

Corn following winter cereal rye cover crop

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Key findings

- The length of time between cover crop termination and corn planting was an important factor in seedling health. The longer the interval, the more vigorous the corn seedlings and the lower disease incidence .
- In general, corn plants in strip tillage had greater shoot dry weight indicating more vigorous plants.
- Understanding factors that affect corn seedling vigor after a winter rye cover crop will enable improved management practices that optimize yield in a corn-cover crop farming system.

Background

Despite numerous environmental benefits associated with cover crops, many farmers are still hesitant to change their current production practices. Winter rye is one of the most widely used and successful cover crops in the Upper Midwest, but many farmers are reluctant to try winter rye for various reasons. Although soybean yield following a rye cover crop is usually the same or greater than without a cover crop, there have been reports of possible corn yield reductions following a rye cover crop (Kaspar & Bakker 2015; Acharya et al. 2017).

Recent work at Iowa State University (Bakker et al. 2016) showed winter cereal rye is a host of corn seedling pathogens. Under certain conditions, seedling disease may reduce stands, or corn plant vigor and this may result in yield loss. Indeed we recently reported planting corn too soon after termination of cereal rye increased corn seedling disease and led to reduced yields in one year (Acharya et al. 2017). There are also reports of reduced corn yields in no-tillage systems when rye was terminated immediately after planting corn.

Our hypothesis is winter cereal rye provides a “green bridge” between the cover crop and corn crops. Thus if corn is planted too soon after cover crop termination, it may be at risk for seedling disease. In a no-till cover crop system, the risk of seedling disease may be greater than a strip till cover crop system, because the corn is in closer proximity to the rye.

The objective of this research project was to determine the effect of winter rye termination date on the incidence of seedling disease in the corn crop planted into the winter rye residue for successfully growing corn after winter cereal rye.

Methods

- Corn seedlings were sampled at growth stage V2 to V4, and evaluated for root disease and seedling vigor (growth stage, shoot dry weight).
- Root rot incidence was calculated as the percent of seedlings with lesions on the root tissue (Figure 2).
- Corn shoots were dried in an oven at 60° C for 7 days and then weighed.

Results

- In 3 of 6 field evaluated, where rye was terminated 0-2 days before planting corn, more root disease was observed (Table 1).
- These data agree our previous study at Iowa State University (Acharya et al. 2017)
- Corn plants from the early terminated rye strips (10-14 days before planting) were larger (greater shoot weight) compared to plants sampled from the strips terminated just prior to planting corn (0-2 day before planting) (Figure 4).
- Corn plants sampled from the strip till strips were larger than those sampled from the no till management system (Figure 5).

Table 1. Effect of time interval between winter cereal rye termination and corn planting on corn seedling root disease incidence recorded from different participants

Rye termination date	Disease Incidence (%)					
	Kaufmann	Sloan CS	Sloan CC	Vittetoe	Dooley	Steinlage
10-14 DBP	37	77	0	26	9.5	3
0-2 days DBP	97	43	73	16	19	3
Post Planting	-	-	-	-	-	5

DBP= Days before planting corn; Post planting treatment was only present at the Steinlage farm

Disease incidence was calculated as the percentage of emerged seedlings with lesions on seedlings root system.

Table 2. Seedling disease incidence observed on corn plants sampled from no till and strip till strips.

Treatments	Disease incidence %			
	Boyer 1	Boyer 2	Dooley	Sieren
No-till	68	43	15	48
Strip-till	54	58	14	43

- Two out of four fields in no-till showed greater disease incidence than strip till treatments (Table 2).
- More work on this area will be done in 2019 and 2020 with funding from Iowa Nutrient Reduction strategy center at Iowa state University.



Figure 2. Typical root rot symptoms observed on corn seedlings sampled from strips planted 2 days after cereal rye was terminated.



Figure 3. Healthy roots observed on corn seedlings sampled from strips planted 14 days after cereal rye was terminated.

