GROWERS CONSERVE NITROGEN FERTILIZER ON DRIP-IRRIGATED ONION

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Summary

Two growers' furrow-irrigated and drip-irrigated onion fields were examined for N fertilizer use efficiency. Nitrogen fertilizer use was substantially more efficient in drip-irrigated fields than in furrow-irrigated fields.

Introduction

Drip irrigation is generally used on fields with imperfect topography, lower soil fertility, and histories of lower productivity compared to the fields used for furrow irrigation. From 1992 to 1994 we demonstrated that drip irrigation is an effective irrigation practice compared to furrow and sprinkler irrigation for onion production on Treasure Valley soils that were difficult to irrigate (Feibert et al. 1995). While 320 lb N/acre is commonly used in furrow-irrigated onion production, drip-irrigated onion is not very responsive to nitrogen fertilizer (Shock et al. 2000, 2001, 2002). Here we report two growers' nitrogen fertilization practices using drip and furrow irrigation systems and the corresponding crop yields.

Materials and Methods

Grower 1

Grower 1 typically used 250 to 280 lb N/acre on flat high-quality fields planted to furrow-irrigated onion. In 2002 on a furrow-irrigated field (near his drip-irrigated field) he used 265 lb N/acre with 74 lb N/acre broadcast in the fall, 10 lb N/acre banded when marking out the beds, and the balance divided in two sidedress applications.

Grower 1's drip-irrigated field was marginal productive soil. The field had been heavily leveled, with prevalent white soil exposed from subsoil caliche (lime). The grower's target N application was 144 lb N/acre, but 171 lb N/acre was actually applied. Of the 171 lb N/acre, 74 lb N/acre was broadcast in the fall, 10 lb N/acre was banded when marking out the beds, and 67 lb N was applied as four applications designed to be 15 lb N/acre through the drip lines, and an additional 20 lb N/ acre was supplied in the acid used to acidify the water for a Vydate application.

Grower 1 used soil tests and plant tissue tests to adjust his nutrient applications on both fields. Both fields were irrigated using ditch water. Drip irrigation was scheduled using crop ET and soil water potential measurements from Watermark Soil Moisture Sensors

(model 200SS, Irrometer Co., Inc., Riverside, CA) and an Outrider Data Logger (Clearwater Supply, Inc., Othello, WA).

Grower 2
Grower 2's general practice was to apply 280 to 320 lb N/acre on furrow-irrigated onion. In his furrow-irrigated field close to the drip-irrigated field, the grower applied 300 lb N/acre, 80 lb N/acre broadcast in the fall, 40 lb N/acre injected into the bed preplant, and the remainder distributed as three sidedress applications.

For the drip-irrigated field he used sloping ground with variable and unfavorable soil texture. The field had not had good productivity in the last 26 years. Total N inputs were 145 lb N/acre, with 50 lb N/acre applied in the fall, 40 lb N/acre injected into the bed preplant, and the balance of 55 lb N/acre divided into 5 roughly equal applications through the drip line.

Nitrogen fertilizer application needs were estimated for both fields by soil analyses. Irrigations were scheduled using soil water potential measurements from Watermark Soil Moisture Sensors (model 200SS, Irrometer Co., Inc.) and an Am 400 Hansen datalogger (MK Hansen Co., East Wenache, WA).

Both Fields
The drip irrigation systems were designed by Clearwater Supply of Ontario, OR, using T-Tape.

Results and Discussion

Grower 1
The grower's furrow-irrigated field with favorable soil produced 825 cwt/acre while the drip-irrigated field with marginal soil yielded 815 cwt/acre. Comparing yield per N applied, the furrow-irrigated field produced 3.11 cwt/lb of applied N, while the drip-irrigated field yielded 4.77 cwt/lb of applied N.

Grower 2
The grower's furrow-irrigated field with favorable soil produced approximately 650 cwt/acre while the drip-irrigated field with poor soil yielded 750 cwt/acre. Comparing yield per lb of N applied, the furrow-irrigated field produced 2.17 cwt/lb of applied N, while the drip-irrigated field yielded 5.17 cwt/lb of applied N.

Drip irrigation may provide an important option for growers to rotate onion onto soils not usually used for the crop. These fields may not be as highly infested with pathogens from short rotations of cash crops.

Conclusions

Both growers used much less N fertilizer under drip irrigation and yields were just as good or better under drip irrigation even though the soils had less favorable physical and chemical properties. Under furrow irrigation, much more water is applied at each

irrigation. The potential for deep leaching of nitrate is substantial with every furrow irrigation. With drip irrigation it is easier to maintain uniform soil moisture, even on difficult sites. Since each water application with a drip system can be carefully managed to just replace water used by the crop, nitrate leaching can be greatly reduced with drip irrigation. The reduction of nitrate leaching losses with drip irrigation was reflected in better N fertilizer use at a commercial scale.

References

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