

# Fermentation at high-pressure of CO<sub>2</sub> and H<sub>2</sub> for acetone production by modified *Acetobacterium woodii*.

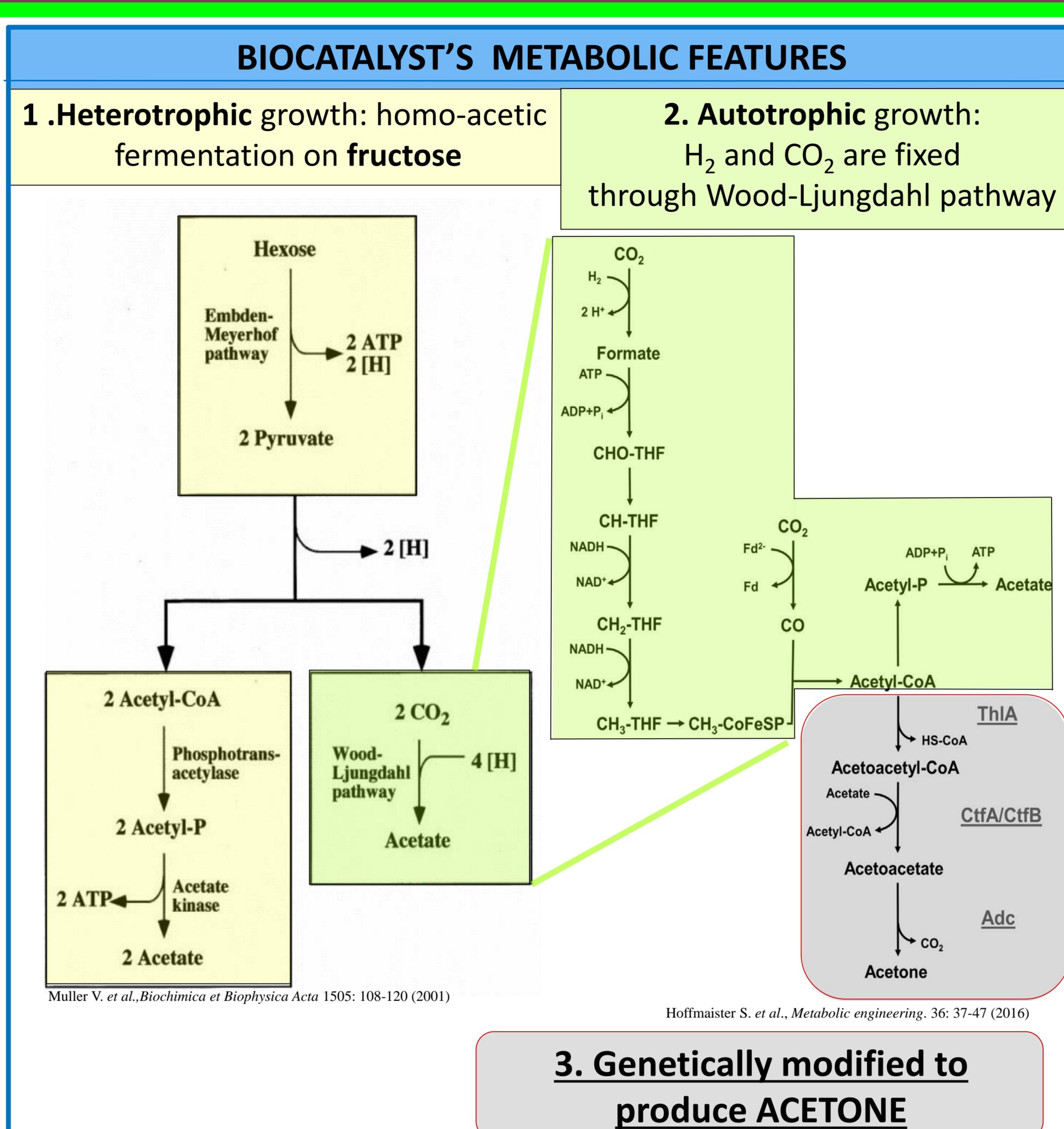
