



PERFORMANCE OF SIDA HERMAPHRODITA AND SILPHIUM PERFOLIATUM IN EUROPE: PRELIMINARY RESULTS

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Objectives

Assessing the performance of *Sida hermaphrodita* L. Rusby (Virginia mallow) and *Silphium perfoliatum* L. (cup plant): two promising multipurpose perennial herbs which received little attention from researchers and practitioners until recently [1, 2, 3, 4].

Potential uses of these two crops include:

- alternative energy plant to corn for biogas production, and direct combustion; pollinator food
- basic compound for fibre products, particle or insulation boards, and substitute for turf.

Project Partners

- (1) Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (I)
- (2) West Pomeranian University of Technology in Szczecin (PL)
- (3) Consiglio Nazionale delle Ricerche (I)
- (4) Cranfield University (UK)
- (5) 3N Centre of Experts - Lower Saxony Network for Renewable Resources (D)
- (6) Albert-Ludwigs-University Freiburg (D)



Concluding remarks

- During the first two years of the study, Silphium produced higher amounts of biomass than Sida.
- Two harvests for biogas production are possible for both crops, the first in early summer and the second in early autumn.
- Biomass harvested in winter, particularly Sida, can be used for combustion in heating plants.
- Plants grown from seeds on an open field produce less biomass than plants grown from seedlings, especially in the case of Sida.
- Sida and Silphium are neophytes in Europe, and it is of crucial importance to assess their competitive and invasive potentials.

Methods and Materials

Sites:
 Lipnik in PL, Werite in D, Silsoe in the UK, Casale Monferrato and Montenero di Bisaccia in Italy.

Experimental design
 Randomized complete block or a Latin square design with 4 replications depending on the location; the experimental units have a surface area of about 100 m² to compare two provenances of Virginia mallow (Sida 1 and Sida 2) and one of cup plant (Silphium). The plots were split in two subplots. One (subplot a) was sown, and in subplot b, seedlings were transplanted.

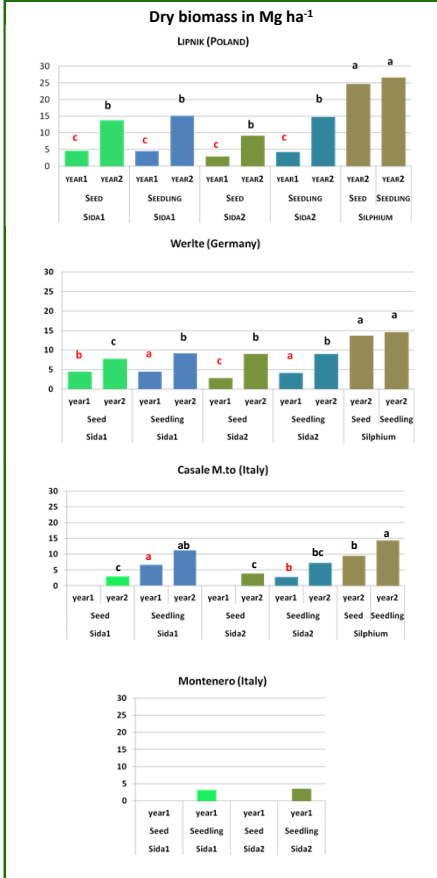
Cultivation
 Noteworthy aspects: Irrigation in Italy and the UK. Manual hoeing in the first month after establishment, mechanical and chemical weed control in subsequent year.

Harvesting
 To determine the biomass available for biogas production, harvests were performed in October of 1st year, and in July and October of the 2nd year. Harvests to determine the biomass for combustion was performed in February of each year. Silphium was harvested only in the 2nd year.

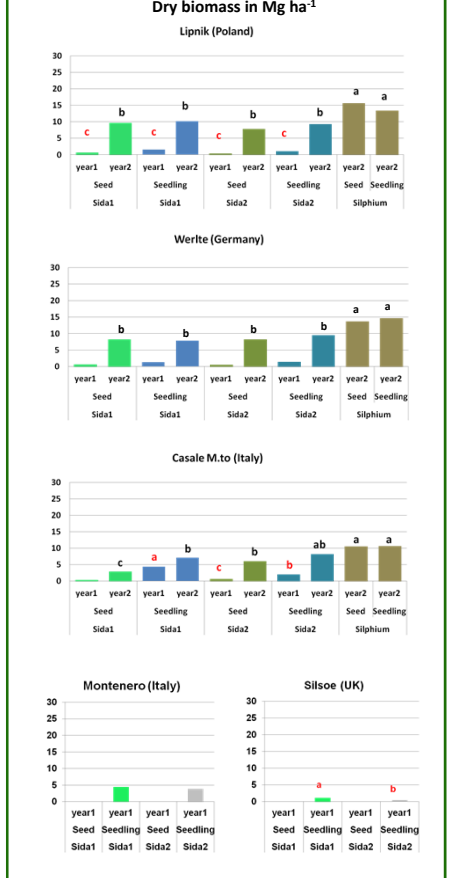


Top left: Flowers of *Sida hermaphrodita* with bee; top right: flower of *Silphium* with bumble bee; bottom left: producing *Sida* chips; bottom right: experimental *Sida* plot of Silsoe (UK).

Yields for biogas production



Yield for biomass combustion



References

[1] H. Borkowska, R. Molas R (2013). Yield comparison of four lignocellulosic perennial energy crop species. *Biomass and Bioenergy* 51, 145-153

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[3] M. Nahm, C. Morhart. Virginia mallow (*Sida hermaphrodita* (L.) Rusby) as perennial multipurpose crop: Biomass yields, energetic valorization, utilization potentials, and management perspectives. *Global Change Biology Bioenergy* (2018), doi: 10.1111/gcbb.12501.

[4] M. Gansberger, L.F.R. Montgomery, P. Liebhard. Botanical characteristics, crop management and potential of *Silphium perfoliatum* L. as a renewable resource for biogas production: A review. *Industrial Crops and Products* 63, (2015) 362-372.



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