# Growth and Development of Non-Irrigated Corn Following a Cover Crop

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## Introduction

Cover crops (CC) can have many positive effects such as preventing water erosion, improving soil structure and reducing nutrient loss. CC can also have allelopathic properties and immobilize soil nitrogen (N). Grasses use more N than legumes and so will deplete soil reserves. We wanted to determine the effects of a rye and oat CC on non-irrigated corn growth and development. We expected that highly productive CC would have a negative impact on the corn crop. A highly productive crop will, along with depleting N, deplete soil water. We expected CC to delay growth and development of the corn crop.

## Materials and Methods

- Research was conducted at the South Central Ag Lab near Clay Center, Nebraska.
- CC were planted following winter wheat harvest in on 22 August, 10 September and 1 October 2015; treatments were rye, oat, rye-oat, and control.
- Oat winterkilled and rye CC were terminated with glyphosate on 25 April and again on 5 May; no residue was removed.
- Corn was planted on 8 May 2016.
- Data collection began on June 16 and continued weekly through 21 July; plant density was calculated on 16 June (plants/acre), height and stalk diameter were measured, and stage was determined using ISU leaf collar method (Abendroth, et al.).

Figure 5. Corn in the rye-oat treatment, 23 June 2016.

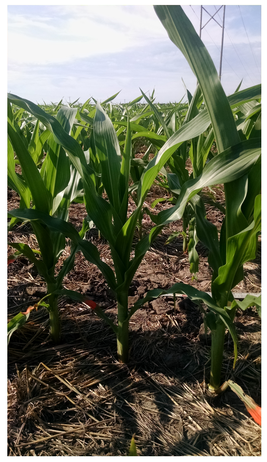
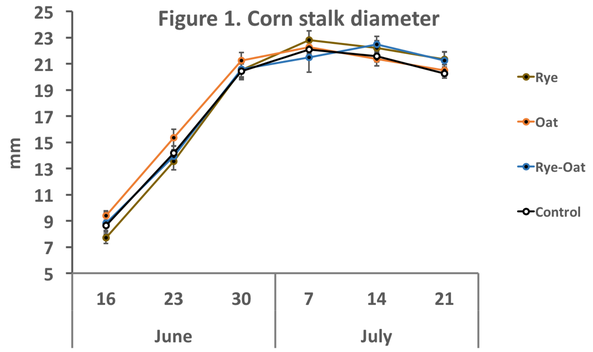


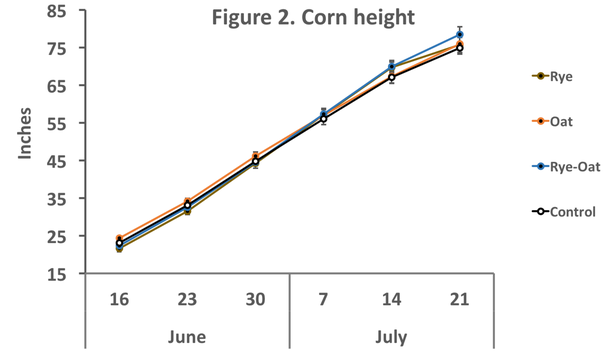
Figure 6. Corn in the oat treatment, 23 June 2016.

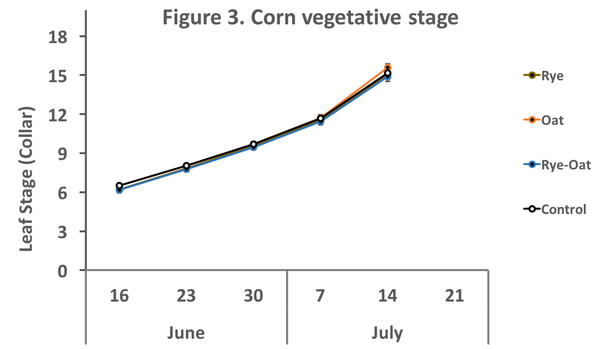
Figure 7. Corn in the control treatment, 1 July 2016.

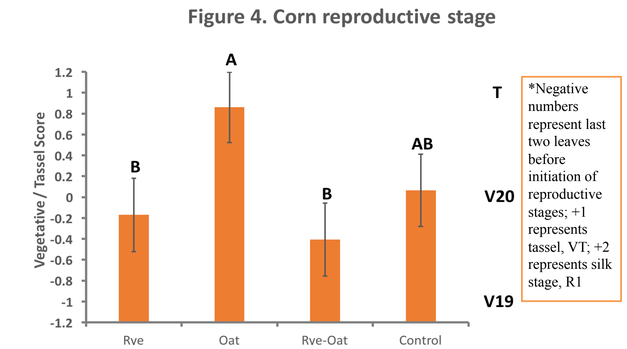
Figure 8. Corn in the rye treatment, 1 July 2016.

## Results




- No difference was found between CC planting dates.
- Corn plant density did not differ between treatments.
- Corn stalk diameter in the rye treatment were less through V9, but there were no differences among any treatments at the final data collection date (R1-R2).
- Corn height were similar between treatments throughout the data collection period.
- Corn vegetative stage was similar among treatments.
- Corn reproductive stage of the oat and control treatments was more advanced than those of rye and rye-oat.

## Discussion

When corn stalk diameter (Fig. 1) and height (Fig. 2) results are compared to critical stages for corn, an interesting pattern emerges. For the first 3 collection dates, plants were at V6, V8, and V9. During these stages, corn requires more nutrients (Coffman, 1998) and critical yield components are set (Abendroth, et al., 2011). Oat winterkills so it will not resume growth in the spring, limiting its use of soil stored resources, while rye is highly productive and overwinters which will deplete soil N and soil water.

After V9, we found no differences. As plants approach reproductive stages, water becomes the most important resource. Since rye produces the most biomass, the rye plots would have the most ground cover, leading to decreased soil water evaporation (see Fig. 8).

Another possible explanation for early season differences could be allelopathic properties of rye residue which would have been diluted or resolved by mid-season.

## Conclusion

There was early season delay in corn growth that was resolved by R1. Corn development showed no delay between treatments until reproductive stages commenced. No differences were found between treatments and control, but there were differences between oat and rye. This may influence selection of CC species.

## Acknowledgements

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## References

Abendroth, L.J., R.W. Elmore, M.J. Boyer, and S.K. Marlay (2011). *Corn growth and development.* PMR 1009. Iowa State University Extension, Ames, Iowa.

Coffman, C. G. (1998, May 16) Texas Agricultural Extension Service Critical Growth Stages of Corn. *Texas A&M Extension.* College Station, TX.