Forage Crabgrass Management in the Northeast US

Planting and Harvest Timing, Variety Selection, Nitrogen Fertilization, and Seeding Rate

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Rationale

In the Northeast US, low pasture and hay productivity from late June through August stresses farm budgets and can also lead to overgrazing which harms the long-term productivity and health of agricultural lands.

Southern and large crabgrasses (*Digitaria ciliaris* (Retz.) Koeler and *Digitaria sanguinalis* (L.) Scop.) are unexplored but promising warm-season forages in the Northeast.

Two experiments were performed at the University of Massachusetts - Amherst research farm to investigate regional management options.

Methods

Planting Date, Seeding Rate, and Harvest Time Experiment

Quick N Big crabgrass was planted at four times and three seeding rates:

mid-May
early June
mid-June
late June

3.4 kg seed ha^{-1}
6.7 kg seed ha^{-1}
10.1 kg seed ha^{-1}

Weekly sampling between four and nine weeks after planting explored the relationship between crabgrass development and forage yield and quality. This experiment received uniform 56 kg N ha^{-1}.

Variety and Nitrogen Experiment

Four improved crabgrass varieties were evaluated for their yield and quality with three nitrogen fertilizer application rates in a two-cut system:

Dal's Big River
Mojo
Quick N Big
Quick N Big Spreader

56 kg N ha^{-1}
112 kg N ha^{-1} single application
112 kg N ha^{-1} split application

All crabgrass varieties were planted at 6.7 kg seed ha^{-1}, planted in early June, and harvested at boot stage.

Experimental Design, Measurement, and Statistical Analysis

Both experiments were conducted for two years in 2022 and 2023 using randomized complete block designs with four replications. Plots were 1.8 x 12.1 m and were sampled using 0.25 square meter quadrats. Samples were dried and forage quality was assessed using near infrared spectrometry. Forage quality data presented here come solely from 2022.

Results were analyzed using mixed-effect models in R software. Main effects and interactions were first evaluated using ANOVA ($p < 0.05$). Permutation tests rather than parametric methods were used to assess the significance of explanatory variables on yield to account for heterogeneous residual variance. In addition to yield, relative forage quality (RFQ), dry matter intake (DMI), and protein, acid detergent fiber (ADF), and neutral detergent fiber (NDF) content were assessed as measures of forage quality.

Orthogonal polynomial regression was used to evaluate continuous predictors (plant age, seeding rate) and Tukey adjusted pairwise comparisons were used to perform mean separation for discrete predictors (planting time, nitrogen fertilization, variety, cut number) at a threshold of $p < 0.05$.

All pictures by Arthur Siller

Results

Dry matter yields rose considerably as crabgrass matured (about 700 kg ha^{-1} per week) while forage quality declined between four and nine weeks after planting (figures 1 to 3).

Forage quality is suitable for dairy cows until five weeks after planting and non-lactating cattle until six to seven weeks (Figures 2 and 3).

Forage quality was not affected by planting time but planting in Late June led to lower yields than earlier plantings (Figure 1).

Increasing seeding rate up to 10.3 kg seed ha^{-1} led to an average yield increase of 60 kg ha^{-1} for each kg of seed (Figure not shown).

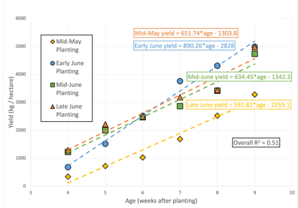


Figure 1. Mean crabgrass yield depending on time of planting between four and nine weeks of age.

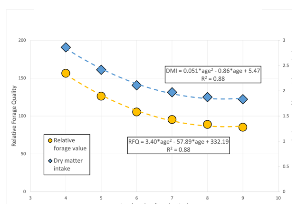


Figure 2. Mean crabgrass relative forage quality and dry matter intake between four and nine weeks of age.

