Biomass and Forage Yield and Nutritive Values for Native Texas Bunchgrass

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Introduction:

The demand for fossil fuels has led to the search for renewable alternatives such as biofuels, which are of plant origin and can be cultivated or reused. For example, forages, typically used as livestock feed, can also serve as an alternative for biofuel feedstock. Depending on climate and prices, growers could sell to either market.

Pink Pappusgrass

https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_pabi2.pdf

Little Bluestem

https://www.nrcs.usda.gov/plantmaterials/txpmcrb13869.pdf

Seacoast Bluestem

https://www.nps.gov/places/seacoast-bluestem.htm

Trichloris

https://cales.arizona.edu/yavapaiplants/SpeciesDetailGrass.php?genus=Trichloris&species=crinita

Objectives:

- Evaluate the potential of Texas native bunchgrasses as:
  1. Forage
  2. Bioenergy Feedstock
- Compare two harvest (H) strategies
  1. Season-long forage (F)
  2. End-of-season biomass (BM).

Methodology

- Location: Kingsville, TX
- Three factors:
  1. Accession
  2. Harvest
  3. Year (environment)

- Dependent variables: dry matter yield and nutritive values

Results

Table 1. Forage (multiple harvests during the growing season) versus biomass (single season-end harvest) dry matter yields (kg/ha equivalent estimated from 2 plants) and forage: biomass (F: B) yield ratios of native bunchgrasses at Kingsville, TX, in 2021.

Kingsville 2021	Dry Matter Yield		
	Forage	Biomass	F:B
Big Bluestem Kenedy	597.69^{B}	30963.92^{AB}	0.194
Big Cenchrus 9111964	20100.00^{AB}	12116.32^{BC}	1.659
4-Flower Trichloras 91844	24816.33^{AB}	15751.21^{BC}	1.576
Seacoast Bluestem 9076898	6152.40^{B}	5250.40^{C}	1.172
Silver Bluestem 9093250	10648.15^{B}	4846.53	2.197
Switchgrass PMC	34964.29^{A}	41060.85^{A}	0.852
2-Flower Trichloris -	8110.43^{B}	8885.30^{C}	0.913
	P-Values		
Harvest	0.5092		
Accession	0.0056		
Harvest x Accession	0.2533		

^{ABCD} Denotes differences between values associated with main effects. Means with the same superscript do not differ.

Table 2. Forage (multiple harvests during the growing season) versus biomass (single season-end harvest) dry matter yields (kg/ha equivalent estimated from 2 plants) and forage:biomass (F:B) yield ratios of native bunchgrasses at Kingsville, TX in 2022.

Kingsville 2022	Dry Matter Yield		
	Forage	Biomass	F:B
Awnless Bush 9086291	8689.18^{AB}	-	-
Big bluestem Kenedy	3126.43^{AB}	3319.82^{A}	0.942
Big Cenchrus 9111964	1177.39^{AB}	-	-
4-Flower Trichloras 91844	635.21^{AB}	-	-
Indiangrass Yellow	2663.93^{AB}	-	-
Little Bluestem 9089176	1691.60^{AB}	7177.03^{A}	0.236
Pink Pappusgrass 9090520	8564.81^{AB}	4166.67^{A}	2.056
Seacoast Bluestem 9076898	6127.45^{AB}	-	-
Silver Bluestem 9093250	1373.21^{B}	-	-
Switchgrass PMC	12091.22^{A}	7142.86^{A}	1.693
2-Flower Trichloras -	1237.01^{AB}	-	
	P-Values		
Harvest	0.7814		
Accession	0.7232		
Harvest x Accession	0.6500		

^{ABCD} Denotes differences between values associated with main effects. Means with the same superscript do not differ.

Table 3. Average chemical and nutritional characteristics over Y1 (2021) vs. Y2 (2022).

Kingsville		ASH	C	N	NDF	ADF	ADL	IVTD
	Y1	7.18	44.42	1.10	74.92	42.53	5.91	45.33
	Y 2	7.56	44.69 ^{A}	0.99 $^{H x A}$	77.37 $^{H x A}$	43.38 $^{H x A}$	8.99	52.08 ^{H}

^{H} Denotes differences between Harvest values associated with main effects. Means with the same superscript do not differ.
^{A} Denotes differences between Accessional associated with main effects. Means with the same superscript do not differ.
$^{H x A}$ Denotes interaction between Harvest x Accessional associated with main effects. Means with the same superscript do not differ.

Conclusion:

Native Texas bunchgrasses show potential for dual use as forage and biofuel.