Società Italiana di Agronomia
50° Convegno Nazionale

Evoluzione dei sistemi agronomici in risposta alle sfide globali

Udine, 15-17 settembre 2021

First harvest results of reduced and well-watered perennial grass clones, species and hybrids

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Introduction

Bioenergy perennial grasses (BPGs) are efficient from a water perspective and can afford a low-energy cultivation system; however, crop selection and cultivation practices for minimizing land use change and maximizing resource use efficiencies remain a challenging task. This work screened a diverse panel of new Miscanthus hydrid selected for drought tolerance, Arundo donax clones and one clone of Saccharum spontaneum spp. aegyptiacum to identify which types could maximize yield under summer drought conditions typical in the South Mediterranean. Results from first year harvest are reported.

Materials and Methods

Plantlets of seed-based Miscanthus hydrid (GNT3 and GNT43) and clones from rhizomes of Miscanthus x giganteus – MxG (provided by Terravesta Assured Energy Ltd., Lincoln, UK), Arundo donax clone Piacenza - ARPI (provided by University Cattolica Sacro Cuore, Italy), clone Catania (ARCT), clone Marocco (ARMO) and one clone of Saccharum spontaneum spp. aegyptiacum – SAC (all collected at the Experimental Farm of the University of Catania, Italy) were hardened in a glasshouse at the Experimental Farm of the University of Catania, Italy (10 m a.s.l., 37°24' N lat., 15°03' E long) before transplant on field.

Establishment was carried out on May 2020. The irrigation was scheduled from June to the end of August supplying ≈250 mm in well-watered and ≈150 mm in reduced watered. Fertilization was neither applied at transplant nor as a top dressing and weeds were controlled mechanically. Harvest was carried out on mid-March 2021 and representative wet subsamples were dried to a constant weight at 65°C to determine the subsample dry weight. Five representative stems from each plot were selected for morphological and yield traits and biomass components. Biomass dry yield and leaf mass ration (LMR) are reported in the present work. Data were analysed by two-way ANOVA and means were evaluated for significance using the Tuckey test at P≤0.05.

Results

Table 1. ANOVA for main effects and interaction on dry matter yield (DMY) and leaf mass ratio (LMR)

Source		DMY	LMR
	DF	AdjMS	
Rep	2	0.019	0.06
Species (S)	6	21.13***	1.09***
Irrigation (I)	1	14.63***	0.03ns
S x I	6	6.20***	0.12ns
Error	26	0.015	0.08

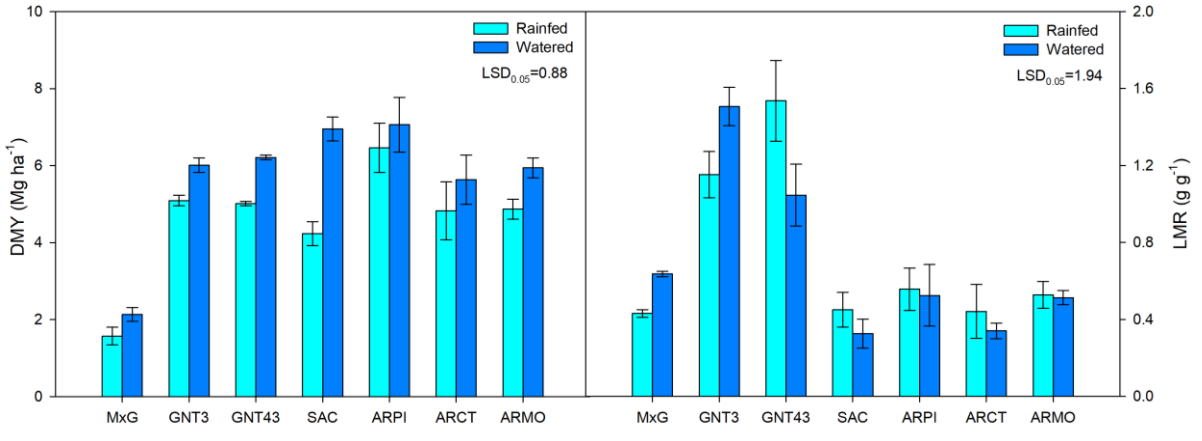

Figure 1. Biomass dry matter yield (DMY) and leaf mass ratio (LMR) of perennial grasses under well- and reduced-water conditions

Conclusions

Present first year results highlighted the effect of irrigation water at establishment to improve biomass yield of BPGs. Arundo donax confirmed its high productivity as compared to the other BPGs, however, the new seed based hybrids (GNT3 and GNT43) did not differ. The LMR was the highest in GNT3 and GNT43; this is an interesting trait for advanced bioconversions since leaves are poor in lignin while have a consistent amount of structural polysaccharides. This is the first time these new Miscanthus hydrid (GNT3 and GNT43) are grown in Sicily, therefore, it would be interesting to observe present trends next year, in more aged stands.

Acknowledgments: Progetto PRIN 2017 (Prot. 2017CCT75Y)