Detergent assisted lipid extraction for biodiesel

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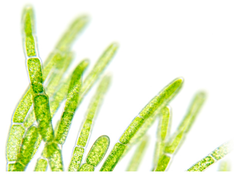
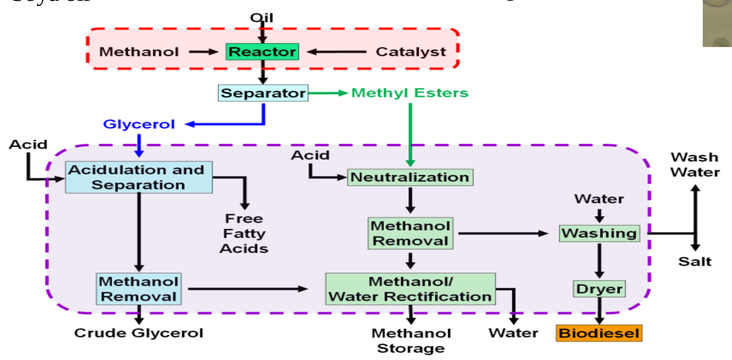
Background

Soya oil

Animal fats

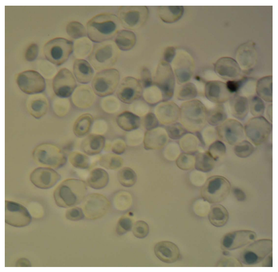


Algae oil

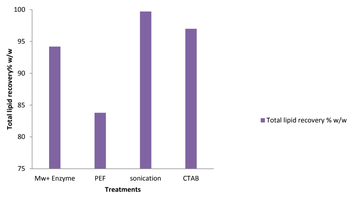


Schematic diagram of Biodiesel production

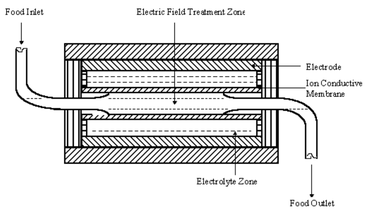
Problems



Oleaginous yeast oil



Literature- Comparision of different treatments



Pulse Electric Field

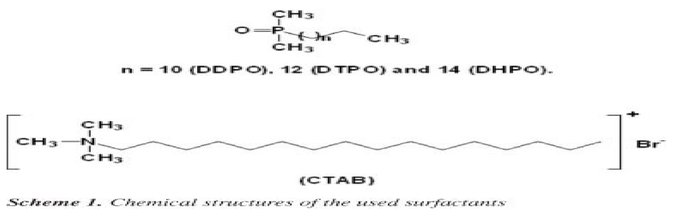
Microwave

Sonication

Objective

Response surface methodology

- ❑ Four important parameters
- N-LS concentration
- N-LS volume
- Incubation time
- Incubation temperature