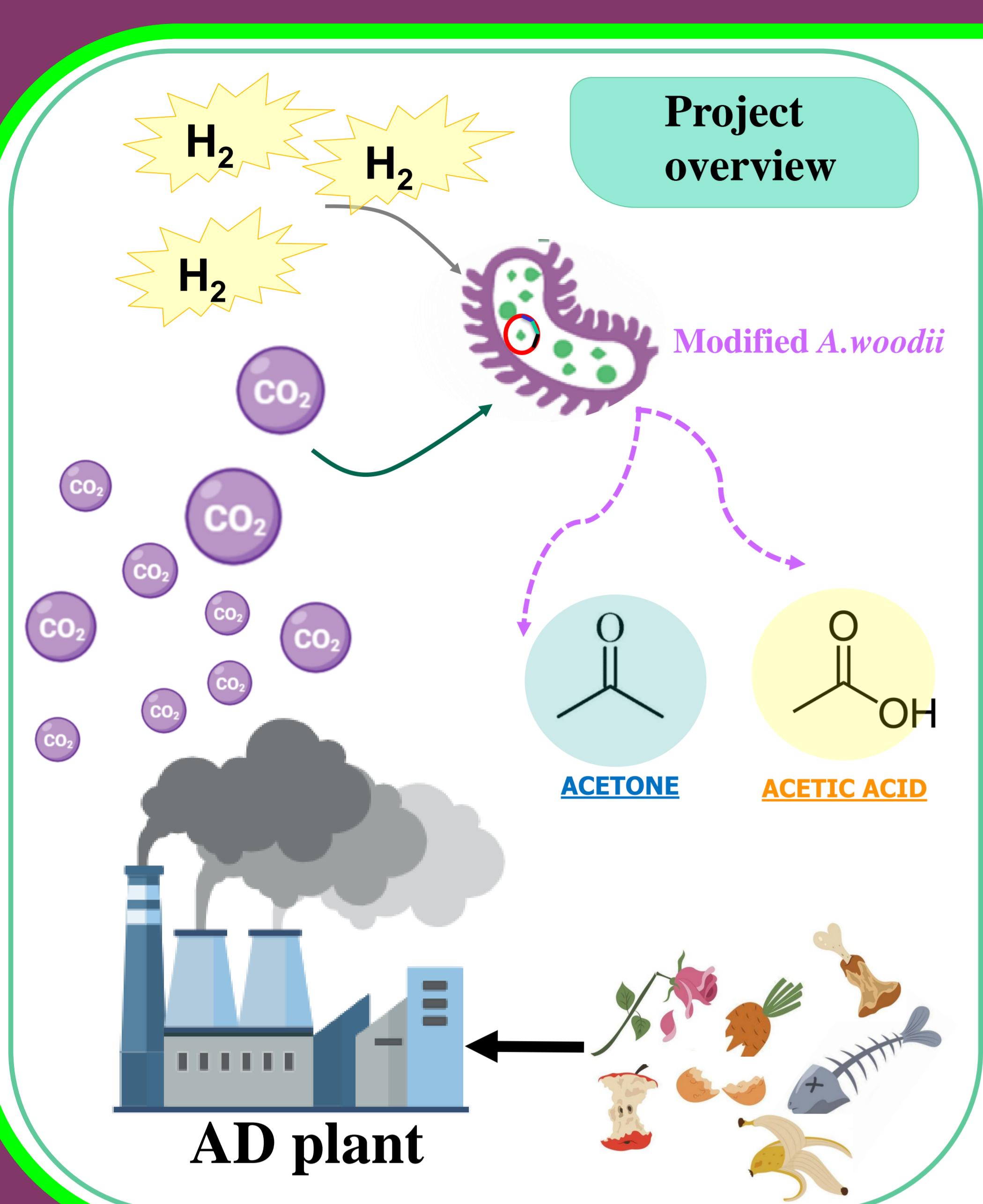
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Synthesis of acetone from CO<sub>2</sub> and renewable H<sub>2</sub> with modified *Acetobacterium woodii*

