



Biomass yield and composition of nine switchgrass cultivars in eastern Canada

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Introduction

- ✓ Switchgrass (*Panicum virgatum* L.) has been identified as a high-potential energy crop (Monti et al., 2008).
- ✓ The combustion of the densified biomass is presently the most sustainable approach to convert switchgrass into energy (Samson et al., 2005).
- ✓ High yield and low concentration of inorganic elements (e.g. K, Cl, ash) are the most important biomass characteristics sought for combustion (Nussbaumer, 2003; Orberner et al., 2006; Chandrasekaran et al., 2016).

The objective was to assess the extent of phenotypic variability for yield and inorganic element concentration (ash, Cl, and K) across nine switchgrass cultivars cultivated in eastern Canada

Materials & methods

Plant material:

- ✓ Seven switchgrass cultivars from USA and two populations developed in Canada (REAP-Canada)

	Origin	Latitude
Bluejacket II (BJ II)	Derived from Sunburst, QC, Canada	47° 01'N
Cave-In-Rock (CIR)	IL, USA	37°28'N
Dacotah	ND, USA	46°23'N
Forestburg	SD, USA	44°04'N
Nebraska 28	NE, USA	42°28'N
Shawnee	Derived from CIR, NE, USA	40°49'N
Southlow	MI, USA	42°28'N
Sunburst	SD, USA	42°50'N
Tecumseh	Derived from Summer, QC, Canada	47° 01'N

Experimental design:

- ✓ Five sites in Québec (Canada)

Sites	CHU*
Normandin	1823
La Pocatière	2123
St-Augustin-de-Desmaures	2404
St-Mathieu-de-Beloeil	2930
Ste-Anne-de-Bellevue	2935



*CHU: Corn Heat Unit

- ✓ Randomized complete block design with 4 replications
- ✓ Biomass yield: 3 post-seeding years (fall 2012, 2013, and 2014)
- ✓ Ash, Cl, and K concentrations: 2 post-seeding years (2012 and 2013)

Results & Discussion

Highest yield: BJ II, CIR, and Shawnee

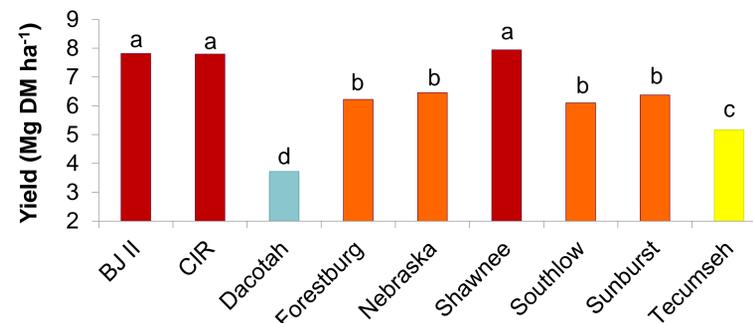


Fig. 1. Biomass yield of 9 switchgrass cultivars or populations averaged across 5 sites and 3 years

Highest ash concentration: Dacotah and Nebraska

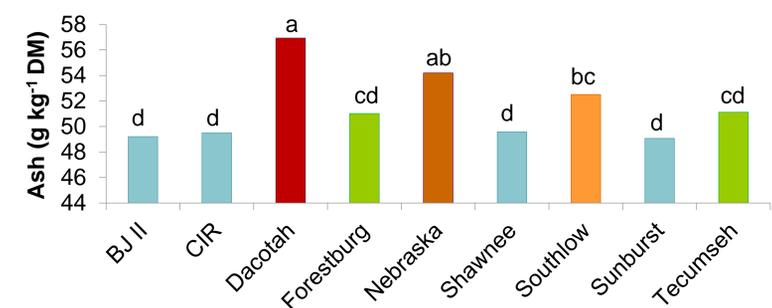


Fig. 2. Ash concentration of 9 switchgrass cultivars or populations averaged across 5 sites and 2 years

Highest Cl concentration: CIR, Shawnee, and Southlow

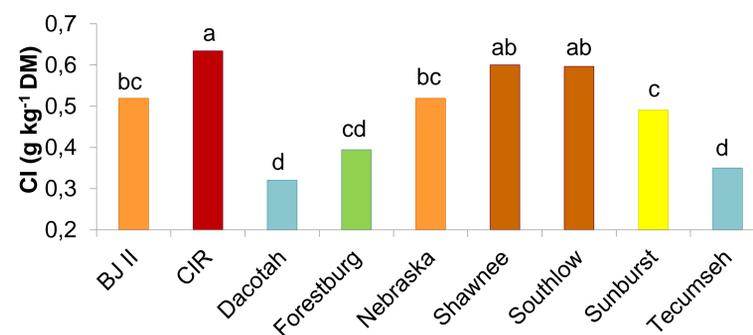


Fig. 3. Cl concentration of 9 switchgrass cultivars or populations averaged across 5 sites and 2 years

Highest K concentration: CIR, Shawnee, and Southlow

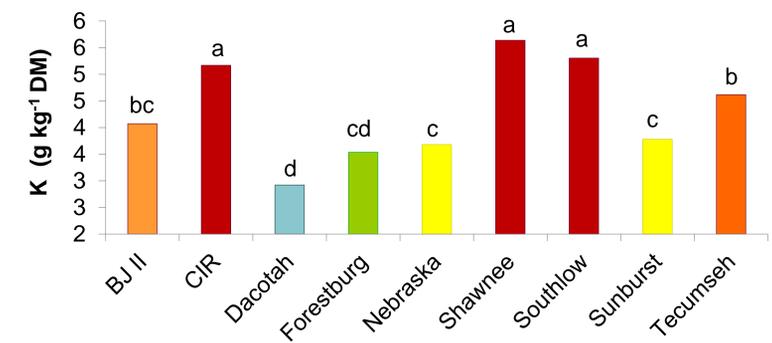


Fig. 4. K concentration of 9 switchgrass cultivars or populations averaged across 5 sites and 2 years

- ✓ Large variation in yield (3.7 to 7.9 Mg DM ha⁻¹) and concentrations of ash (49 to 57 g kg⁻¹ DM), Cl (0.32 to 0.63 g kg⁻¹ DM) and K (2.9 to 5.6 g kg⁻¹ DM) were observed among the nine cultivars or populations tested in eastern Canada.
- ✓ Bluejacket II, Cave-in-Rock and Shawnee had high biomass yield (Fig. 1) and low ash concentration (Fig. 2).
- ✓ Cave-in-Rock and Shawnee, however, had high Cl (Fig. 3) and K (Fig. 4) concentrations.

Conclusions

A large phenotypic variability exists in switchgrass for biomass yield and inorganic element concentrations, which could be used to develop new cultivars adapted to the climatic conditions of eastern Canada.

The high yield, low ash concentration and intermediate Cl and K concentrations observed in Bluejacket II makes it a particularly promising cultivar for combustion in eastern Canada.

References

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Acknowledgements

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