

Alfalfa and silage corn interseeding in North Dakota

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The most common crop sequences in the Corn Belt are continuous corn (*Zea mays* L.) or corn-soybean [*Glycine max* (L.) Merr.]. In the last two decades, forage-based, high diversity, crop rotations have transitioned to less diverse, shorter, and annual crops-based rotations. Despite of the many benefits alfalfa offers to cropping systems, alfalfa annual forage yield is much lower than that of silage corn, particularly in the establishment year. This has resulted in the reduction of alfalfa production on dairy farms, in favor of continuous silage corn production. With the availability of glyphosate-tolerant corn and alfalfa, and the use of growth regulators, corn-alfalfa intercropping has interesting potential in North Dakota. The corn would serve as a companion crop to alfalfa during establishment and the interseeded alfalfa would serve as a cover crop after corn harvest, preventing soil erosion and enhancing nutrient cycling.

The objectives of this research were: 1) to evaluate the productivity, forage quality and stand establishment of alfalfa the year after being established in interseeding with corn at two corn row spacings compared with spring-seeded alfalfa, 2) to determine if the application of prohexadione-calcium (PHX) to alfalfa under the corn canopy improves alfalfa establishment and survival, and 3) to calculate the economic benefits of alfalfa-corn interseeding.

The experiment was conducted in Fargo and Prosper, ND, in 2014 and 2015. The design was a RCBD with four replicates and a split-plot arrangement. The main plot had two-row spacing (RS), 61 and 76 cm, respectively. Treatments in the subplot were: 1) corn alone (check), 2) corn intercropped with alfalfa, and 3) corn intercropped with alfalfa + PHX applied when corn was 20-cm in height. Both alfalfa and corn were seeded the same day in May.

The combined analysis across locations indicated that row spacing did not have effect on corn and alfalfa forage yield or stand establishment. Stand reduction during the winter was greater in non-PHX-treated alfalfa (68% vs. 59%), although plant density in the fall and spring was not different. Corn biomass and grain yield were not affected by the row spacing or the intercropped alfalfa, with or without PHX. Alfalfa forage yield between treated and non-treated was similar. But the alfalfa established as the same time as corn in 2014 had twice the yield than the spring planted alfalfa. Results in North Dakota were different of those reported in Wisconsin previously. The shorter growing season and lower plant height of corn likely allows greater transmission of light to lower layers of the canopy. This probably explains the lack of effect of PHX to enhance alfalfa plants establishment. A slight effect on winter survival on alfalfa treated with PHX was observed, which might indicate the potential usefulness of this treatment. The great benefit of this system is the increased forage yield of alfalfa in the seeding year which might contribute to the increase on alfalfa acreage. Farmers might be more willing to reincorporate alfalfa back into the rotation with silage or grain corn if this system proves to have a greater economic benefit while providing many ecosystem services.