting that 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 at the single sampling in 2000. The onion root nitrate levels were much lower on the July 1, 1999 reading than on July 27. The readings for the unfertilized check treatment in 2000 were not significantly lower than any of the spring-applied Meister treatments or the fall 65 percent treatment.

In 1999 the 65 percent treatment had significantly lower nitrate-N levels than either the 80 percent fall treatment or the spring treatments on July 1. Onion bulb results for 1999 and 2000 are shown in Tables 4 and 5, respectively.

The unfertilized check produced significantly fewer 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 result in any differences except that when the slow-release fertilizer was placed directly under the seed, there was a significant increase 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 in this trial, but did affect the amount of colossal onions produced.

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

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

1999 Treatment		Nutrients Applied			Date Applied
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
-----lb/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
		<u>100</u>	<u>0</u>	<u>0</u>	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
		<u>100</u>	<u>0</u>	<u>0</u>	6-22-00
		250	100	0	
Unfertilized check		0	0	0	

\* All fertilizer treatments were placed two inches to each side of the row and two inches deep except treatment four (year 2000) which was placed two inches deep directly under the seed row.

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

Year	Soil type	PH	% O.M.	PPM			
				NO <sub>3</sub> -N	NH <sub>4</sub> -N	P	K
1999	Silt loam	7.7	1.6	7	6	28	308
2000	Silt loam	7.2	2.3	15	4	45	180

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

Treatment		Root tissue nitrate-N		
		1999		2000
		July 1	July 27	July 11
		-----PPM-----		
Meister 25-10-8	(Fall 80%)	4,608	4,669	4,974
Meister 25-10-8	(Fall 65%)	1,892	4,362	3,691
Meister 25-10-8	(Fall 80%) Appl. under seed bed	---	---	5,586
Standard Fertilizer		8,347	5,847	9,279
Meister 26-11-9	(Spring 80%)	4,224	5,085	3,932
Meister 26-11-9	(Spring 65%)	4,564	5,046	3,152
Unfertilized check		1,353	4,654	2,984
LSD (0.05)		2,198	NS	1,770

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

Treatment		Onion yield by market class				Total yield
Rate	Application timing	Colossal	Jumbo	Colossal & Jumbo	Medium	
-----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		Onion yield by market class				Total yield
Rate	Application timing	Colossal	Jumbo	Colossal & Jumbo	Medium	
-----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	NS	NS	NS	NS