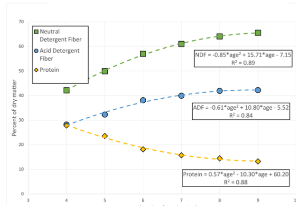
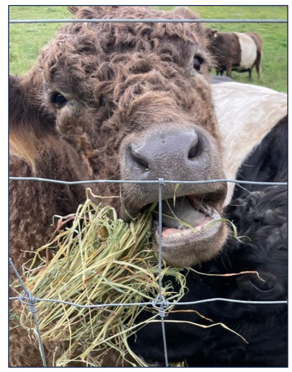


Figure 3. Mean crabgrass protein and fiber between four and nine weeks of age.

Variety differences in forage quality were small but consistent with both large crabgrass varieties (Quick N Big and Quick N Big Spreader) being better quality forages than southern crabgrass (Dal's Big River and Mojo) across a range of parameters (Figures 4 and 5).

Dal's Big River and Mojo had nearly twice as much regrowth as Quick N Big and Quick N Big Spreader and thus had higher yield in two-cut systems (Figure 6).



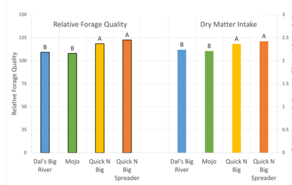


Figure 4. Mean boot stage crabgrass relative forage quality and dry matter intake by variety. Within each parameter, columns labeled with different letters are significantly different ($p < 0.05$).

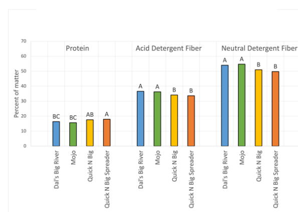


Figure 5. Mean boot stage crabgrass protein, ADF, and NDF content by variety. Within each parameter, columns labeled with different letters are significantly different ($p < 0.05$).

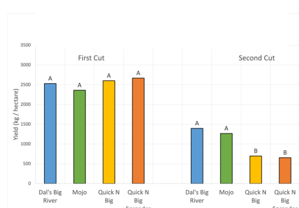


Figure 6. Mean boot stage crabgrass yield by variety at first and second cut. Within each cut, columns labeled with different letters are significantly different ($p < 0.05$).

Applying nitrogen after the first cut improved yield by 50% and protein content by 15% in the regrowth (Figure 7 and 8). Increased nitrogen (above 56 kg N ha^{-1}) did not increase first-cut yield but did increase protein content by 13% (Figure 8).

The varieties did not respond differently to nitrogen fertilization.

While yield was much lower in the regrowth, the forage quality was better with higher protein, and lower fiber leading to 12% higher dry matter intake and 15% higher relative forage quality (Figure not shown).

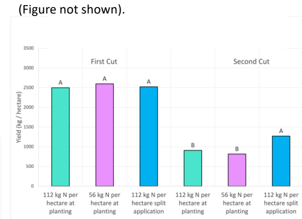


Figure 7. Mean boot stage crabgrass yield by nitrogen treatment at first and second cut. Within each cut, columns labeled with different letters are significantly different ($p < 0.05$).

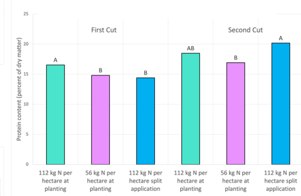


Figure 8. Mean boot stage crabgrass protein content by nitrogen treatment at first and second cut. Within each cut, columns labeled with different letters are significantly different ($p < 0.05$).

Conclusions

Both large and southern crabgrasses are viable summer annual forages in the Northeast US.

3000 kg ha^{-1} of dry matter can be grown in six to seven weeks with relative forage quality over 100 and more than 15 percent protein.

Highest yields are achieved by planting between mid-May and mid-June.

56 kg N ha^{-1} per forage harvest is sufficient for forage production.

Large crabgrass has moderately better forage quality than southern crabgrass but southern crabgrass has better regrowth potential.

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