

# EFFECT OF EXTRACELULAR HYDROLYTIC MATERIAL ON MICROBIAL POPULATION

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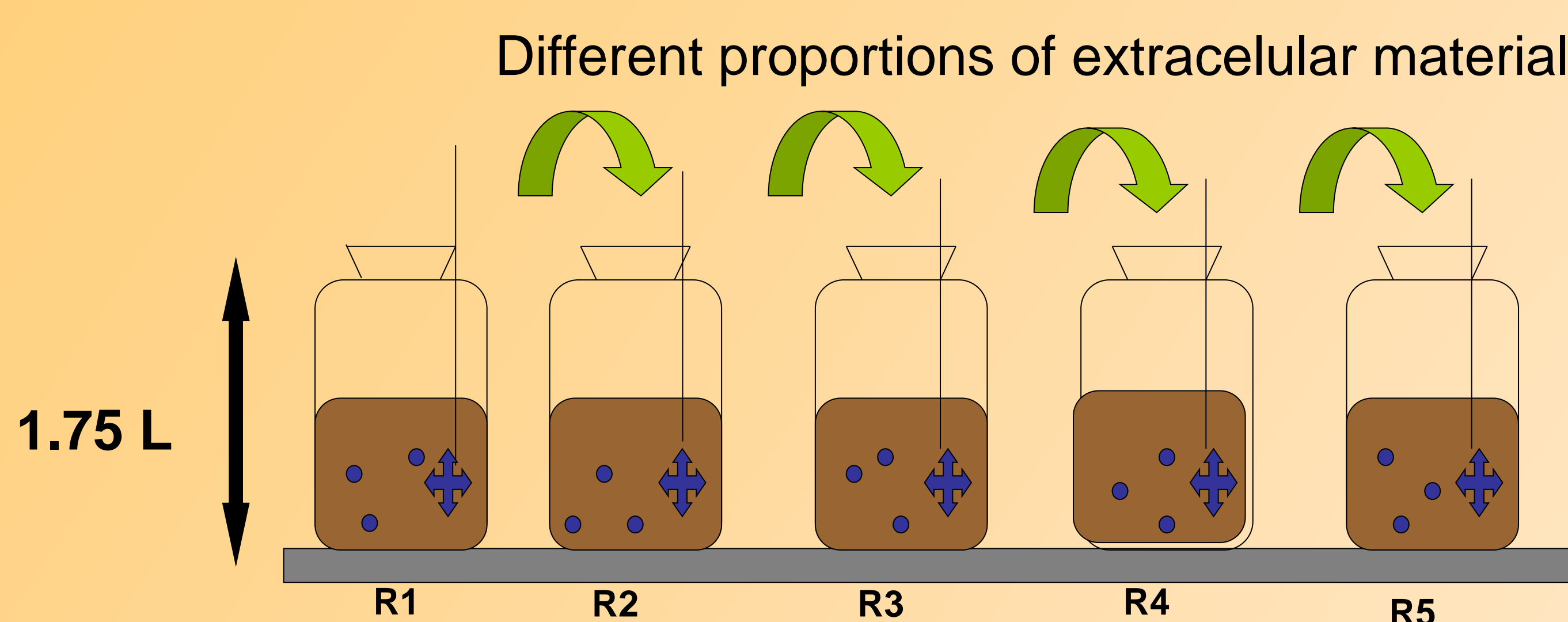
## Abstract

The addition of extracellular hydrolytic material resulting from a process of aerobic sludge digestion to a conventional activated sludge system, produces very encouraging results related to the reduction of sludge production.

Wastewater pollutants are much more difficult to degrade than simple soluble material, and, consequently, constitute part of the excess sludge. By solubilisation, colloidal and particulate organic material is converted into lower molecular weight soluble compounds that can pass through the bacterial cell wall, be used as food and be converted, in part into carbon dioxide and water.

