Pigeonpea: A Versatile, Drought-Resistant Crop for the Southern Great Plains

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Abstract
Pigeonpea [*Cajanus cajan* (L.)] is a drought tolerant legume originating in India and ranking sixth in production worldwide, compared to other grain legumes. The objective of this study was to evaluate the production potential of pigeonpea in the alkaline clay soils of the North Texas Blacklands. Four pigeonpea cultivars (Georgia One, Georgia Two, W-1, and W-3) were obtained from the University of Georgia, Tifton Campus. In 2005 and 2006, Georgia Two was planted in Houston Black clay that had previously received multiple applications of a low and high rate of municipal yard waste compost (YWC-Low and YWC-High, respectively) and an agronomic rate of biosolids (Bio). The amended soils were compared to un-amended native soil (Ctrl). Georgia Two biomass production in 2005 was 2113, 1733, 2629, and 2096 kg ha^{-1} for the Ctrl, YWC-Low, YWC-High, and Bio treatments, respectively, and in 2006, was 820, 943, 1963, 973 kg ha^{-1}, respectively. Greater biomass production for the YWC-High treatment was probably due to more rapid water infiltration into the clay soil. This effect was most pronounced in the 2006 growing season when growing conditions were unusually hot and dry. In another 2006 study, the four cultivars were planted into Houston Black clay at N fertility levels of 0 and 112 kg ha^{-1}. The cultivars were evaluated for forage and dry bean production. The W-3 cultivar produced significantly more forage than the other cultivars in unfertilized soil, but the effect was less apparent when fertilized with 112 kg ha^{-1} N. Georgia One and Georgia Two yielded more dry beans than W-1 and W-3 under both fertility levels. During the 2006 growing season, studies were conducted under rainfall deficit conditions with temperatures exceeding 32ºC for more than 115 days. This suggests that pigeonpea has potential as a low input crop, adaptable to various cropping systems in the Southern Great Plains.

Materials and Methods

Study	Experimental Design	Material
Soil Amendment: Houston Black clay Municipal yard waste Biosolids	Randomized block four replications	Georgia One pigeonpea cultivar Planting rate 11.2 kg/ha^{-1} 2005-2006
Forage and Grain Production: Georgia One Georgia Two W-1 W-3	Randomized block four replications	Houston Black clay N rate 0 and 112 kg N/ha^{-1} Planting rate 11.2 kg/ha^{-1} 2006-2007
Biological Chiseling/Palatability :	Randomized block four replications	Georgia One Georgia Two Pasture Aeroway ®

Fig. 1 Soil Amendment Georgia One September 2005

Data Collected 2005 –2006
- Plant Population
- Total Biomass
- Leaf/Stem Ratio
- Grain Production
- Tissue Analysis

Fig. 2 Forage and Grain Production October 2006

Data Collected 2006-2007
- Plant Population
- Forage Yield
- Forage Analysis N-P-K
- Grain Production
- Grain Analysis N-P K
- Leaf/Stem Ratio
- Phenotypic Characteristics

Fig. 3 Biomass from Run-off Plots

Data Collected-2007
- Plant Population
  ca 28,098plts/ha^{-1} on 16" rows
  ca 15,904plts/ha^{-1} on 16" rows
- Leaf/Stem Ratio
- Total Biomass
- Palatability

Objectives
Evaluate *Cajanus cajan* (L.) potential in the Southern Great Plains for use as a drought tolerant legume under various planting conditions.

Fig 4. Biomass from Soil Amendment Study.

