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Publication date: 2013

Document Version Publisher's PDF, also known as Version of record

### Link back to DTU Orbit

Citation (APA):

Gunnarsson, I. B., Karakashev, D. B., & Angelidaki, I. (2013). *Succinic acid production from Jerusalem artichoke*. Poster session presented at EU BC&E 21st European Biomass Conference and Exhibition, Copenhagen, Denmark.

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# DTU

# Succinic acid production from Jerusalem artichoke tubers

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## Succinic acid

Succinic acid is currently produced from petro chemicals.





- Has applications in agricultural, food, chemical and pharmaceutical industries.
- A. succinogenes 130Z produces succinic acid in large amounts during fermentation.
- Theoretically consumes 1 mol CO<sub>2</sub> per 1 mol succinic acid produced.
- Could contribute to the abatement of CO<sub>2</sub> emissions at a time when  $CO_2$  levels in earth's atmosphere are at an all time high (>400 ppm).

- Root vegetables rich in inulin.
- Inulin is a D-fructose and D-glucose polysaccharide.
- **Poor digestibility in humans.** •
- Investigate using Jerusalem artichoke • tubers for producing succinic acid.



## Results

### **Fermentation of pure sugars (batch bottles):**

Succinic acid (SA) yield was 83% when D-glucose was the substrate compared to 72% yield SA when D-fructose was the substrate.

## Results

### **Fermentation of tuber hydrolysates:**

SA yield was 80.2% in bottles compared to 77.9% in 3-L bioreactor. However

the SA production was increased by 26.4% in 3-L bioreactor and the

D-glucose utilization was 93% compared to 88.5% D-fructose utilization.

		Glucose	Fructose
0 hours	Initial reducing sugar (g/L)	$48.0 \pm 0.5$	46.2±0.3
48 hours	Residual reducing sugar (g/L)	$3.4 \pm 0.2$	$5.4 \pm 0.1$
	Succinic acid (g/L)	37.2±0.6	29.4±0.1
	Formic acid (g/L)	$5.8 \pm 0.2$	7.0±0.2
	Acetic acid (g/L)	$8.2 \pm 0.1$	7.2±0.5
	Sugar utilization (%)	$93.0 \pm 0.5$	88.5±0.2
174	Succinic acid yield* (%)	$83.0 \pm 1.3$	72.0±0.5

D-fructose utilization increased from 68.5% to 96.5%.



# Conclusions

- This is the first report on the use of Jerusalem artichoke tuber hydrolysate as substrate for succinic acid production by A. succinogenes.
- Succinic acid was successfully produced, where the highest succinic acid concentration was 26.8 g/L and the highest succinic acid yield observed was 80.2%.

• A. succinogenes 130Z utilized both D-fructose and D-glucose in the tuber hydrolysates.

- The importance of pH control and its effect on D-fructose utilization during succinic acid production was clearly observed when results from batch bottles and 3-L bioreactor were compared.
- Jerusalem artichoke tubers as raw material for succinic acid production is a very attractive option compared to other types of biomass tested for succinic acid production.





EUROPEAN UNION European Regional Development Fund