2022 Summer Annual Mixtures Trial

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2022 SUMMER ANNUAL MIXTURES TRIAL
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Warm season grasses, such as sudangrass, and millet can provide quality forage in the hot summer months, when cool season grasses enter dormancy and decline in productivity. However, these grasses require lots of nitrogen which can be very costly, especially in organic systems. Adding a legume into the mixture with these grasses could help lower the nitrogen requirement of the crops and potentially increase protein content of the forage. However, the competitive nature of the grasses makes it challenging to establish an adequate balance without sacrificing yield or increasing costs from seed. To identify adequate seeding rates of summer annual grass/legume mixtures, the UVM Extension Northwest Crops and Soils Program conducted this trial to evaluate the yield and quality of warm season annual grass/legume mixtures.

MATERIALS AND METHODS

A trial was initiated at Borderview Research Farm in Alburgh, VT on 2-Jun. Plots were managed with practices similar to those used by producers in the surrounding area (Table 1). Twenty treatments consisting of different mixtures of summer annual grasses (sudangrass or pearl millet) and legumes (crimson or red clover) were compared (Table 2). Plots were seeded with a Great Plains cone seeder. Approximately 50 lbs N was applied in the form of urea (46-0-0) on 12-Jul. Prior to harvest, heights of both the grass and legume species present in each plot were measured.

Table 1. General plot management, 2022.

Trial Information	Borderview Research Farm-Alburgh, VT
Soil Type	Benson rocky silt loam
Previous crop	Sweet potatoes
Planting date	2-Jun
First harvest date	22-Jul
Second harvest date	25-Aug
Tillage methods	Pottinger TerraDisc

Plots were hand-harvested by cutting the forage growing within a 0.25 m^2 quadrat in each plot to a height of 5" on 22-Jul and 25-Aug. The material in each plot was sorted into summer annual grass, legume, and weed fractions. Each fraction was weighed and a composite sample of each planted species and an overall composite sample of weeds were weighted and dried to determine dry matter content.

Table 2. Summer annual mixture seeding ratio treatments, 2022.

| Grass species | Legume species | Seeding rate (lbs ac^{-1}) | | Seeding ratio |
		Grass	Legume	Grass : Legume
Sudangrass Variety: AS 9301	Red clover Variety: Alta-Swede	0	12	0:100
		7.5	9	40:60
		15.0	6	70:30
		22.5	3	90:10
		30	0	100:0
Sudangrass Variety: AS 9301	Crimson clover Variety: Dixie	0	15	0:100
		7.5	11.3	40:60
		15.0	7.5	70:30
		22.5	3.75	90:10
		30	0	100:0
Pearl Millet Variety: Prime 360	Red clover Variety: Alta-Swede	0	12	0:100
		6.25	9	40:60
		12.5	6	70:30
		18.8	3	90:10
		25.0	0	100:0
Pearl Millet Variety: Prime 360	Crimson clover Variety: Dixie	0	15	0:100
		6.25	11.3	40:60
		12.5	7.5	70:30
		18.8	3.75	90:10
		25.0	0	100:0

Results were analyzed using a general linear model procedure of SAS (SAS Institute, 2008). Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure where the F-test was considered significant, at $p < 0.10$.

RESULTS

Seasonal precipitation and temperatures, recorded with a Davis Instruments Vantage Pro 2 weather station with a WeatherLink data logger in Alburgh, VT, are shown in Table 3. Conditions at planting were good with warm temperatures and recent ample rainfall. However, following planting temperatures remained relatively low with elevated rainfall accumulating through June. By July, temperatures had increased and rainfall diminished. Over 80% of the total rainfall accumulated during July occurred in just three rain events. Similar conditions were observed in August with over 50% of the monthly accumulated rainfall occurring in just two rain events. Overall, there were a total of 1763 Growing Degree Days (GDDs) accumulated during these months, 95 fewer than the 30-year normal. While these summer annual forage species are relatively drought and heat tolerant, they typically do not perform well if those conditions are experienced during establishment or under cool conditions.

Table 3. Seasonal weather data collected in Alburgh,

Figure 1. Forage composition of total dry matter by grass : legume seeding ratio, 2022.

DISCUSSION

These data suggest that red clover and crimson clover are not suitable legumes to create well-balance mixtures with sudangrass or pearl millet. Even at the highest inclusions, minimal legume biomass was attained. Interestingly this year virtually all the mixture ratios resulted in a similar total yield with only slight changes in the proportions of grass, legume and weeds in the mixture. Due to wet cool weather the overall establishment and resulting yields were poor and weed pressure high. In general, however, perhaps the mixtures would have been more balanced had seeding rates of the grasses been lower than 6 lbs ac^{-1} coupled with legume rates over 10 lbs ac^{-1}, however, the reduction in total biomass may be too substantial compared to the cost of the seed in these instances. Different legumes that are better suited to the hot dry conditions, such as cowpea, may be a more suitable option, however, in years where conditions are cool and wet, no summer annual forage species will perform optimally.

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