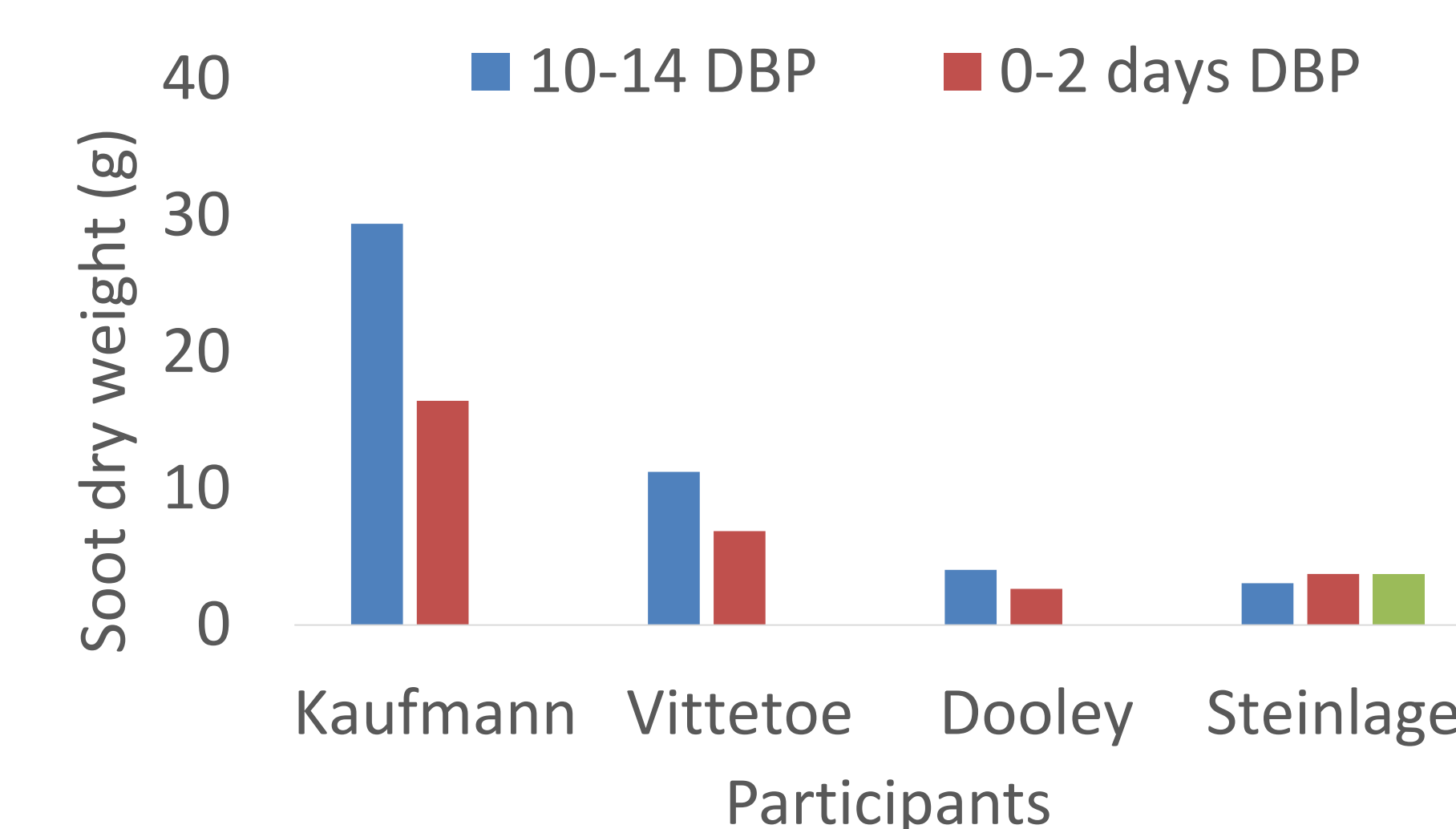


Figure 4. Corn shoot dry weight following rye terminated at 10-14 days or 0-2 days before planting corn.

