

INTRODUCTION

Alfalfa (*Medicago sativa*) and corn (*Zea mays*) silage are commonly grown in rotation in dairy forage production systems throughout the northern regions of the USA.

While alfalfa has low erosion and nutrient losses compared to silage corn, relatively low seeding year alfalfa yields limit its use (Olmstead and Brummer 2008).

Alfalfa interseeded into silage corn could potentially serve two purposes: as a cover crop during the silage corn production year, and to establish alfalfa for forage harvest during subsequent growing seasons.

Competition between the co-planted corn and alfalfa that often leads to alfalfa stand failure, but foliar application of the growth regulator prohexadione-calcium (PHD) to select alfalfa varieties can greatly improve interseeded alfalfa survival (Grabber 2016).

Objective:

In order to quantify potential environmental and agronomic benefits of the interseeded alfalfa/corn silage system we compared an interseeded alfalfa system with a conventional cropping system of silage corn followed by spring seeded alfalfa.

MATERIALS & METHODS

Silage corn was planted (86,500 seeds ha⁻¹) in May. In the interseeded system, four rows of alfalfa were interseeded (18 kg seed ha⁻¹) between the rows of corn within 1 day of corn planting. Interseeded alfalfa received PHD application in June to improve survival. In the conventional system alfalfa was planted the following April. The experiment was established twice (2014 and 2016) at the Lancaster Agricultural Research Station in SW Wisconsin on Fayette silt loam soils with 3-10% slope.

Runoff, soil, and nutrient losses were measured at three times during the growing season using a rainfall simulator.

Simulated rainfall was applied for 45 to 60 minutes at a rate of either 4.7 or 7.6 L min⁻¹. Measurement events were October 2014 following silage harvest, the following April 2015 after alfalfa green up, and early June of the silage production year in 2016.