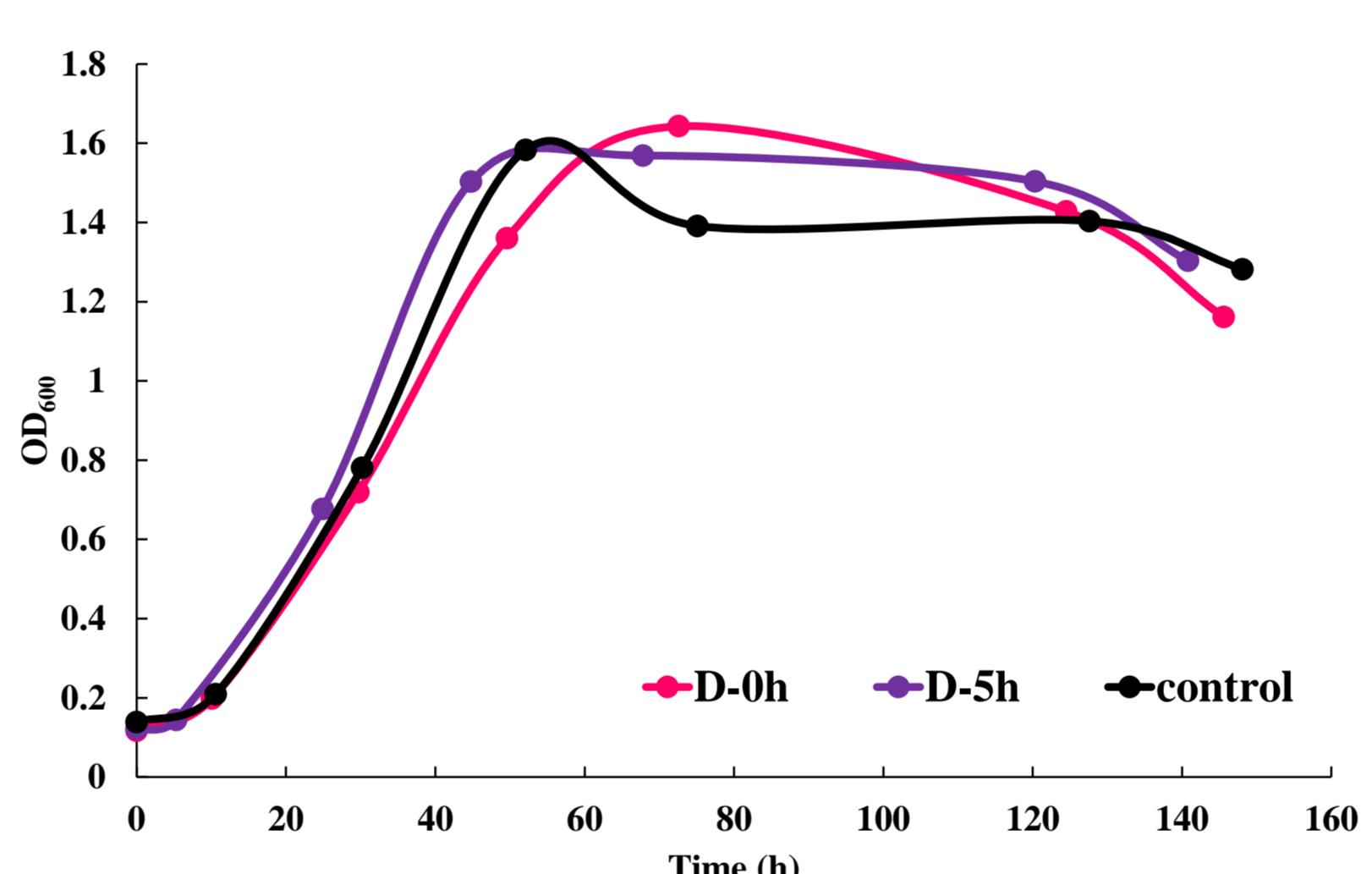
