EVALUATION OF TRANSIT SOIL AS A SOIL AMENDMENT FOR ONION PRODUCTION

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Introduction

Transit Soil (FBSciences, Collierville, TN) is sold as a nutrient uptake enhancer. This trial tested Transit Soil in onion production.

Materials and Methods

The onions were grown on a Greenleaf silt loam previously planted to wheat. In the fall of 2009 prior to planting, the wheat stubble was shredded and the field was irrigated and disked. A soil sample taken in the fall of 2009 showed: pH 7.8, organic matter 1.6 percent, 29 ppm phosphorus (P), 379 ppm potassium (K), 19 ppm sulfate (SO_4), 2,442 ppm calcium (Ca), 556 ppm magnesium (Mg), 60 ppm sodium (Na), 2.6 ppm zinc (Zn), 1.4 ppm copper (Cu), 6 ppm manganese (Mn), 10 ppm iron (Fe), and 0.9 ppm boron (B). Based on sufficiency ranges for plant nutrients, soil analysis indicated the need for 100 lb phosphate (P_2O_5)/acre, 24 lb sulfur (S)/acre, 2 lb Mn/acre, 4 lb Zn/acre, and 1 lb B/acre. These nutrients were broadcast in the fall of 2009 after disking. The field was then moldboard-plowed, groundhogged, roller-harrowed, and bedded at 22 inches. The field was not fumigated due to a failure of the company hired to apply the fumigation.

The field was divided into plots that were 4 beds wide by 20 ft long. The experimental design was a randomized complete block with six replicates. There were three treatments: two application rates of Transit Soil and an untreated check (Table 1). Onion seed of 'Vaquero' (Nunhems, Parma ID) was planted on March 23, 2010 at 150,000 seeds/acre. Two rows spaced 3 inches apart were planted on each 22-inch bed. The seed was planted with a customized planter using John Deere Flexi Planter units equipped with disc openers. Drip tape with emitters spaced 12 inches apart and an emitter flow rate of 0.22 gal/min/100 ft (T-tape, T-systems International, San Diego, CA) was laid at 4-inch depth between 2 onion beds at the same time as planting. The distance between the tape and the center of each bed was 11 inches. The water application rate was 0.06 inch/ hour.

The onion beds received a narrow band of Lorsban 15G® at 3.7 oz/1,000 ft of bed (0.82 lb ai/acre, for preventive control of onion maggot) and the soil surface was rolled immediately after planting. After planting the field was drip-irrigated long enough to have the wetting front reach just beyond the onion row farthest from the drip tape. Onion emergence started on April 15.

The Transit Soil was applied through the drip tape using a Venturi injector. For treatment 3, the Transit Soil was applied at 4 oz/acre on April 28, May 17, May 26, June 10, June 28, and July 6. For treatment 2, the Transit Soil was applied at 8 oz/acre on May 17.

Soil water tension (SWT) was measured in each plot with a granular matrix sensor (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer Co., Riverside, CA) installed at 8-inch depth in the center of the double row. Sensors had been calibrated to SWT (Shock et al. 1998). The GMS were connected to the datalogger via four multiplexers (AM 410 multiplexer, Campbell Scientific, Logan, UT). The datalogger read the sensors and recorded the SWT every hour.

The trial was irrigated automatically when the average SWT reached 20 cb. The datalogger made irrigation decisions every 6 hours. Irrigations were controlled by the datalogger using a controller (SDM CD16AC controller, Campbell Scientific, Logan, UT) connected to a solenoid valve. The water for the drip irrigation was supplied by a well that maintained a continuous and constant water pressure of 35 psi. The pressure in the drip lines was maintained at 10 psi by a pressure regulator. The automated irrigation system was started on May 20 and ended on September 7.

The onions were managed to minimize yield reductions from weeds, pests, diseases, and other nutrient deficiencies. The trial received 50 lb N/acre on May 17 and June 28 as uran injected through the drip tape. Weeds were controlled with an application of Roundup® at 1 lb ai/acre on April 8 prior to onion emergence. On April 19, Prowl H_2O® at 0.95 lb ai/acre was applied for weed control. On May 14, Goal® at 0.16 lb ai/acre, Buctril® at 0.19 lb ai/acre, and Volunteer® at 0.25 lb ai/acre were applied for weed control. On June 25, July 8, and July 16, the field was sprayed with Aza-Direct® at 0.0062 lb ai/acre and Success® at 0.25 lb ai/acre at 30 psi and 20 gal/acre with a backpack sprayer for thrips control.

The onions were lifted on September 13 to cure in the field. Onions from the middle two rows in each plot were topped by hand and bagged on September 17. The bags were put in a shed at ambient air temperature. Onions were graded on September 23.

During grading, bulbs from each plot were counted and separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), neck rot (bulbs infected with the fungus *Botrytis allii* in the neck or side), plate rot (bulbs infected with the fungus *Fusarium oxysporum*), and black mold (bulbs infected with the fungus *Aspergillus niger*). The No. 1 bulbs were graded according to diameter: small (<2.25 inches), medium (2.25-3 inches), jumbo (3-4 inches), colossal (4-4.25 inches), and supercolossal (>4.25 inches). Bulb counts per 50 lb of supercolossal onions were determined for each plot of every variety by weighing and counting all supercolossal bulbs during grading.

Treatment differences were compared using one-way ANOVA, where factor A was treatment and factor B was replicate. Means separation was determined with Fisher's least significant difference test at the 5 percent probability level, LSD (0.05).

Results and Discussion

There was no significant difference in plant population between treatments (Table 1). Both Transit Soil treatments resulted in higher total and marketable bulb yield than the untreated check (Table 1). The adoption of changes in cultural practices by growers should be based on multiple-year trials with consistent outcomes. The composition of Transit Soil is unknown to the authors.

References

Shock, C.C., J.M. Barnum, and M. Seddigh. 1998. Calibration of Watermark Soil Moisture Sensors for irrigation management. Pages 139-146 *in* Proceedings of the International Irrigation Show, Irrigation Association, San Diego, CA.

Table 1. Onion yield and grade response to Transit Soil. Malheur Experiment Station, Oregon State University, Ontario, OR, 2010.

				Marketable yield by grade									
Rate	Timing	Total applied	Total yield	Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	No. 2s	Small	Plate rot	Bulb counts >4¼ in	Plant population
oz/acre		oz/acre	---------- cwt/acre ----------								%	#/50 lb	plants/acre
Check			1,080.2	1073.1	4.8	202.1	840.1	26.1	0.0	4.3	0.3	40.0	127,490
8	once	8	1,135.9	1128.7	17.0	247.3	833.9	30.6	0.0	4.2	0.3	35.8	132,550
4	bi-weekly	24	1,139.5	1134.0	15.3	267.2	827.9	23.6	0.0	5.0	0.0	36.1	130,020
LSD (0.05)			47.8	47.4	NS	NS	NS	NS	NS	NS	NS	NS	NS