RESULTS

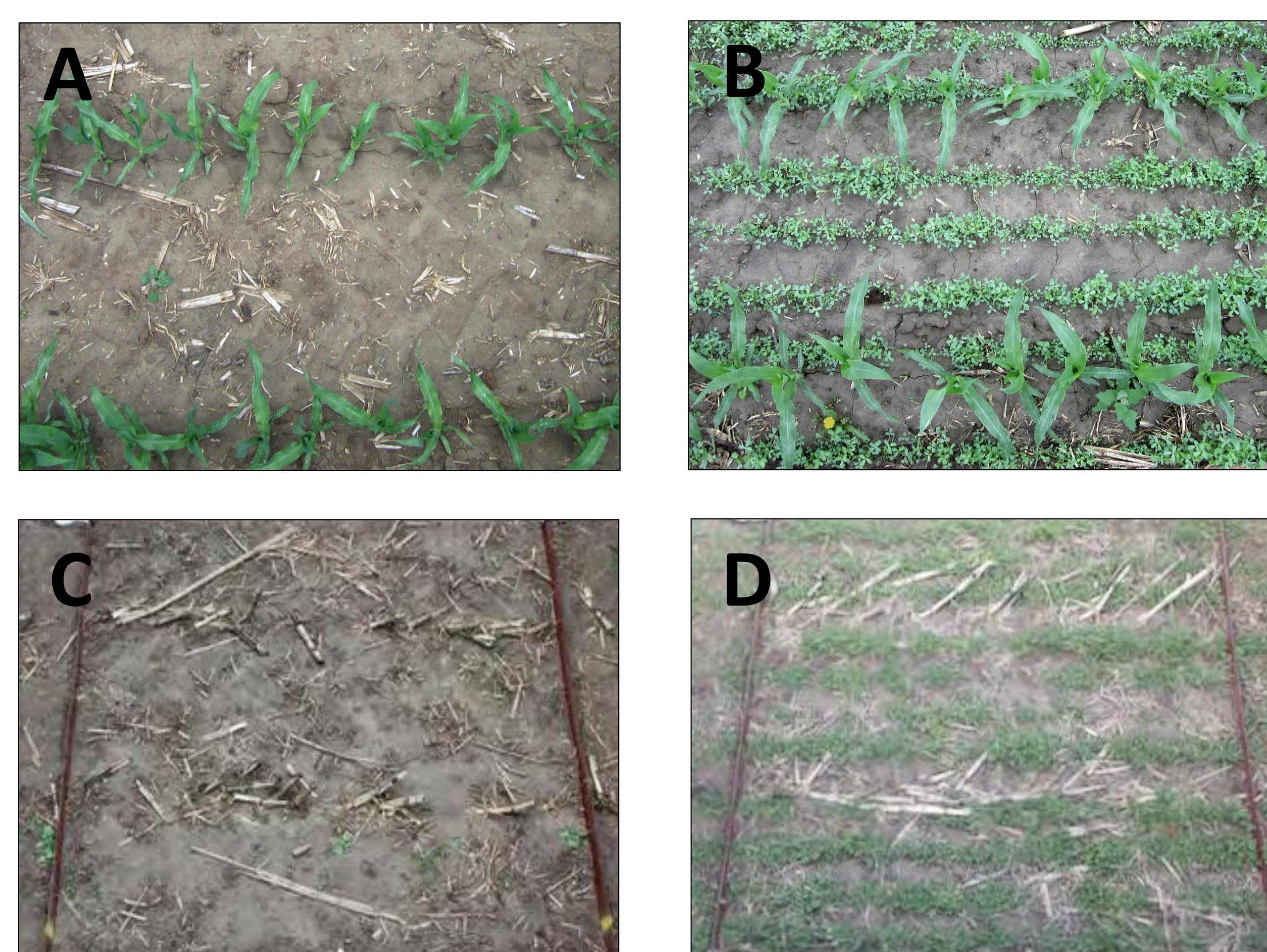


Figure 1. Soil cover was increased by interseeded alfalfa + corn (B,D) compared to corn alone (A,C) in both June (A,B) and April (C,D).

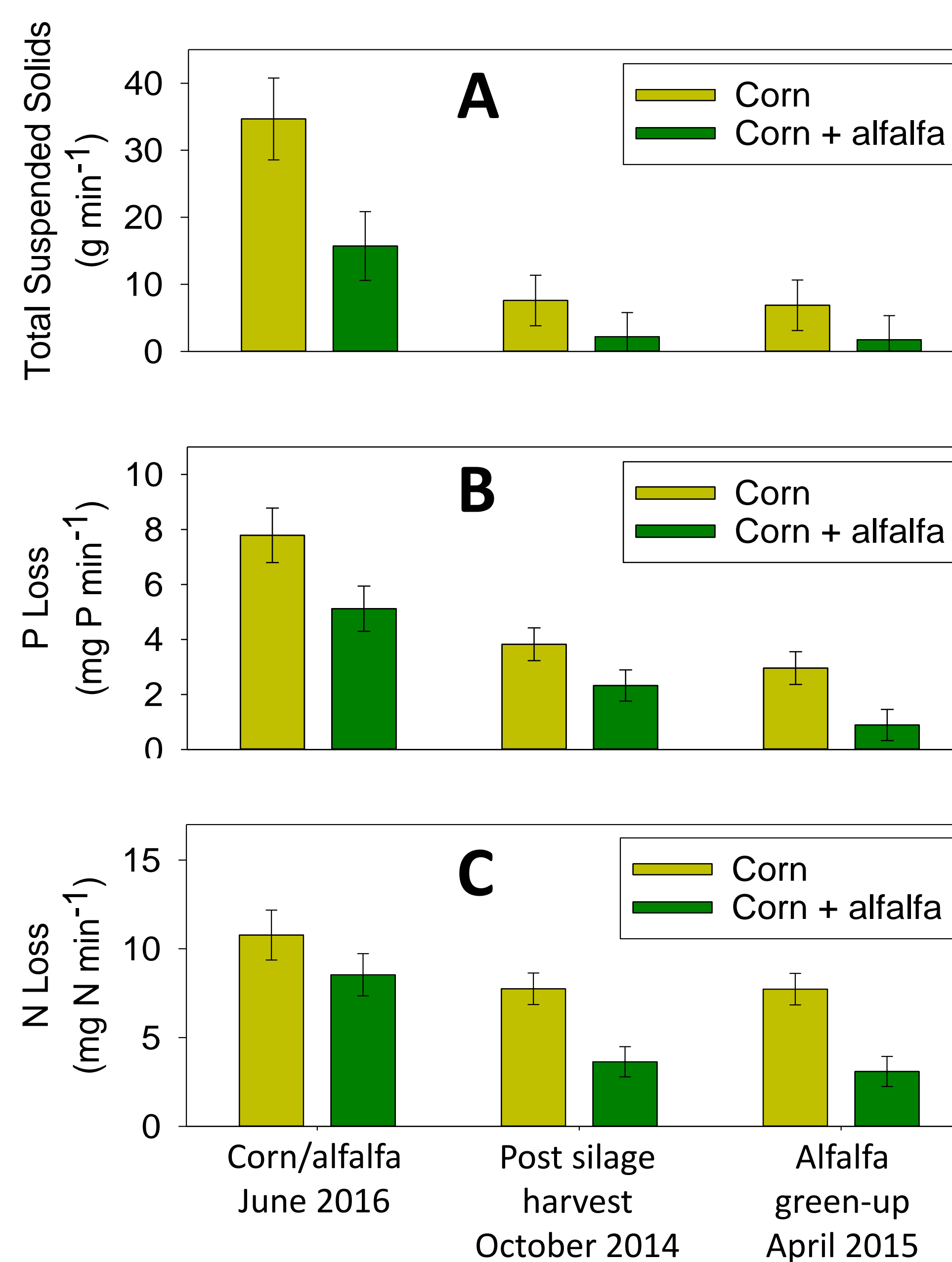


Figure 2. Over the three rainfall simulation events, soil loss (A) was reduced 62% with interseeded alfalfa ($p=0.01$). Interseeded alfalfa reduced the amount of phosphorous (B) and nitrogen in runoff (C) by 40% ($p=0.0008$) and 35% ($p=0.001$), respectively.

