# Planting Date and N Availability Impact Fall N Uptake of Triticale

Sarah E. Lyons[a], Quirine M. Ketterings[a], Greg Godwin[a], Jerome H. Cherney[b], Karl J. Czymmek[a,c], and Tom Kilcer[a,d]

[a]Nutrient Management Spear Program, Department of Animal Science, [b]Soil and Crop Sciences Section of the School of Integrative Plant Science, [c]PRO-DAIRY, Department of Animal Science; Cornell University, Ithaca, NY; and [d]Advanced Agricultural Systems, LLC, Kinderhook, NY



## Introduction

Triticale planted as a double or cover crop after corn silage harvest in the fall can provide many benefits to forage rotations in the Northeast, including reduced risk of soil erosion over the winter months, enhanced soil organic matter, improved rotation diversity, and, if grown as a double crop, increased total season yields. In addition, triticale has the potential to take up readily available nutrients either left over from the previous crop or from fall-applied manure, reducing the potential for nutrient loss. The benefit of fall nutrient uptake will depend on how early the winter cereals are planted in the fall. To evaluate the impact of planting date and nitrogen (N) availability on the growth and N uptake of triticale, four trials were conducted from 2012-2014.

## Trial Set-Up

The four trials were planted with triticale (King's Agri-Seeds Trical 815 variety) from late August to early October in eastern NY (Valatie) and central NY (Varna). Each trial had two planting dates and, to create a range in soil nitrate availability, 5 N rates were applied at planting in the fall (0, 30, 60, 90, and 120 lbs N/acre). Triticale was planted at 1-inch seeding depth and 7.5-inch row spacing (120 lbs/acre seeding rate). In late November prior to frost, we sampled the above ground biomass and analyzed the biomass for carbon and nitrogen. The "Apparent N Recovery (ANR)" was also calculated for each trial to see how efficient the triticale was at recovering fall-applied N. The ANR is calculated by subtracting the total amount of N in the biomass when no N was applied from the amount of N in the biomass when N was applied, and dividing that value by the actual amount of N applied: ANR (%) = (Triticale $N_{N\ rate}$ – Triticale $N_{0\ N}$)/N rate. A higher ANR means more of the N that was applied was taken up by the triticale.

## Results

Triticale planted before September 20 had more biomass than plots planted after September 20. For the triticale planted after the 20th, there was no increase in biomass when N was added. However, when triticale was planted earlier, N addition resulted in increased growth (Figure 1a). Across all N rates, biomass ranged from 0.6 to 1.1 tons DM/acre and averaged 0.9 tons DM/acre when planted before September 20, and 0.2 to 0.3 tons DM/acre with an average of 0.2 tons DM/acre when planted after September 20. These results are consistent with earlier studies in New York (see Ort et al., 2013), where triticale planted prior to September 20 yielded, on average, 0.7 tons DM/acre above-ground biomass in the fall, versus 0.2 tons DM/acre with later plantings.

In all four trials, biomass and N uptake were linearly related, meaning that as biomass increased, so did N uptake (Figure 1B). Thus, as N addition for

