



LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE

Evaluating the adaptability of forage species and varieties in northwest Iowa

Abstract: Iowa's harsh climate can make forage establishment and maintenance difficult. This project examined which forages might be best adapted to growth and survival in northwest Iowa.

Question & Answer

Q: Which forages can be best adapted to northwest Iowa?

A: Results of this study found that tall fescue was the best of the grasses while alfalfa had the highest overall annual dry matter yields. Berseem clover and perennial ryegrass did not perform well.

Background

Forage crops are important to diversified crop and livestock farms still commonly found in northwest Iowa. Producers need a variety of forage species for improved pasture, hay production, nitrogen fixation, and as components of crop rotations. Forages also are used for cover crops, buffer strips, and waterways to reduce soil erosion and improve water quality.

Iowa's climate challenges can make forage establishment difficult, limit yields, and reduce stand longevity. Alfalfa and smooth broomegrass are the most commonly grown forages because of their proven adaptability. As new forage species and improved varieties are introduced, information on local adaptability is often incomplete. To increase forage use and reduce production risks, producers need location-specific information that will tell them which forages are most likely to succeed in northwest Iowa.

Approach and methods

Six experimental forages were evaluated from 2000 to 2003 at the ISU Research and Demonstration Farm near Doon in northwest Iowa. Soils were fertilized to soil test recommendations. All plots were established into conventionally prepared seedbeds in three replications. All annual and perennial plots were planted on a well-drained loess soil commonly found in Lyon County.

Six legume species and varieties were tested. Cicer milkvetch and kura clover were the experimental forages that were evaluated, with birdsfoot trefoil, alfalfa, berseem clover, and red clover for comparison. An oat nurse crop was used to aid establishment for all species.

Nine grass species and varieties were included in the study. Experimental grasses being tested were eastern gamagrass, perennial ryegrass, a seeded Bermuda grass, and intermediate wheatgrass. Grasses included for comparison purposes were smooth brome grass, timothy, orchardgrass, annual ryegrass, and tall fescue.

No measurements other than visual observations were taken during the establishment year. Plots were hand weeded and clipped to control weeds.

Results and discussion

In July 2000 a good stand of Bermuda grass (8 to 10 inches tall) was present. By April 2001, all of the Bermuda grass had winterkilled, thus it is not adapted to northwest Iowa as perennial forage.

Principal Investigator:

David Haden
ISU Northwest Research
and Demonstration Farm
Sutherland

Co-investigators:

Steve Barnhart
Agronomy
Iowa State University

Joel DeJong
ISU Extension Crop Specialist

Plymouth County Extension
LeMars

Budget:

\$4,000 for year one
\$4,200 for year two
\$4,400 for year three

Perennial ryegrass proved difficult to establish and tended to winterkill in northern Iowa. It also was not a good candidate for growing in north Iowa.

Because it is a warm season grass, Eastern gamagrass exhibited poor germination and slow growth until later in the summer. It is adapted to northern Iowa, but it yielded no significant dry matter at the last cutting in 2003 because it was very short, below clipping height.

Annual ryegrass must be reseeded each season. As a cool season grass, it is sensitive to variations in soil moisture and air temperature. April plantings for annual rye grass appeared to yield more than May plantings.

Eastern gamagrass, perennial ryegrass, and annual rye grass all averaged less than 1 ton of dry matter per cutting over the three years of the study. Based on those results, they would not be recommended to northwest Iowa farmers as viable forage crops.

Smooth brome grass is widely grown for pasture and hay use in northwest Iowa. Its dry matter yield improved each year of the study and it yielded nearly 7 tons of dry matter per acre in 2003. Orchardgrass (3.73 tons/acre) and timothy (3.48 tons/acre) were very similar in yield potential, but fell significantly below the totals for smooth brome grass.

Intermediate wheatgrass has potential as a new forage in northwest Iowa. (It was substituted for Bermuda grass in the study after the Bermuda grass winterkilled.) This species is a sod-forming grass similar to smooth brome grass, but shorter in growth habit than brome. It averaged 3.17 tons/acre from 2001 to 2003, but more work needs to be done on crop characteristics to make it widely acceptable to farmers.