Scheme 1. Chemical structures of the used surfactants

Experimental design

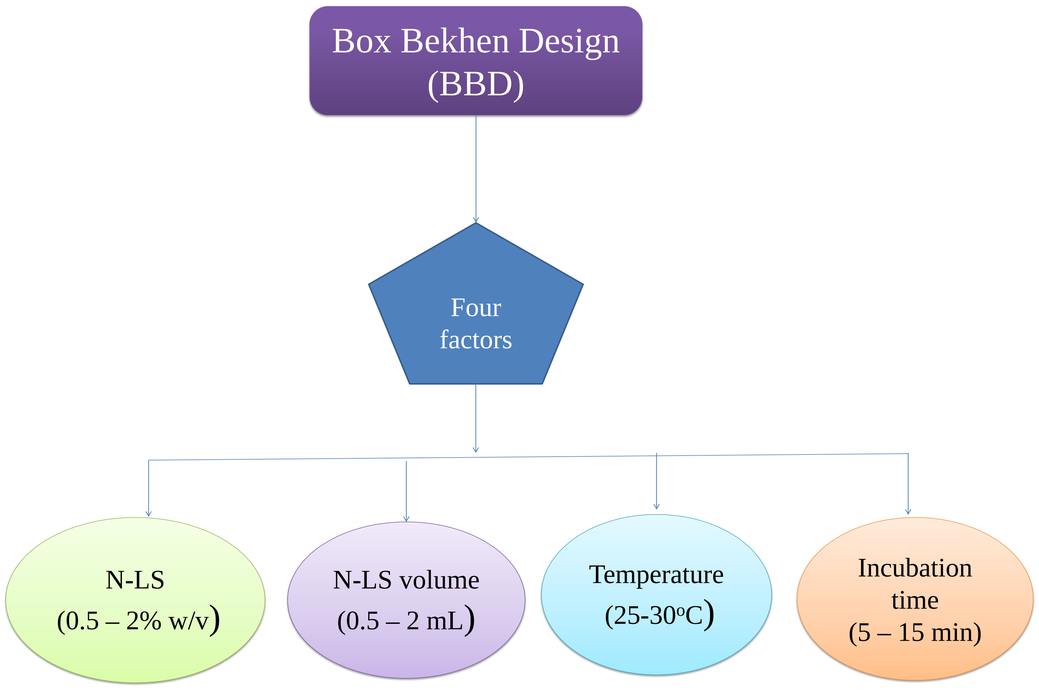


Figure 1: Experimental design using Box Bekhen design

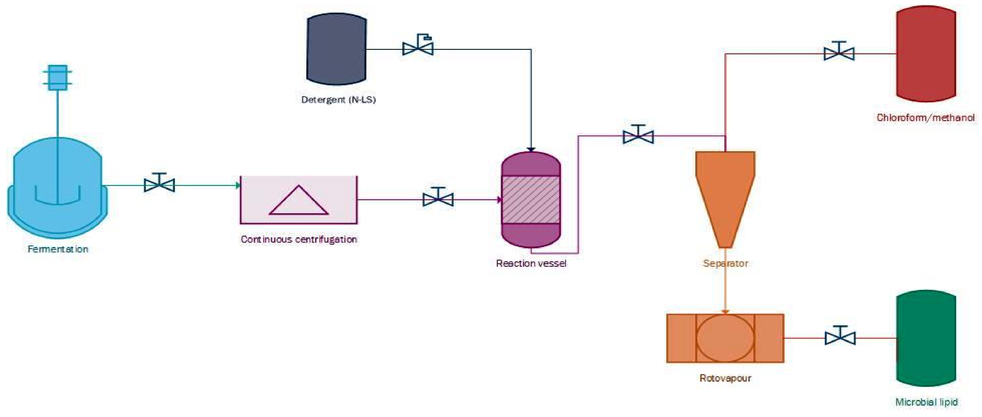
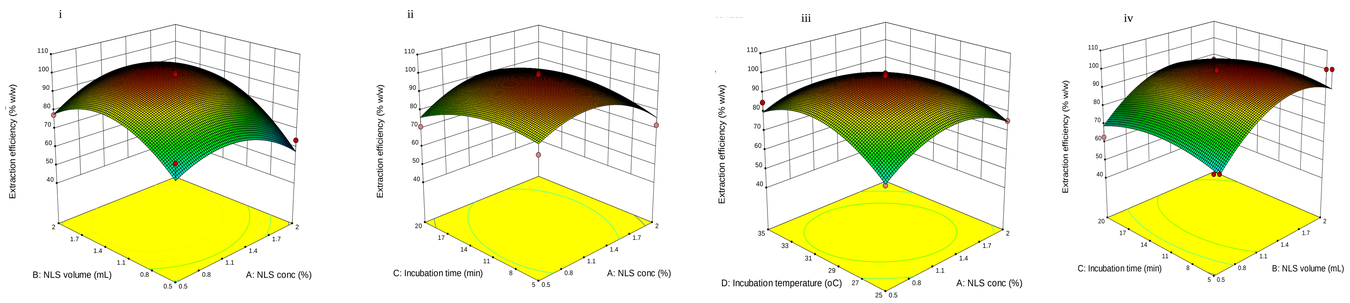
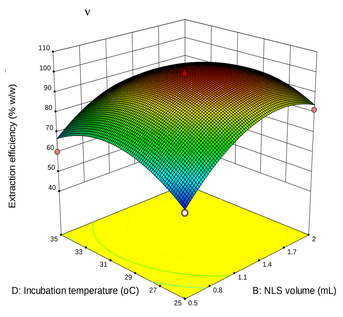


Figure 1: Process flow diagram

Results

Figure 2: Response surface plots for lipid extraction efficiency (%w/w) at varying concentrations





i) NLS conc and NLS volume
ii) NLS conc and incubation time
iii) NLS conc and incubation temperature
iv) NLS volume and incubation time
v) NLS volume and incubation temperature
vi) Incubation time and incubation temperature

Fatty acids	Relative amount of total fatty acid (% w/w)	
	Conventional chloroform methanol (2:1 v/v)	N-lauryl sarcosine + chloroform/methanol
Palmitic acid (C16:0)	17.2	16.2
Palmitoleate (C16:1n7)	0.3	0.3
Stearic (C18:0)	5.1	4.5
Oleic (C18:1n9)	45.6	42.5
Vaccenic (C18:1n7)	1.2	1.1
Linoleic (C18:2n6)	24.7	30.2
Linolenate (C18:3n3)	1.3	1.5
C23:0	4.6	3.7

Table 1: Comparison of fatty acid profiles between conventional and N-lauryl sarcosine assisted lipid extraction processes

Conclusion

N-lauryl sarcosine aided cell disruption and lipid release from the cells followed by lipid extraction using a lower volume of chloroform and methanol (1:1 v/v) revealed a high lipid extraction efficiency of 98.2% (w/w)

References

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Vicente G, Bautista LF, Rodríguez R, Gutiérrez FJ, Sádaba I, Ruiz-Vázquez RM, Torres-Martínez S & Garre V (2009) Biodiesel production from biomass of an oleaginous fungus. *Biochemical Engineering Journal* 48(1):22-27.