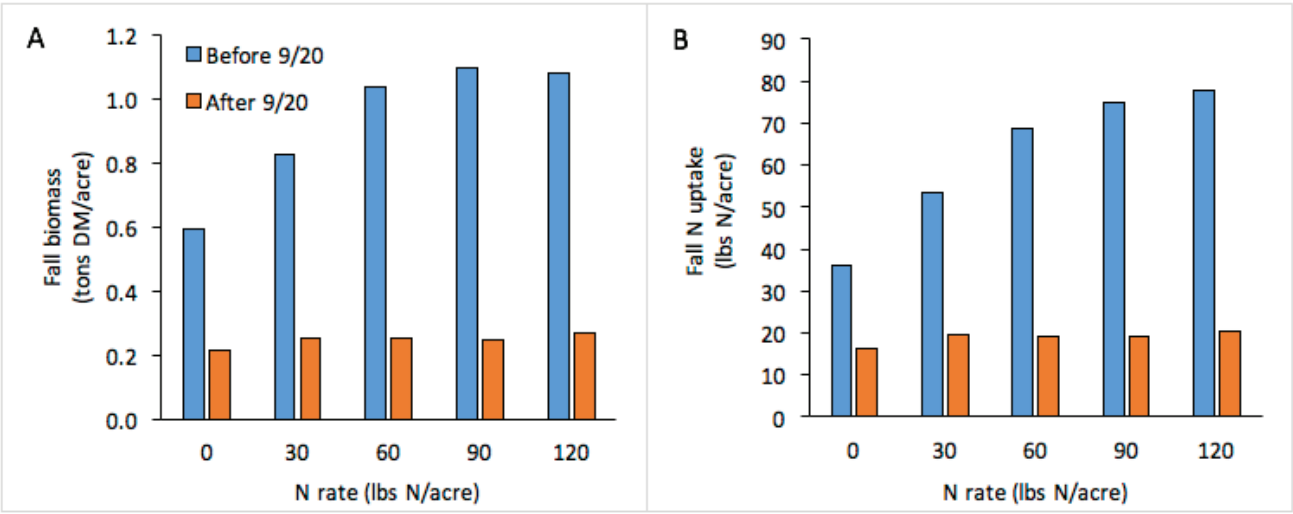


**Fig. 1.** Above-ground fall biomass accumulation (A) and nitrogen uptake (B) of triticale at different planting dates and N rates averaged across four trials.

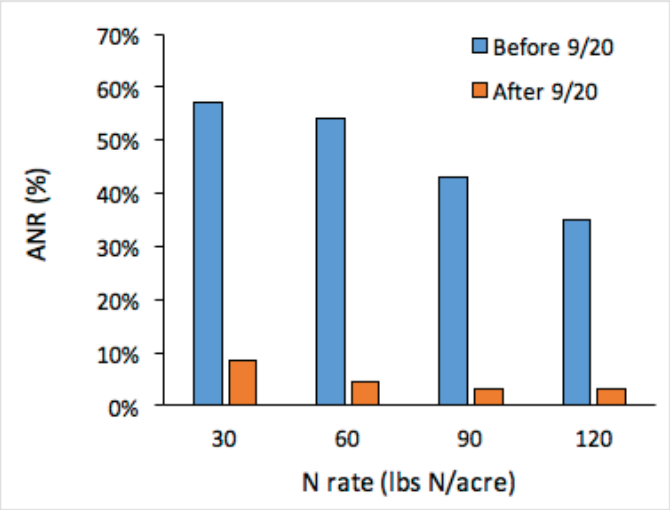


**Fig. 2.** Apparent nitrogen recovery (ANR) of triticale at different planting dates and fall N fertilizer rates, averaged across four trials.

later plantings did not increase yield, it also did not increase N uptake. Across all N rates, N uptake ranged from 36 to 78 lbs N/acre and averaged 62 lbs N/acre for the triticale planted before September 20, and ranged from 16 to 20 lbs N/acre with an average of 19 lbs N/acre for triticale planted after September 20. For every ton of DM triticale biomass produced in the fall, approximately 70 lbs of N was taken up.

The apparent N recovery was greater for earlier plantings (Figure 2). This is related to increased biomass production for the earlier planting dates, which has a direct impact on N uptake capacity of the triticale. The ANR averaged 47% for triticale planted before September 20, and only 5% for triticale planted after September 20.

## Conclusions and Implications

Winter cereals, like triticale, grown as double or cover crops can take up residual N as well as additional N applied at or close to planting but the amount of N taken up depends on planting date. Triticale in this study was able to accumulate 0.9 tons DM/acre and take up 62 lbs N/acre on average when planted before September 20, but only 0.2 tons DM/acre biomass and 19 lbs/acre of N on average when it was planted after September 20. Additional N did not influence biomass or N uptake if triticale was planted late, but when planted early biomass did increase with greater N availability showing the benefits of early seeding for utilizing end-of-season N or newly applied N from manure. Planting winter cereals like triticale can sequester N that could otherwise be lost as well as provide dairy farmers with an additional opportunity to apply manure while reducing the risk of N loss. More research is needed to determine more precise planting windows for optimal N utilization by winter cereals in the Northeast, as well as determining an upper limit to the amount of manure that can be applied in the fall if a winter cover or double crop is planted.

## Reference

Ort, S.B., Q.M. Ketterings, K.J. Czymmek, G.S. Godwin, S.N. Swink, and S.K. Gami. 2013. Carbon and nitrogen uptake of cereal cover crops following corn silage. What's Cropping Up? 23: 5-6. Available at: https://scs.cals.cornell.edu/extension-outreach/whats-cropping-up.

## Acknowledgements

This work was supported by Federal Formula Funds, and grants from the Northern New York Agricultural Development Program (NNYADP), New York Farm Viability Institute (NYFVI), and Northeast Sustainable Agriculture Research and Education (NESARE). For questions about these results, contact Quirine M. Ketterings at 607-255-3061 or qmk2@cornell.edu, and/or visit the Cornell Nutrient Management Spear Program website at: http://nmsp.cals.cornell.edu/.