Tall fescue seems to be well adapted to northwest Iowa's growing conditions. This variety tested ('Endo-free brand') had the highest total dry matter yield of any grass forage examined in the study and the highest yield of any forage in 2001. The average total dry matter yield for tall fescue was 5.92 tons/acre.

No winterkill was observed in any of the perennial legumes established. Berseem clover is an annual legume that appears to do best when seeded in April. Establishment

problems occurred when it was seeded in May and overall it had the lowest total dry matter production of the legumes.

Kura clover was slow to establish, and there was no harvestable stand during the seeding year. But the annual dry matter production averaged 3.61 tons/acre, with a yield of 4.23 tons/acre. By 2003, the kura clover had spread 12 to 18 inches into adjoining plots.

Cicer milkvetch also proved slow to establish and there was no harvestable stand during the seeding year. However, total dry matter yields for 2002 and 2003 were similar at 5.42 and 5.09 tons/acre, respectively.

Red clover, birdsfoot trefoil, and alfalfa all produced stands with potential for harvest the year they were seeded, as well as having the highest annual average dry matter yields among the legumes tested. Red clover's average yield of 5.54 tons/acre was significantly less than that for birdsfoot trefoil or alfalfa. It did display a good stand in the seeding year and competed well with weeds.

Birdsfoot trefoil yielded 5.97 tons/acre of dry matter, which was significantly less than alfalfa. It also produced an excellent stand with few weeds during its first year. Plants were 6 to 10 inches tall by July 2000.

Alfalfa generated the highest average annual yield—6.95 tons of dry matter per acre. The good stand in the seeding year helped combat weed growth. Plants were 10 to 12 inches high in July 2000.

Average yields over the three-year study showed that tall fescue and smooth brome grass were the only grasses to have an average yield above 5 tons of dry matter per acre, while alfalfa, birdsfoot trefoil, and red clover were the only legumes to reach this yield level during the period studied.

Conclusions

Bermuda grass and perennial ryegrass are not well adapted to northwest Iowa as perennial grass forages. Smooth brome grass, tall fescue, intermediate wheatgrass, orchardgrass, timothy, and eastern gamagrass all are well adapted to northwest Iowa. Adverse growing conditions may affect yield during the establishment year,

but perennials may overcome these effects during future production. Grasses grown for annual production, such as annual ryegrass, may have continuing large variations in yield due to adverse conditions.

The grasses were established in 2000 and data collection ended with the last harvest in 2003. The literature indicates that this may not be sufficient establishment time for eastern gamagrass or possibly intermediate wheatgrass to reach full yield potential. Full yield potential was not achieved by any grass forage evaluated since no nitrogen fertilizer was applied.

Alfalfa, birdsfoot trefoil, and red clover, along with kura clover and cicer milkvetch (two experimental legumes), all are adapted to growing conditions in northwest Iowa. No winterkill was observed with any of these legumes. It appears that kura clover may take more time to reach maximum yield potential compared to cicer milkvetch. Both have potential as long-lived perennial legumes in pasture mixes; cicer milkvetch does not induce bloat, and kura clover is rhizominous and spreads.

Impact of results

Which of the new and less often used forages are best adapted to northwest Iowa? Two experimental legumes and four experimental grasses were evaluated against several more commonly used forages. Information produced will provide guidance for producers to consider in their risk management planning and may increase the use of new forage species and improved varieties in northwest Iowa.

Education and outreach

Information on the productivity and persistence of various common and new forage species in northwest Iowa will be reported in the ISU Research and Demonstration Farm Annual Report and will be used in ISU Extension programming. Field day demonstrations and discussions have occurred and will continue to help familiarize producers and Extension staff, community educators, and local agribusiness personnel with these forage species.

**For more information, contact
David Haden, ISU Northwest Research and Demonstration
Farm, 6320 500th St., Sutherland, Iowa 51058;
(712) 446-2526**