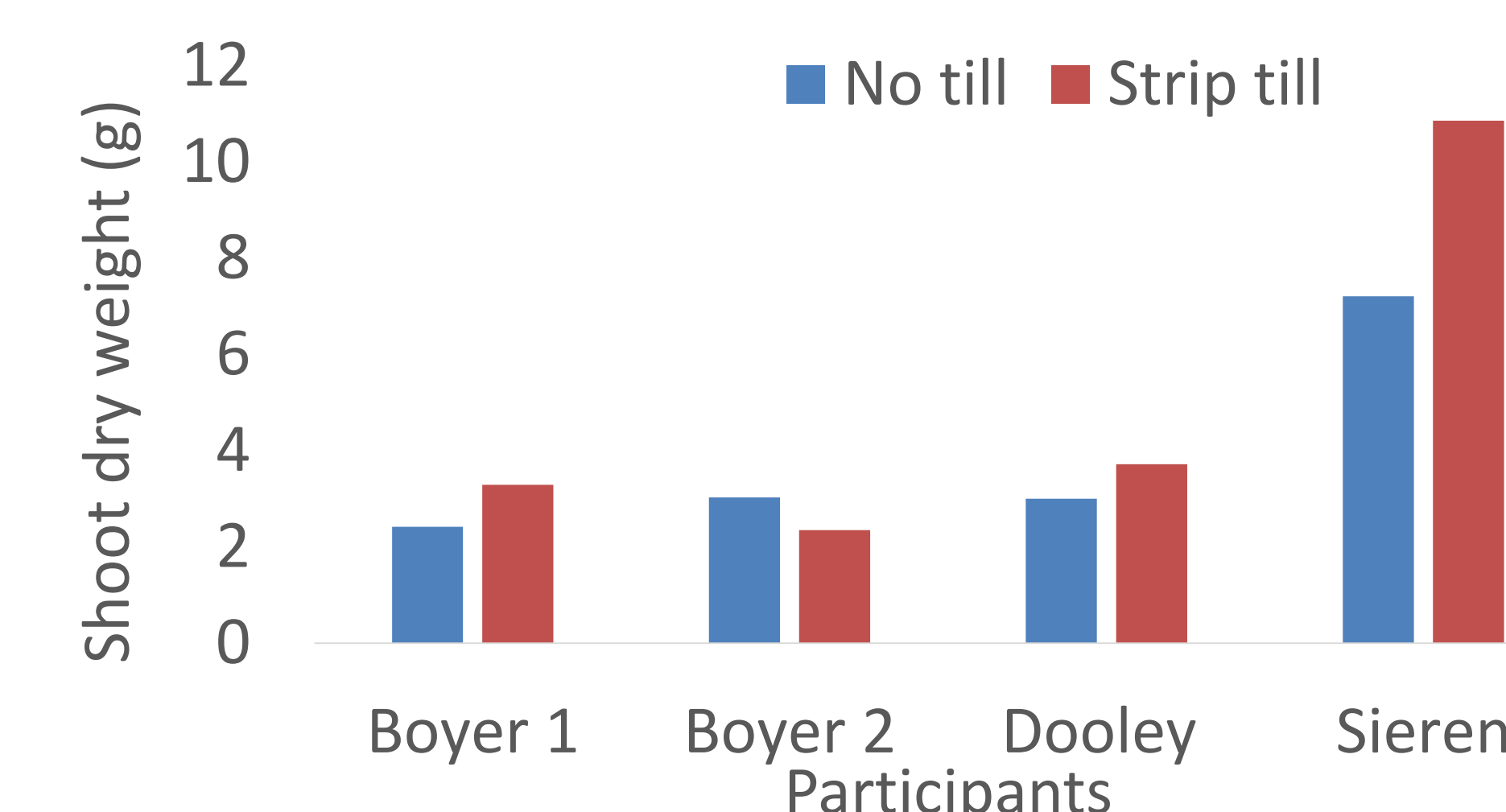


Figure 5. Corn shoot dry weight following rye in no till vs strip till treatments.

