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HALOPHYTE'S BIOMASS AS SOURCE OF RENEWABLE ENERGY IN MARGINAL LANDS

Karelinia caspia

Halostachys belangeriana

Halophytes are suggested as energy crops in arid saline lands.

Anaerobic digestion of some halophytes collected in the Kyzylkum desert (Uzbekistan) were studied in batch-mode tests in mesophilic (35^0C) and thermophilic (55°C) conditions with stirring and F/M=0.2.

Obtained results showed that halophytic biomass should be considered as a valuable renewable source of biogas.

Though high mineral content was detected in the biomass (i.e., Na^+, K^+, Cl^- and SO_4^{2-}), total biogas yields in results of anaerobic degradation were about 200-400 mL (at 35^0C) and 300-500 mL (at 55°C) from 1 gDM (with 60% of methane-gas).

Halophytic farm trial in Kyzylkesek, Central Kyzylkum

Atriplex nitens in farm trial

Total organic matter and organic carbon (OC) concentrations were determined to investigate plant biomass. Organic matter concentrations is observed between 736-900 mg VS/g DM. The highest organic carbon content found in biomass of *Suaeda paradoxa, Atriplex nitens, Karelinia caspia* and *Cynodon dactilon* were 243.9, 337.6, 394 and 396 mg OC/g DM respectively. Low OC content (about 200 mgOC/gDM) was measured in biomasses of *Salicornia, Halostachys* and *Climacoptera*.

Results indicated that 40-60% of total organic matter in halophyte biomass can be decomposed into biogas. The highest yield of approximately 300-500 m^3 of biogas from 1 t DM was produced from *Atriplex nitens, Karelinia caspia, Suaeda paradoxa* (and *Cynodon dactylon*). After considering annual biomass yield of the studied plants, their current use, and biogas generation measured in the laboratory, *Karelinia caspia* (wild associations or cultivated plantations) is recommended as one of the most promising renewable sources for biogas production in desert salt affected areas of Central Asia.

Salicornia europaea

Climacoptera lanata

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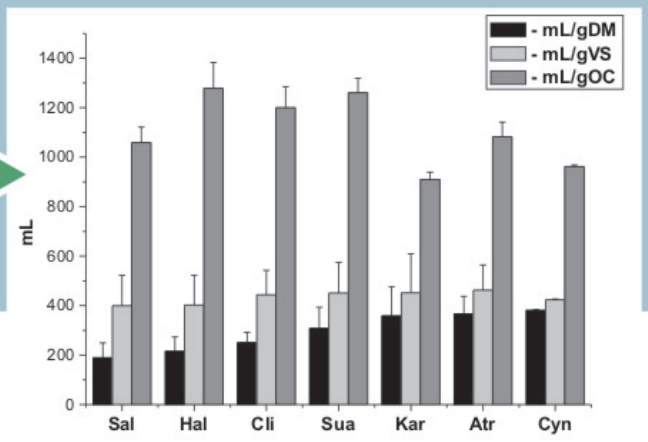
BIOGAS POTENTIAL OF HALOPHYTES

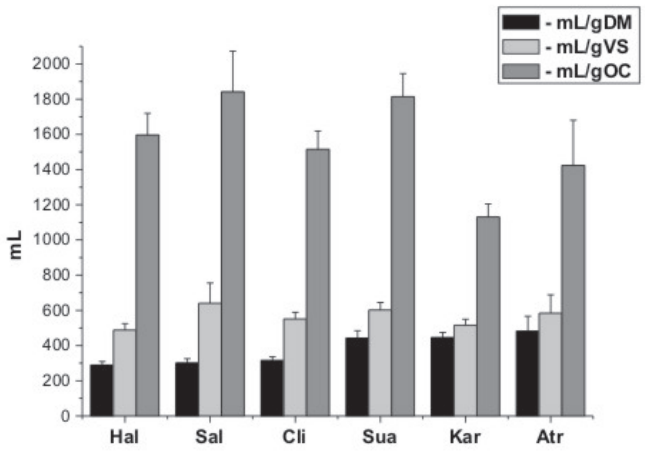
Anaerobic digestion of halophyte biomasses in batch-test mode experiments indicated that approximately 190-366 mL biogas (with 60% CH4) can be produced from anaerobic digestion of 1 g DM of halophytic biomass under mesophilic conditions.

Anaerobic decomposition of the biomass (at F/M=0.2) at 55°C took about 12-14 days, at 35°C, it took 21-26 days; and mean cumulative biogas yield of AD of halophytes at 55°C varied from 289 mL/g DM (Halostachys) to 481 mL/g DM (Atriplex).

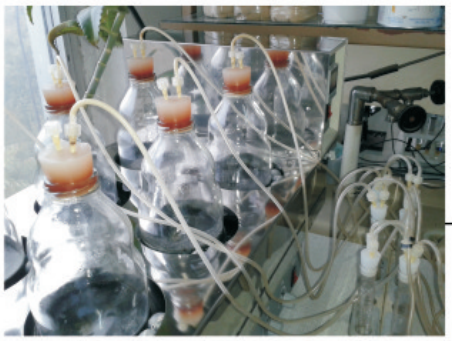
Suaeda paradoxa, Atriplex nitens and Karelinia caspia were recognized as the most productive halophytes among investigated plants in terms of biogas yield. With anaerobic decomposition of abovementioned plant biomasses, 190 mL, 366 mL, and 358 mL biogas was produced from 1 g DM at 35°C, respectively, and 300 mL, 481 mL, and 445 mL biogas was produced from 1 g of dry matter at 55°C, respectively.



at 35°C - 200-380 mL of biogas/1 gDM



at 55°C - 300-480 mL of biogas/1 gDM



Biogas potential of some halophytes in Central Asia

	Biogas yield in lab-tests (m^3/t DM)		Biomass production (tDM /ha/year)	Estimated biogas production** (m^3/ha/year)
	35°C	55°C		
Salicornia europaea	190	330	(15-20)*	(2850-3800)
Halostachys belangeriana	215	289	1-2	215-430
Climacoptera sp.	250	315	1-1.5 (20)	250 – (5000)
Suaeda paradoxa	308	443	4 (13)	1232-(4004)
Karelinia caspia	358	445	0.1-1.2	35.8-429.6
Atriplex nitens	366	481	6 (21)	2196-(7686)

*Actual data from plants under cultivation/irrigation is given in parentheses.
**Calculated for mesophilic conditions (35°C).

It is concluded that biomass of Karelinia caspia (Pall.) Less is one of the most promising sources for biogas production in Central Asia. Wild associations of the halophyte can be used as renewable source of alternative energy, and it can be planted in abandoned saline arid lands for improving and increasing their productivity.

Acknowledgements
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