In this study, we have established the operating conditions which result a higher solubilization of endoplasmatic material that have an effect on the reduction of sludge generated. The assays were realized in batch regime during a period of 24 hours, adding different concentrations of extracellular material.

## Material and methods



Physicochemical Parameters

- TSS , VSS (g/L)
- COD (mgO<sub>2</sub>/L)
- SOUR (mgO<sub>2</sub> / gSVS-d)
- Rate of microbial growth observed Y<sub>x</sub>/s (mg VSS / mg COD)

Microbiological Parameters

- Dehydrogenase activity (DHA)
- Esterase activity (FDA)
- Carbohydrate
- Proteins

## Results and discussion

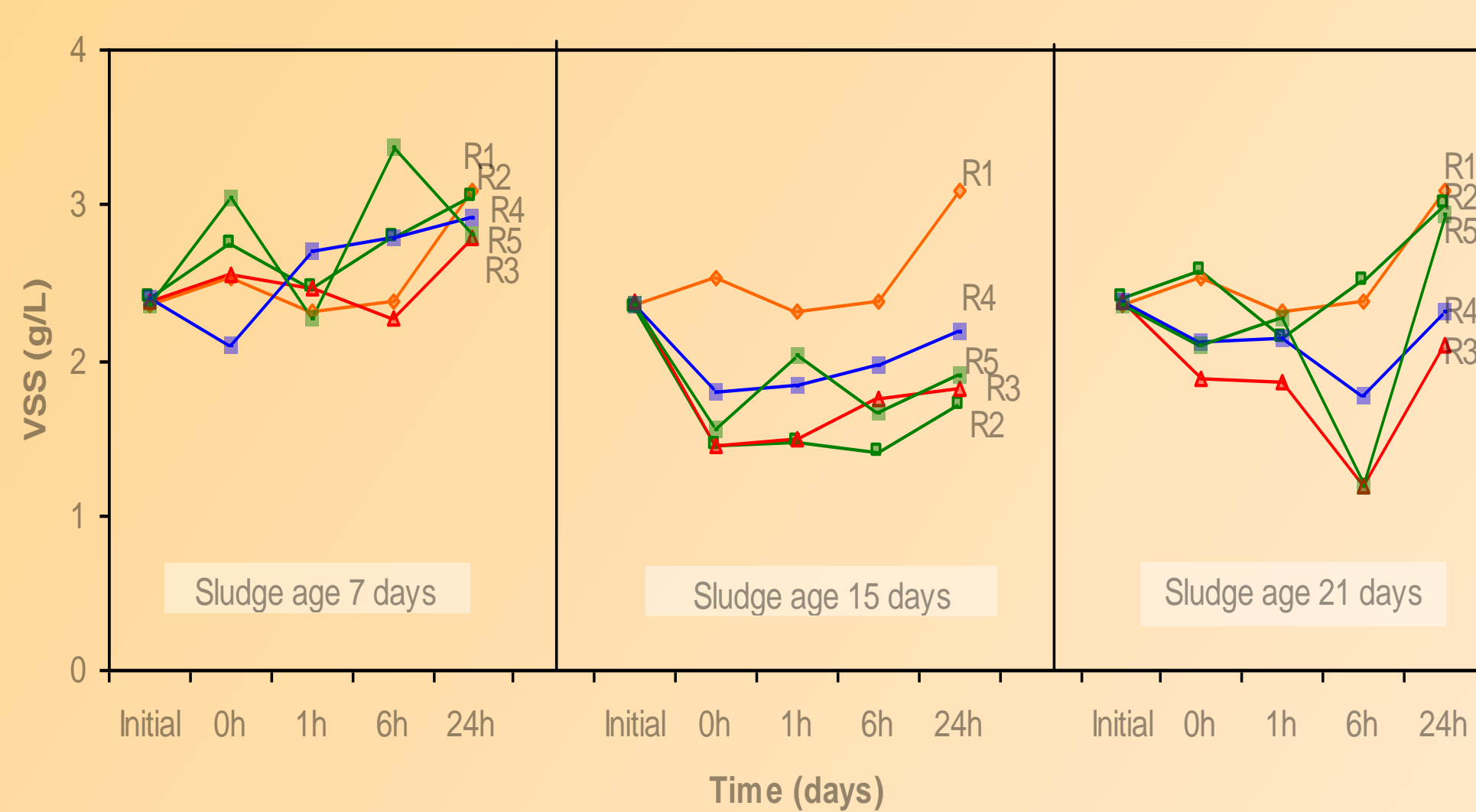


Figure 1. Evolution of suspended solid in reactors along assay. R1: Reference. R2: 10 % Digested Supernatant. R3: 30 % Digested Supernatant. R4: 10 % Digested sludge. R5: 30 % Digested sludge.

Figure 1 shows how solid values decrease quickly when extracellular material from the aerobic digester with sludge age of 15 days was added. This represents a very positive effect on the sludge production in a conventional activated sludge system.

Reactor	COD Reduction (%)	Growth of rate observed (mgVSS/mgCOD)	SOUR (mgO <sub>2</sub> /gSVS-d)				
			0 h	1h	5h	24h	
R1 CONTROL	48.40	2.39	227.37±0.04	519.34±0.05	445.89±0.04	124.26±0.04	
7 days	R2	63.78	0.77	200.00±0.04	245.85±0.04	213.43±0.04	71.05±0.05
	R3	60.89	0.72	264.56±0.04	248.78±0.04	264.42±0.04	77.91±0.04
	R4	54.71	2.71	209.14±0.04	192.00±0.04	246.86±0.05	54.25±0.04
	R5	55.20	0.77	255.79±0.04	284.21±0.04	161.89±0.04	66.38±0.04
15 days	R6	65.92	0.50	238.77±0.04	376.00±0.04	637.24±0.04	323.59±0.04
	R7	58.01	0.83	225.00±0.05	415.57±0.04	447.91±0.04	189.89±0.04
	R8	55.67	0.84	221.82±0.04	436.72±0.05	387.41±0.04	89.17±0.04
	R9	51.96	0.99	235.39±0.05	317.65±0.04	438.07±0.04	79.16±0.04
