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Effect of cultivar on yield, chemical composition and British Thermal Unit content of three Switchgrass (*Panicum Virgatum L.*) cultivars

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Introduction

Switchgrass varieties with different sowing times and years of cultivation may change nutrient parameters, dry matter production and bio-fuel characteristics expressed as British Thermal Unit (BTU). The objective of this study was to report the effect of cultivar on dry matter yield, chemical composition and bio-fuel value of three Switchgrass (*Panicum Virgatum L.*) cultivars. Fossil fuel usage is a key human-related factor contributing to the production of green house gases. Biomass conversion into forms of energy is an old idea but one that is receiving increasing attention largely because of environmental, energy supply and agricultural market condition concerns (McCarl and Schneider 2001).

Methods

Switchgrass varieties and place of experiment

This experiment carried out for three consecutive years using three varieties of Switchgrasses (SWGs) including Carthage (CT), Cave In Rock (CIR), and Forestburg (FB) sown at three different seeding times (April 23, May 4 and May 13). The experiment was located in Chuncheon, Gangwon-do, South Korea. The average soil pH was 5.84 which is within the optimum soil pH range for SWGs.

DM, chemical composition and calories (BTU) where determined. Chemical composition of SWGs was analysed using AOAC procedure (1990). Calories were measured using a bomb calorimeter (PARR1261 soperibol, Kyoto, Japan). Then, a formula was used to convert the data to BTU.

Statistical analysis

Completely randomized block design was used with 3 Switchgrass varieties and 3 replications. Mean values of seeding time (April 23, May 4 and May 13) were reported in this paper. Statistical analysis was conducted using the GLM procedure of SAS (SAS institute 1999), and the means were compared for significance by LSD test at $P<0.05$.

Results

In the entire trial, CT showed the highest yield among the varieties (4.3, 17.6, 18.9 t/ha vs. 3.3, 21.2, 17.4 t/ha and 1.9, 16.2, 16.2 t/ha in CT, CIR and FB, respectively) except for the second year when CIR produced a higher yield. No differences were observed in chemical composition of SWGs in all years.

Crude protein, crude fiber, and fat content (Table1) were similar to that of rice straw (Standard tables of feed composition in Korea 2002). The difference between the SWGs and other bio-fuel sources were the higher calory (BTU) values in SWGs (Fig. 1) compared with wood pellets, wood chips, firewood and wood crop waste (Role of forest sciences for green growth 2010). There were no significant differences between SWG varieties in BTU. Thus, in the results we reported the average BTU.

Conclusion

As a result, it seems that CT is a suitable fodder to be cultivated for bio-fuel utilization compared with other SWGs

Table 1: Chemical composition according to cultivar and mean of seeding time (April 23, May 4 and May 13)

Cultivar[1]	Year	DM%	Chemical composition (% DM basis)						
			Ash	CP	EE	CF	NFE	NDF	ADF
CT	1	79.4	6.2	4.1	1.4	30.1	58.1	73.8	41.5
	2	78.4	4.2	4.3	1.2	37.3	53.0	77.8	47.7
	3	-	3.8	2.5	0.9	43.4	49.3	85.5	55.9
CIR	1	81.8	6.3	4.1	1.8	29.7	58.2	74	42.3
	2	79.3	4.2	4.1	1.1	36.1	54.5	78.8	49.0
	3	-	3.9	3.2	1.1	44.0	47.8	84.3	53.7
FB	1	84.4	6.5	3.1	1.6	30.3	58.6	77.1	45.3
	2	81.5	4.3	3.7	1.0	36.9	54.2	79.6	51.4
	3	-	4.1	3.9	0.8	39.7	51.4	83.1	51.9

[1] Switchgrass varieties were Carthage (CT), Cave In Rock (CIR), and Forestburg (FB)

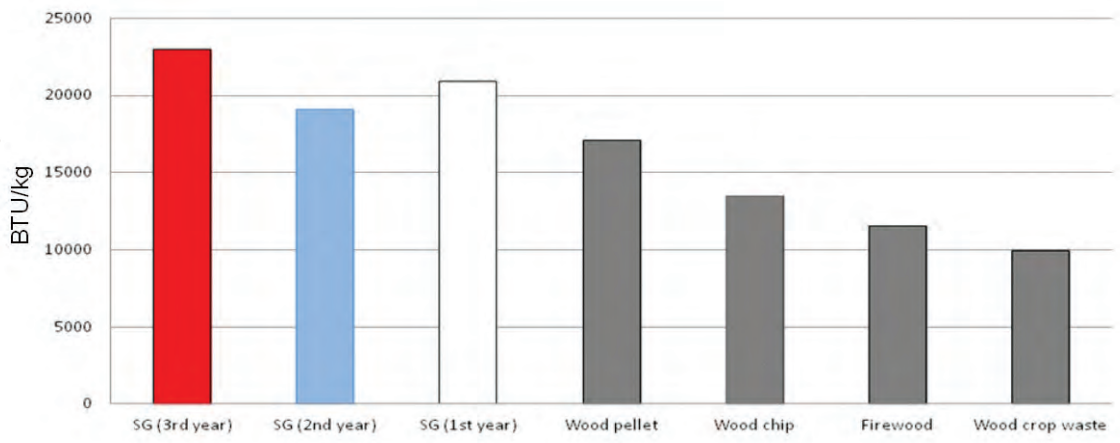

Figure 1. British Thermal Unit content (BTU/kg DM) of Switchgrass (mean of 3 varieties) according to seeding time compared with alternative biofuels.

in this experiment as it produces more dry matter yield than other SWGs. Therefore, when there is a lack of forage in Korea, we can use SWGs as a source of bio-fuel especially the variety Carthage.

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