

Interception of Light by Crops

AGRON 590 MG: Crop-Soil Modeling

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Miscanthus more productive than Maize

More Productive Than Maize in the Midwest: How Does Miscanthus Do It? Frank G. Dohleman and Stephen P. Long (2009). *Plant Physiology*. Vol 150. 2104-2115. DOI: www.plantphysiol.org/cgi/doi/10.1104/pp.109.139162

Miscanthus and Maize

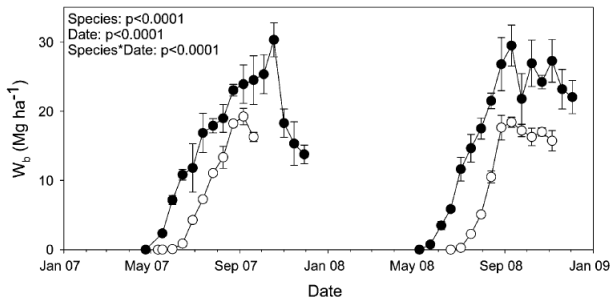


Figure 1. Accumulated aboveground dry biomass (W_b) of Miscanthus (black circles) and maize (white circles) over the 2007 and 2008 growing seasons. The intercept ($W_b = 0$) indicates the date of emergence for each crop in each year. Values represent arithmetic means \pm 1 SE ($n = 4$).

Miscanthus and Maize

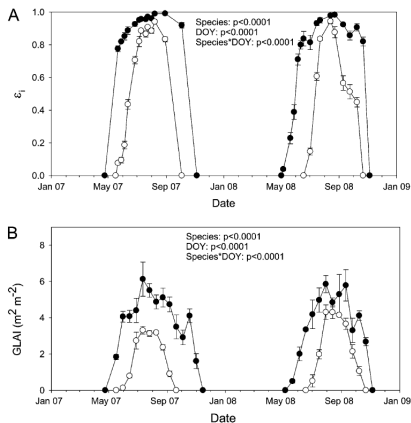


Figure 2. Radiation interception efficiency (ϵ_i) and GLAI of Miscanthus (black circles) and maize (white circles) over the 2007 and 2008 growing seasons. X-intercepts represent the dates of crop emergence and completion of senescence for each species in each year. Significant effects of species, date (DOY, day of year), and the species by date interaction are indicated by the P values.

Miscanthus and Maize

Table II. Annual interception and conversion efficiencies of maize and Miscanthus

Total annual incident PAR, interception efficiency (ϵ_i), total annual PAR_i, annual peak biomass yield (W_b), energy content of biomass (k), and conversion efficiency for aboveground biomass (ϵ_{ca}) for Miscanthus and maize canopies over the 2007 and 2008 growing seasons near Urbana, IL.

Year	Species	PAR	ϵ_i	PAR _i	W_b t ha ⁻¹	k	ϵ_{ca}
		<i>MJ m⁻²</i>		<i>MJ m⁻²</i>	<i>kg m⁻²</i>	<i>MJ/kg</i>	
2007	Miscanthus	2,693	0.55	1,491	30.3 (3.03)	18	0.039
2007	Maize	2,693	0.36	957	19.2 (1.92)	18	0.038
2008	Miscanthus	2,607	0.51	1,318	29.5 (2.95)	18	0.045
2008	Maize	2,607	0.29	752	18.4 (1.84)	18	0.048

Conclusions from this study

- We can conclude that one of the most important factors that controls how much biomass a crop produces is the amount of radiation that is intercepted during the whole growing season.
- This depends on LAI amount and duration.