21 days	R10	48.76	1.37	235.00±0.04	288.71±0.04	162.46±0.04	197.26±0.04
	R11	46.58	0.82	137.14±0.04	249.08±0.04	235.97±0.04	193.26±0.04
	R12	52.68	0.61	221.80±0.04	252.34±0.04	154.58±0.04	222.30±0.04
	R13	43.18	4.16	409.95±0.04	247.40±0.04	348.00±0.04	166.53±0.04

Table 1. COD reduction, observed growth rate and specific rate of respiration in reactors during the essays.

The results shown in Table 1 confirm that the extracellular enzymes from aerobic digestion with a sludge age of 15 days added to the medium, positively affects the performance in reducing the COD of the system. This is because hydrolytic enzymes and exopolymers produced in a unit of aerobic digestion, solubilize the colloidal and particulate organic matter.

The lower growth of rate observed during the essays, occurs in the reactor in which a higher percentage of COD removal is produced (26%), resulting an important consumption of organic matter associated with a decrease in the growth of the sludge.

The increase occurred in the specific rate of respiration in this reactor, is probably caused by a significant decrease in biomass.

## Conclusions

- The results obtained show that a digestion period of 15 days, produce a material containing a large amount of exoenzymes that favor the reduction of biomass generated in the activated sludge system.
- The addition of extracellular material from the aerobic digester can limit the growth of microorganisms in the environment without significantly reducing the process yield.

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## Acknowledgements

The Authors wish to express their gratitude to NOVEDAR\_Consolider Proyect CSD2007-00055 and to municipal wastewater treatment plant of Jerez de la Frontera (Cádiz. Spain) for their valuable help in the analytical work done.