Alfalfa Response to Manures Applied During the Growing Season

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Livestock manures can be a source of N and other plant nutrients for crop production but must be managed properly to avoid negative impacts on the environment. Manure is usually applied to fields cropped to corn or other annual crops. However, frequently farmers have more manure than what can be appropriately applied to annual crop fields. Annual cropping systems do not allow manure applications during the growing season. A perennial forage like alfalfa, which is cut several times during the growing season, could provide an alternative land base and time management strategy for manure applications. The main objectives of our research were to 1) evaluate alfalfa varieties and experimental populations for tolerance to summer manure applications, 2) develop a protocol to select alfalfa plants tolerant to manure applications during the growing season.

Manures are highly variable in the amount of nitrogen (N) and salts depending on the animal species, feeds and supplements fed to the animals, and the management of the manure. To minimize the variability over time and locations of the salt and N components of the manure treatments we chose the following five manure treatments: the control treatment had the manure application equipment driven over the plots but no manure was be applied; the second treatment was 5000 gallons per acre (GPA) of hog manure; the last three treatments were 5000 GPA of hog manure amended with 750 lb/A of sodium chloride (NaCl), 5000 GPA of hog manure amended with 425 lb/A of ammonium (NH_4) applied as ammonium sulfate ($(NH_4)_2SO_4$), and 5000 GPA of hog manure amended with both 750 lb/A of sodium chloride and 425 lb/A of ammonium.

Fifteen alfalfa entries were established in 3 x 20 ft plots at a seeding rate of 50 live seeds per ft. at two locations in Minnesota. Manures were applied to all plots 8 to 10 days after the second and third cuts in both the first and second production years at both locations. Forage yield was recorded starting after the first application in the first production year. Stand scores were taken in spring and fall of each year.

Environmental effects such as soil type and drought impacted our results, therefore results are discussed separately for each location. There was a manure treatment by entry interaction at Waseca but not at Rosemount. At Waseca, forage yield and stand score response to the manure treatments ranked high to low were: control, un-amended manure, manure with ammonium, manure with sodium and then manure with both ammonium and sodium. At Rosemount, both traits responded unexpectedly to the manure treatments with the greatest yield and stands in the manure treatment amended with ammonium and sodium, followed by manure amended with ammonium, un-amended manure, manure amended with sodium, and then the control. The differences in response to the manure treatments caused the alfalfa entries to rank very differently at the two locations for total forage yield and final stand score.