RESULTS

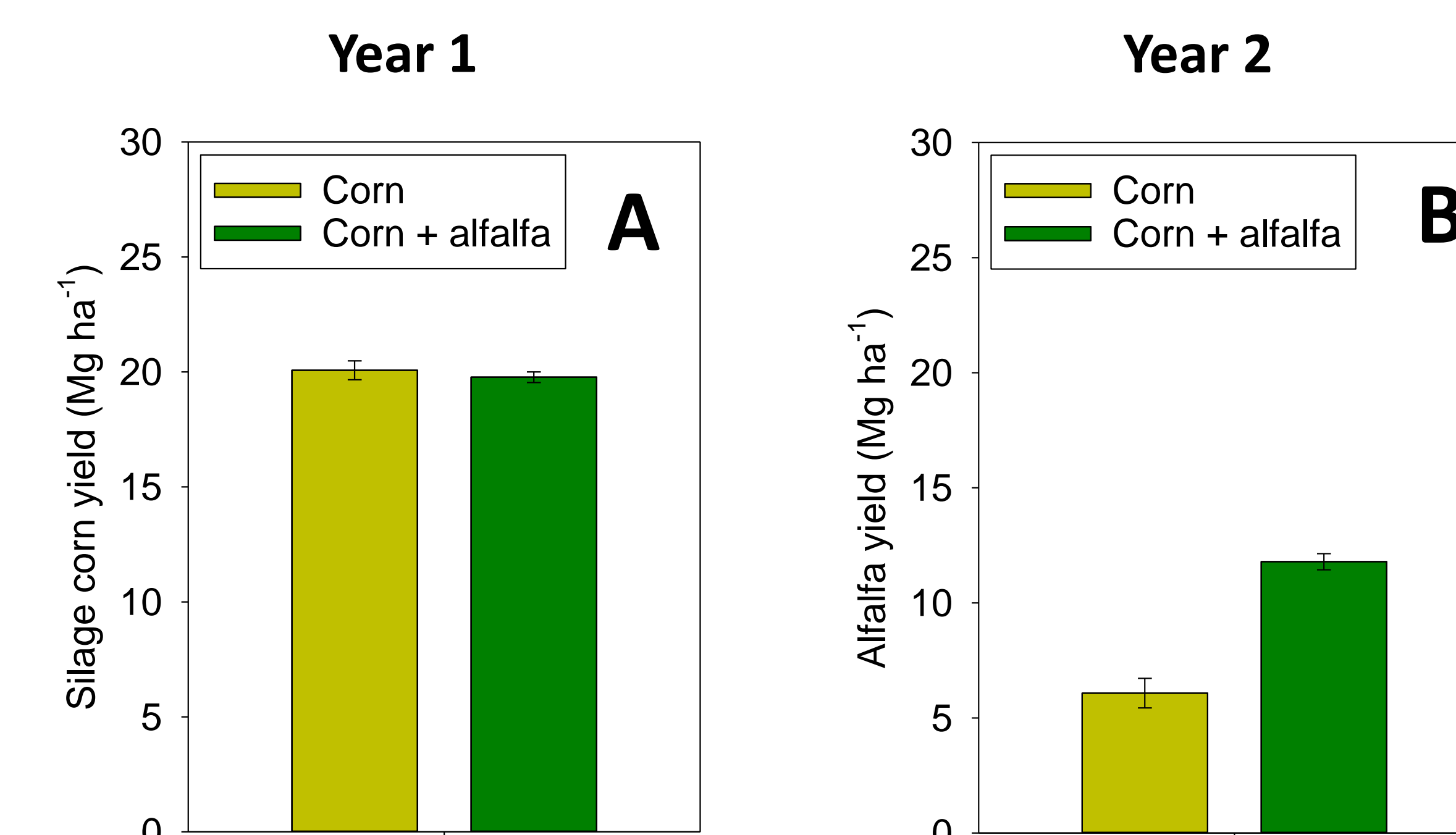


Figure 3. Corn silage yields in 2014 (A) were not significantly different ($p=0.42$) in corn alone compared to corn with interseeded alfalfa. Alfalfa yield in the year following silage production (2015) (B) was 93% ($p<0.0001$) greater for interseeded alfalfa compared to spring seeded alfalfa.

CONCLUSIONS

Runoff, soil erosion, and nutrient losses were reduced by interseeded alfalfa.

Interseeded alfalfa yield exceeded the alfalfa yield in the establishment year of a conventional silage corn-alfalfa system.

The potential environmental and economic benefits of interseeded alfalfa could provide powerful incentives for implementing this production system on dairy farms in the northern USA.

Additional research is needed to refine the interseeded alfalfa system. Future studies will focus on optimal rates/timing of PHD, N fertilization requirements, alfalfa varieties, corn seeding rates, and weed control.

REFERENCES

Grabber, J. 2016. Prohexadione-calcium improves stand density and yield of alfalfa interseeded into silage corn. *Agronomy Journal* 108(2):726-735.

Olmstead, J., and E. Brummer. 2008. Benefits and barriers to perennial forage crops in Iowa corn and soybean rotations. *Renewable Agriculture and Food Systems* 23(2):97-107.



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