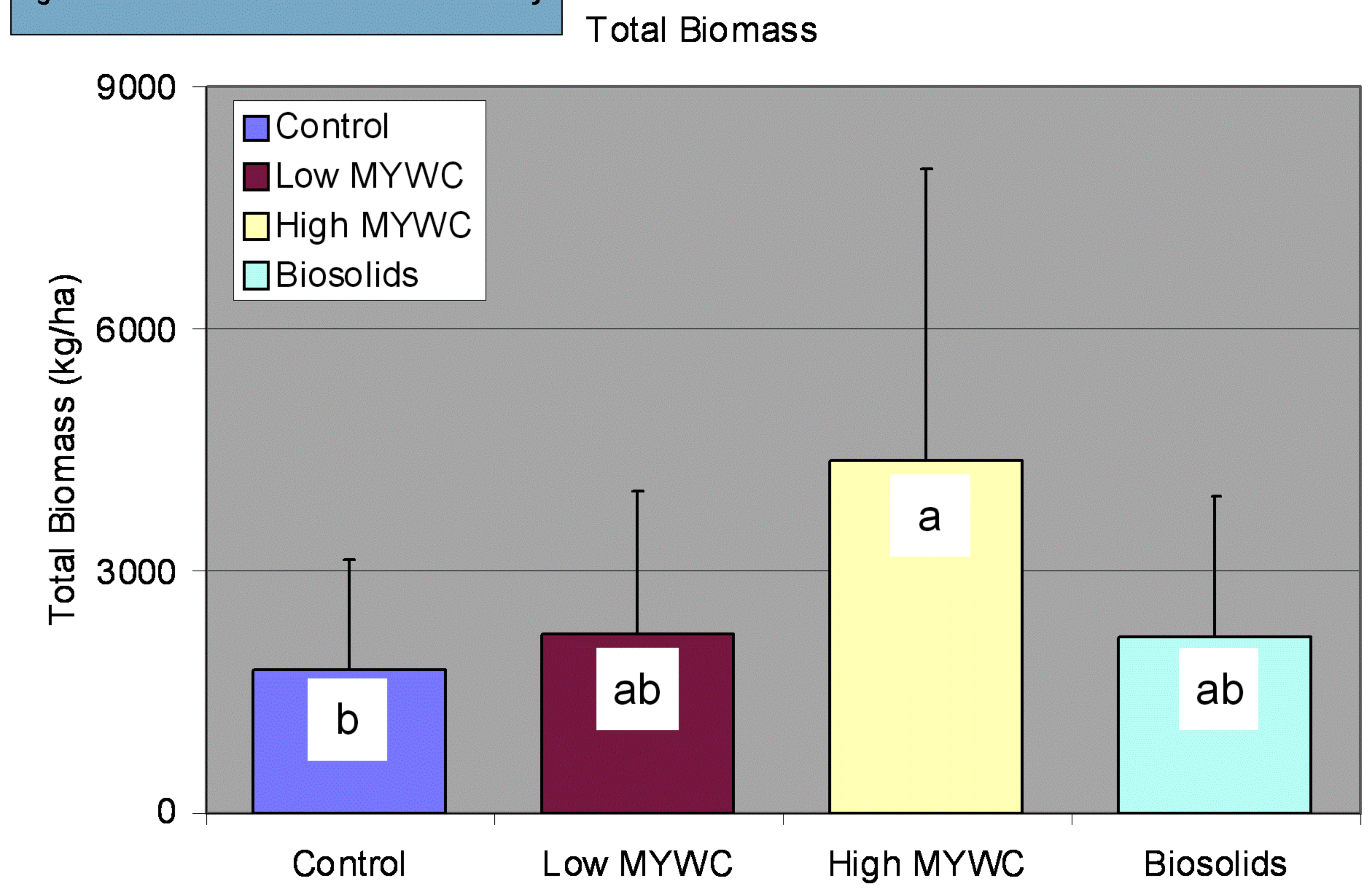

Table 1. Grain Characteristics Influenced by Nitrogen Application on Houston Black clay.

Cultivar	Grain N g/kg		Plant Population/100ft^2		Dry Pea Yield kg/ha-^{1}		
	- N	+N	-N	+ N	-N	+N	Mean
Georgia One	30.6	34.7	70 c	60 c	473 ab	540 a	506 a
Georgia Two	30.7	35.3	156 a	153 a	563 a	449 ab	506 a
W-1	35.8	33.9	39 d	34 d	277 b	362 b	319 b
W-3	32.0	30.3	98 b	83 b	247 b	374 b	311 b
Mean	32.3	34.0	91	82	390	431	

Growing season April—Dec 2006. Rainfall deficient of 8.91 inches April through August 2006.

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Table 2. Forage Yield of four pigeon pea cultivars grown in North Texas 2006. For each harvest month and nitrogen rate, means followed by the same letter are not significantly different (LSD, p<0.10).

Cultivar	Forage Yield (kg/ha^{-1})					
	August		November		Cumulative	
	- N	+ N	- N	+ N	- N	+ N
Georgia One	1756 b	1749 ab	1010	658	2766 ab	2407 a
Georgia Two	1514 b	1704 b	787	1058	2302 b	2762 a
W-1	1617 b	2286 a	633	913	2250 b	3199 a
W-3	2311 a	2067 ab	1098	963	3409 a	3030 a
Mean	1800	1952	882	898	2682	2849

Fig. 5. Pigeonpea 60 DAP on run-off plots with a 2% slope. Harvest Dates: August 2, September 12 and October 17, 2007

Fig.6 Pigeonpea August 2, 2007 harvest fed to cattle to establish pigeonpea palatability.

Fig.7 Pigeonpea consumed by cattle in 24 hour time period.