Interseeding Cover Crops into Corn

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Introduction

Cover crop use has been limited by the relatively short growing season remaining after the primary crop is harvested in the US Midwest. Increasing biomass production is critical for cover crop effectiveness; since planting time is one of the most important factors, intercropping could allow earlier cover crop planting into corn and increase cover crop advantages.

The objectives of this study are:

1) **Evaluate the impact of interseeding cover crops on corn at different corn developmental stages**
2) **Assess cover crop biomass production**

Methods

- **Nebraska Research Sites:** Havelock Farm at Lincoln (rain-fed) and South Central Agricultural Laboratory-SCAL at Clay Center (irrigated).
- **Treatments:** Factorial Combination of cover crop species and cover crop planting dates into corn (Table 1). Treatments were hand broadcast (no incorporation) based on corn development.
- **Experimental Design:** RCBD with four replications. Each plot was 6.1 m x 9.1 m (eight corn rows).
- **Measurements:**
  - Corn: Growth, development, leaf chlorophyll, plant height, stem diameter and yield.
  - Cover Crops: summer, fall and spring biomass.
- **Management:** No-till, corn-soybean rotation; region-specific corn hybrid, plant population and fertilization; weed control with burndown non-residual herbicides before planting and then non-residual herbicides and hand weeding for the specific treatments (V8, R5, R6 and Harvest).

Table 1. Cover Crops, seeding rates and planting dates based on corn phenology.

Cover Crops	Seeding Rate (kg ha^{-1})
Grass (Rye - *Secale cereale*)	67.3
Legume (Hairy Vetch - *Vicia villosa*)	22.4
Brassica (Radish - *Raphanus sativus)*	11.2
3–way Mixture (Rye : Hairy Vetch : Radish)	42.6 (33.6 : 5.6 : 3.4)

Corn Phenology	Cover Crops Planting Date			
	Havelock		SCAL	
	2015	2016	2015	2016
Planting (V0)	3-May	5-May	30-Apr	10-May
V8	23-Jun	17-Jun	25-Jun	21-Jun
R5	13-Aug	15-Aug	12-Aug	16-Aug
R6	16-Sep	7-Sep	17-Sep	14-Sep
Harvest	20-Oct	29-Sep	13-Oct	4-Oct

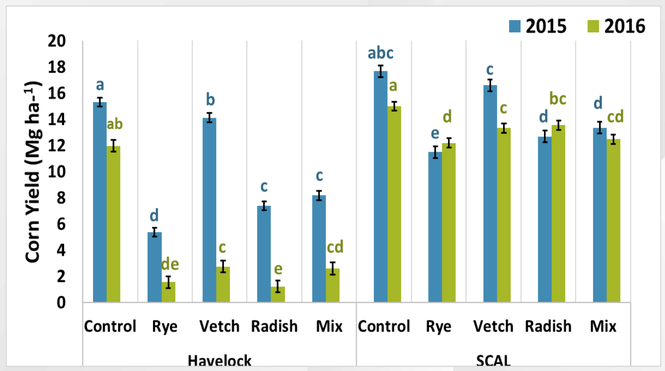


Fig. 1. Corn yield as affected by the cover crop when both are planted at the same time (V0 Treatment). Bars with the same letter(s) within same year and location are not different (Significant at P ≤ 0.05).

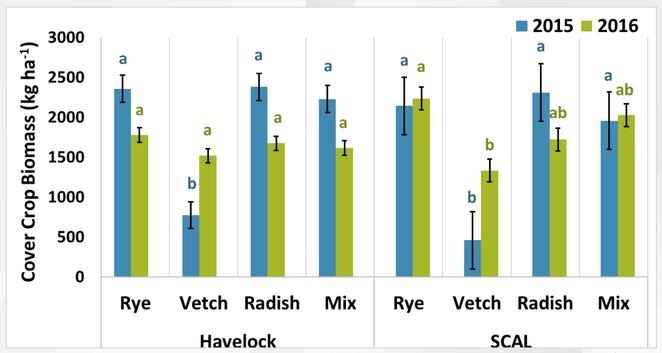


Fig. 5. Summer biomass production as affected by the cover crop specie(s) at V0 treatment. Bars with the same letter(s) within same year and location are not different (Significant at P ≤ 0.05). Sampling dates: 06/23/2015 and 07/08/2016 at Havelock; 06/25/2015 and 07/07/2016 at SCAL.