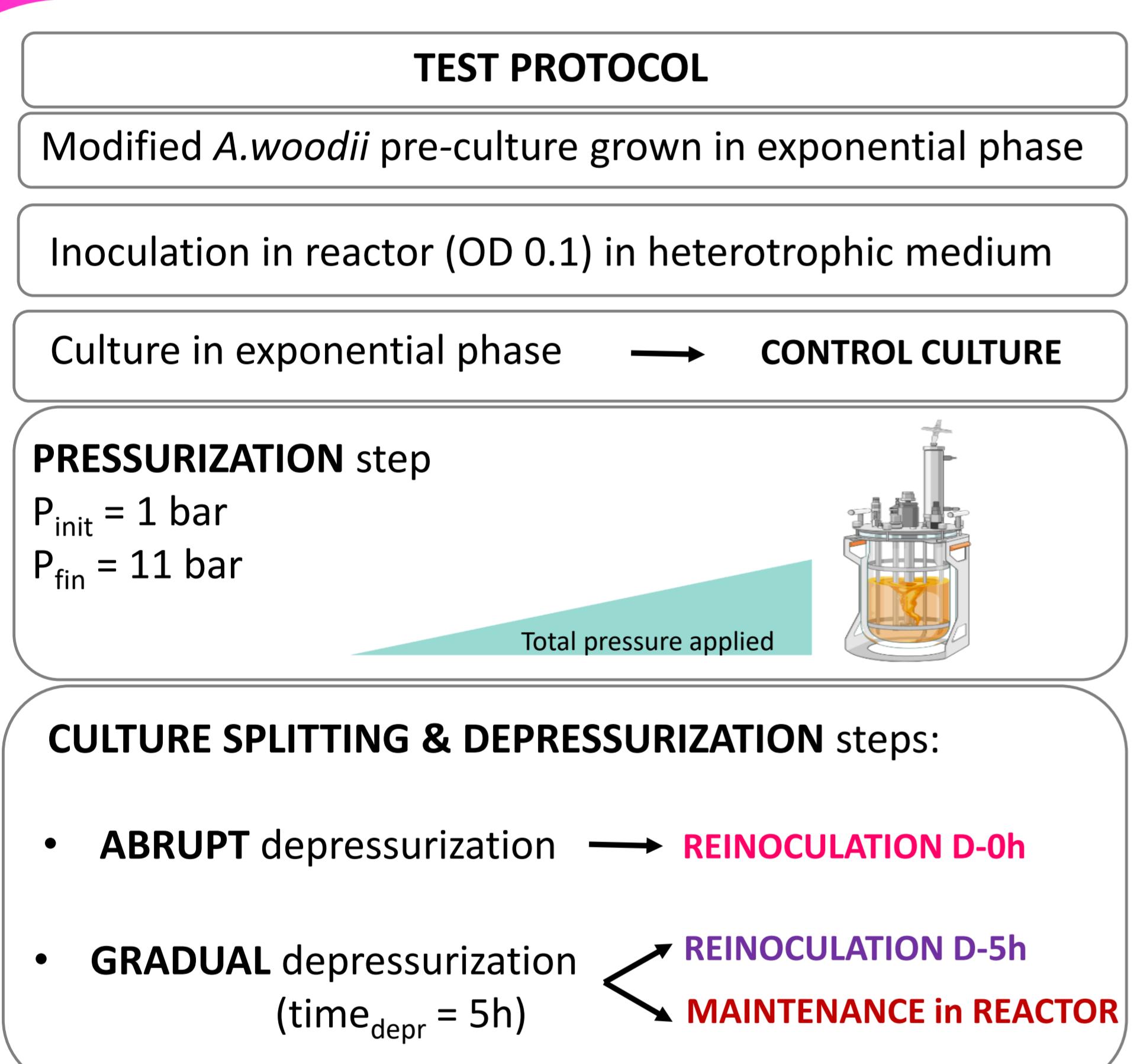
Challenge