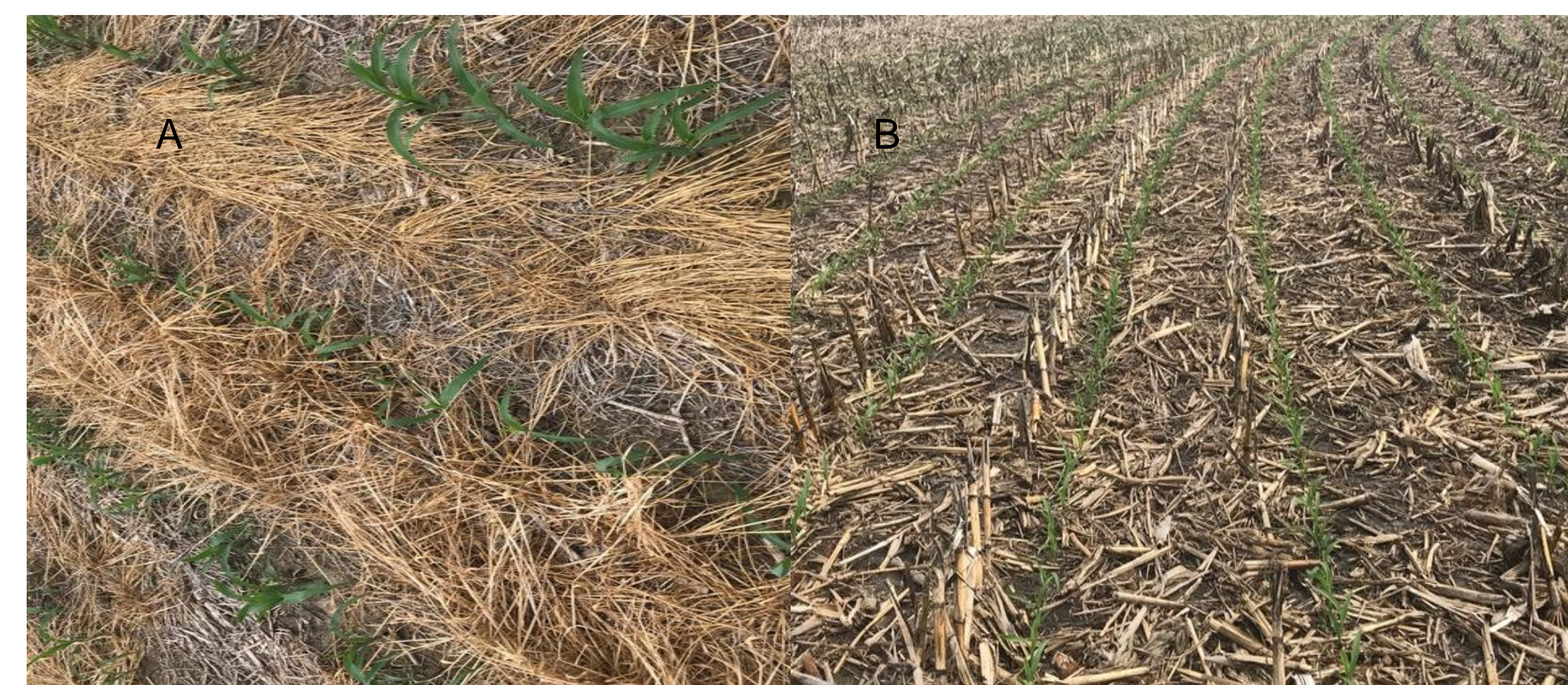


Figure 1. Research strip plots. Corn planted 0-2 days after rye termination in a no-till corn-soybean field in Iowa (A). Corn planted approximately 2 weeks after terminating rye in a no-till corn-corn field in Iowa. The rye was aerially seeded (B).