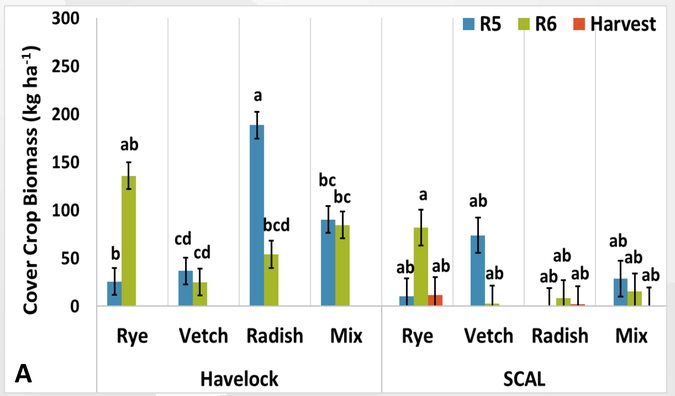
Fig. 7. Radish R5 treatment (left) and Rye R6 treatment (right) at Havelock (rain-fed) for fall sampling.

Fig. 8. Rye R6 treatment at Havelock (rain-fed, left) and SCAL (irrigated, right) for spring sampling.

Fig. 2. Rye planted at the same time as Corn at Havelock (rain-fed).

Fig. 3. Radish planted at the same time as Corn at Havelock (rain-fed).

Fig. 4. 3-way Mixture planted at the same time as Corn at Havelock (rain-fed).



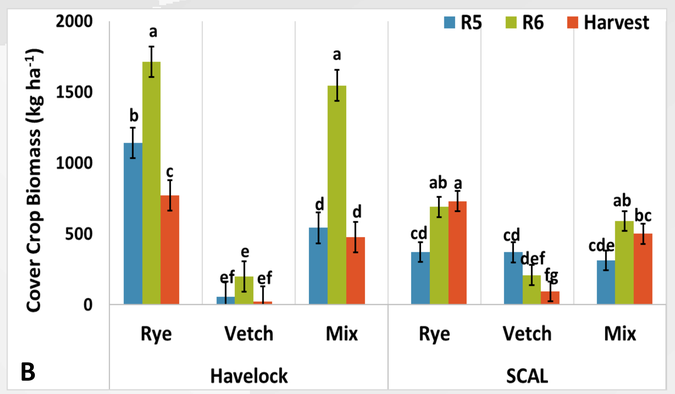


Fig. 6. Fall (A) and Spring (B) biomass production as affected by the cover crop specie(s) and planting date. Bars with the same letter(s) within same location are not different (Significant at P ≤ 0.05). Sampling dates: 11/04/2015 and 4/12/2016 at Havelock; 11/03/2015 and 04/14/2016 at SCAL.

Results

- All corn measurements (development stage, plant height, stem diameter and leaf chlorophyll) were affected when cover crops were planted at the same time as the corn.
- Cover crop competition impacted yield more at the rain-fed than at the irrigated site; rye seeded at corn planting affected corn the most followed by the 3-way mixture and radish (Fig.1, 2, 3 and 4).
- No detrimental effects were found on corn when cover crops were planted at or after corn canopy closure (V8 corn stage).
- Maximum cover crop biomass was produced when planted during the corn growing season; the following spring biomass was next in magnitude; fall biomass was greatly reduced.
- Seeding cover crop at the V8 corn development stage did not produce enough biomass for sampling either year –neither fall nor spring.
- Rye, radish and the 3-way mixture produced higher biomass during summer at both locations and years (Fig. 5).
- For fall sampling, cover crops planted at R5 and R6 corn stage produced the most biomass (Fig. 6A); earlier planting dates did not produce biomass. The R5 planting yield was greatest for radish, followed by the 3-way mixture and vetch but the R6 planting had a greater yield with rye (Fig. 7).
- Cover crops planted at R6 produced higher spring biomass than cover crop planted at R5 or after corn harvest (Fig. 6B). Rye (Fig. 8) and the 3 way-mixture produced the greatest biomass during spring while radish did not overwinter.

Conclusions

- Intercropping cover crops into corn before harvest could be a viable practice for increasing cover crop biomass production without affecting corn yield.
- Although the V8 treatment was included based on canopy closure to diminish corn impact by cover crop competition, the cover crop establishment and biomass production was limited due probably to the reduced light.
- Understanding the optimal cover crop planting date into corn (R5 or R6) is important since the results are specie(s) specific.