



ANNUAL FORAGE CROPPING SYSTEMS FOR MIDWESTERN RUMINANT LIVESTOCK PRODUCTION

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2:15 p.m., Tuesday, November 24, 2015

LILY 2-425

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Abstract:

Annual forage cropping systems are a vital aspect of livestock forage production. One area where this production system can be enhanced is the integration of novel annual forages into conventional cropping systems.

Two separate projects were conducted to investigate alternative forage options in annual forage production. In the first discussed project, two sets of crops were sown following soft red winter wheat (*Triticum aestivum* L.) grain harvest, at two nitrogen application rates 56 and 112 kg ha⁻¹. The first set of crops were C4 summer annuals seeded within two weeks of wheat grain harvest and included, brown mid-rib (BMR) sorghum sudangrass (*Sorghum bicolor* L. Moench subsp. *Drummondii* Nees ex. Steud. de Wet and Harlan), pearl millet (*Pennisetum glaucum* L. R. Br), foxtail millet (*Setaria italica* L. P. Beauv.), and teff (*Eragrostis tef* Zuccagni Trotter). The second set of crops included C3 cool-season annuals sown in early August were oats (*Avena sativa* L.), oilseed radish (*Raphanus sativus* L.; 'Tillage radish'), and forage turnip (*Brassica rapa* var. *rapa* x *napus* L.). Crops were harvested and tested for yield, nitrogen, ash, and fiber content. Results from over a three year span showed that crops did not consistently differ in any studied variable between the two nitrogen rates. Yield and forage quality characteristics allowed crops to be broken into groups based on livestock dietary requirements and production goals.

The second project focused on characterizing the forage quality and nutrient removal capabilities of amaranth (*Amaranthus hypochondriacus* L.) as compared to other annual forage crops in the presence or absence of manure application. Conventional crop options included BMR sorghum-sudangrass, corn (*Zea mays* L.). Additionally, another potential crop option of oats and chickling vetch (*Lathyrus sativus* L.) were also sown. Results from the forage quality study show that amaranth has superior forage characteristics to conventional crop options with the highest nitrogen content of all crops, and one of the lowest fiber contents, but does not have a high enough yield to allow it to be a replacement for any conventional crop option. Corn had the greatest biomass yield of all crop treatments. In the nutrient removal study amaranth plant tissue nutrient concentrations were superior to that of all other crop treatments. However, when plant nutrient removal was analyzed by total removal, individual amaranth harvests did not always remove more of certain nutrients in comparison to corn and other crop options. Results demonstrate that novel annual forage crop options can contribute to conventional systems. Which crop is needed depends on production goals and animal dietary requirements.