Plant Population and Stem Counts to Predict Yield of Modern Alfalfa Varieties

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OBJECTIVES

To determine the relationship of alfalfa plant population density and stem density with forage yield of modern alfalfa varieties.

STUDY DESCRIPTION

Plot layout:
Randomized complete block design with four replications.

Locations:
3 locations in Minnesota.

Plant populations:
6, 12, 18, 24, 36, 48, 72 plants per ft^2.

Alfalfa varieties:
SW5511, SW5509, 5RVR08, and 54VR10.

Analysis:
Alfalfa plant population per ft^2, stem density per ft^2, and forage yield were measured from two harvest in the seeding year, and at one harvest in the spring of the year following seeding.

RESULTS

- In the seeding year, by adjusting our seeding rates we achieved a range of plant populations per ft^2. Varieties did not consistently differ in populations. However, over the season we were challenged to maintain the highest plant populations due to natural thinning of plants.
- In the seeding year, there was no consistent association over locations between plant populations/ft^2 with forage yields or stem number/ft^2 with forage yield. While a 6 plants/ft^2 population had the lowest stem numbers and yields at Rosemount and Becker, differences in stem numbers and yield among the other plant populations were not consistent. Therefore, we could not determine a threshold plant population or stem number that was critical for the seeding year.
- At the first harvest in the spring of the year following seeding, there was a strong association between alfalfa plant populations/ft^2 and alfalfa stems/ft^2. The correlation explained over 90% of the variation in the two variables. Stem numbers range from 50 to 80/ft^2 while plant populations ranged from 6 to over 30/ft^2. Alfalfa varieties had similar relationships between plant populations and stem densities.
- We observed a significant overwintering loss in alfalfa plant density at the higher seeding rates. While we observed over 60 plants/ft^2 in the fall of the seeding year at all locations, by spring the highest populations were about 30 plants/ft^2.
- Responses of yield to plant population/ft^2 and stem densities/ft^2 varied among locations. At St. Paul, where we observed the widest range of plant populations, there was a curvilinear relationship between plant populations and stem density with forage yields. Plant population of about 15 plants/ft^2 or above were required for maximum yields while stem counts of about 67 stems/ft^2 or above were required. At Rosemount, where there was little change in yield over the range in plant populations and stem counts, forage yield were greatest at plant densities of 27-31 plants/ft^2 with stem densities near 71-76 stems/ft^2. At Becker, the response to increasing seeding rates was linear meaning that maximum yields would be achieved at populations greater than 30 plants and stems numbers greater than 70 stems/ft^2.

Figure 1. The relationship between stems/ft^2 to forage yield at the first harvest in 2020 at St. Paul, MN.

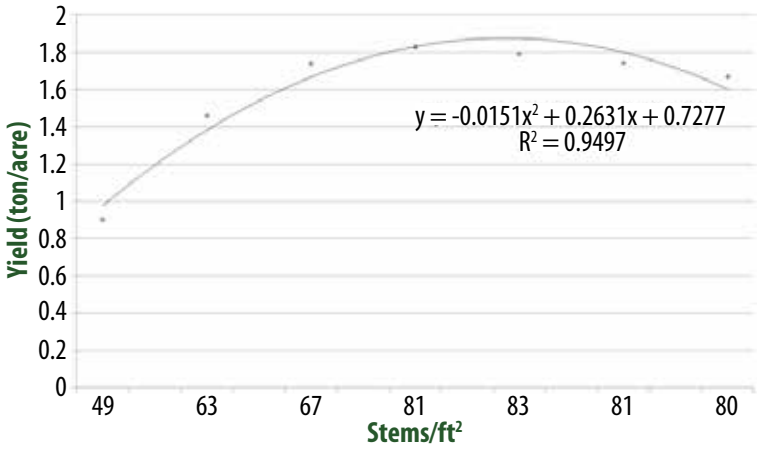
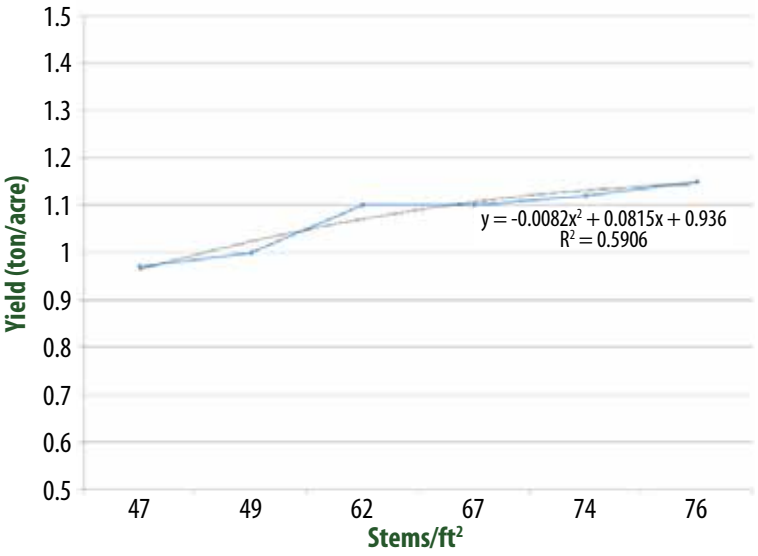


Figure 2. The relationship between stems/ft^2 to forage yield at the first harvest in 2020 at Rosemount, MN.



CONCLUSIONS/SUGGESTIONS

- Based on results from the seeding year, we concur with Undersander and Cosgrove (2007) who recommended that new seedings should have at least 25 to 30 plants/ft^2. In our trials, these plant populations provided yields that were not consistently different from populations as high as 72 plants/ft^2.
- Our results from a single harvest in the year following seeding contrast with existing recommendation in that we found greatest first harvest yields with stem densities of about 70 stems/ft^2 or greater. Alfalfa populations above 55 stems/ft^2 have been considered optimum for alfalfa yields with yields declining with decreased stem densities (Undersander and Cosgrove, 2007).
- These results should be considered preliminary and the research is being continued with additional harvests in 2020 and 2021.

Alfalfa
U.S. Alfalfa Farmer Research Initiative

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