H<sub>2</sub> and CO<sub>2</sub> have low mass transfer rate in liquid solution

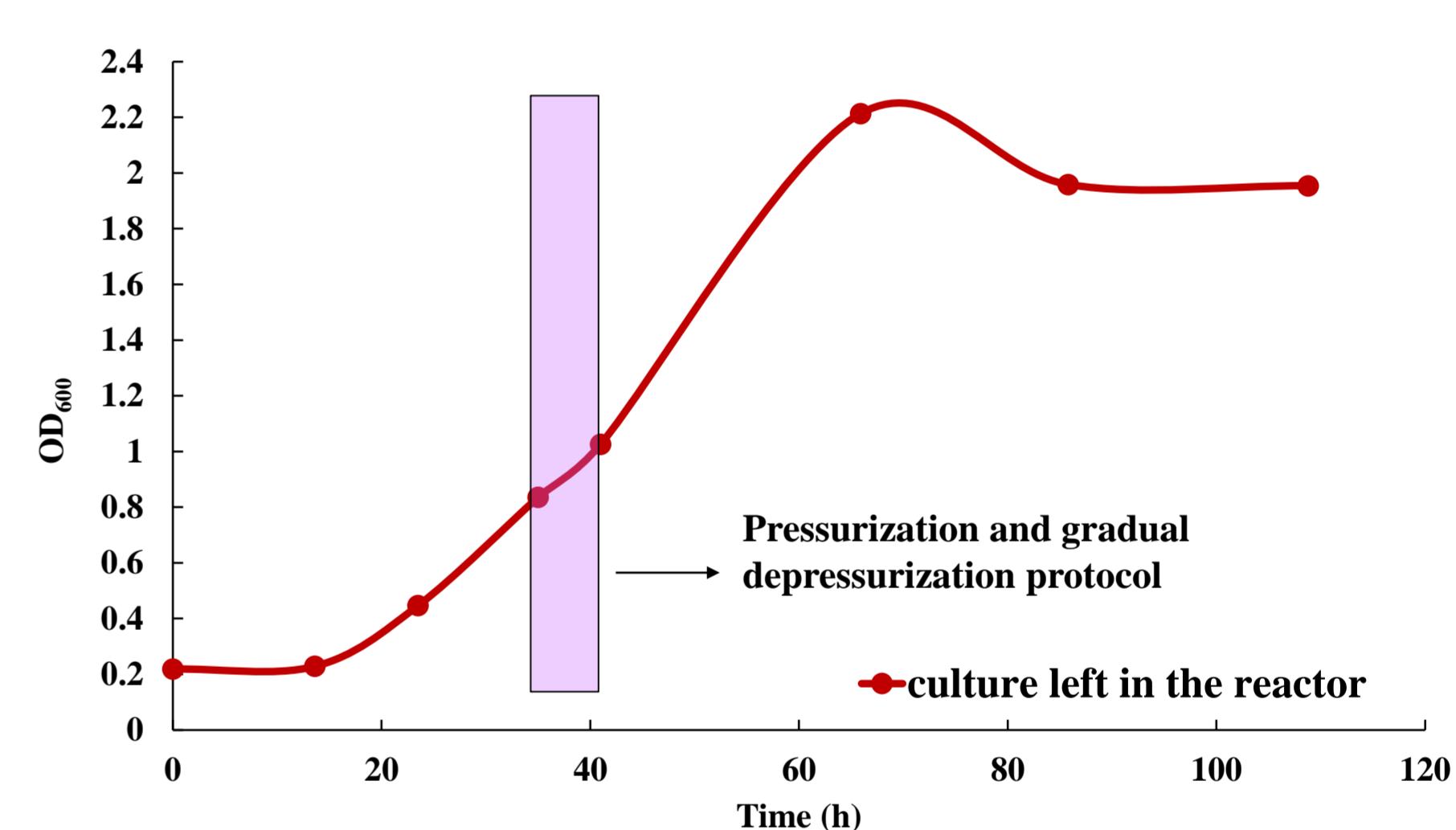
Increase reactor pressure to increase gas mass transfer rate and avoid gas limited fermentation

Maximized microbial fixation thanks to substrate availability

## A.woodii resistance to pressurization



Growth curves of modified *A.woodii* re-inoculated in fresh medium after different pressurization-depressurization protocols.



Growth curve in reactor of modified *A.woodii* stressed by pressurization and depressurization steps.

## High pressure autotrophic fermentation

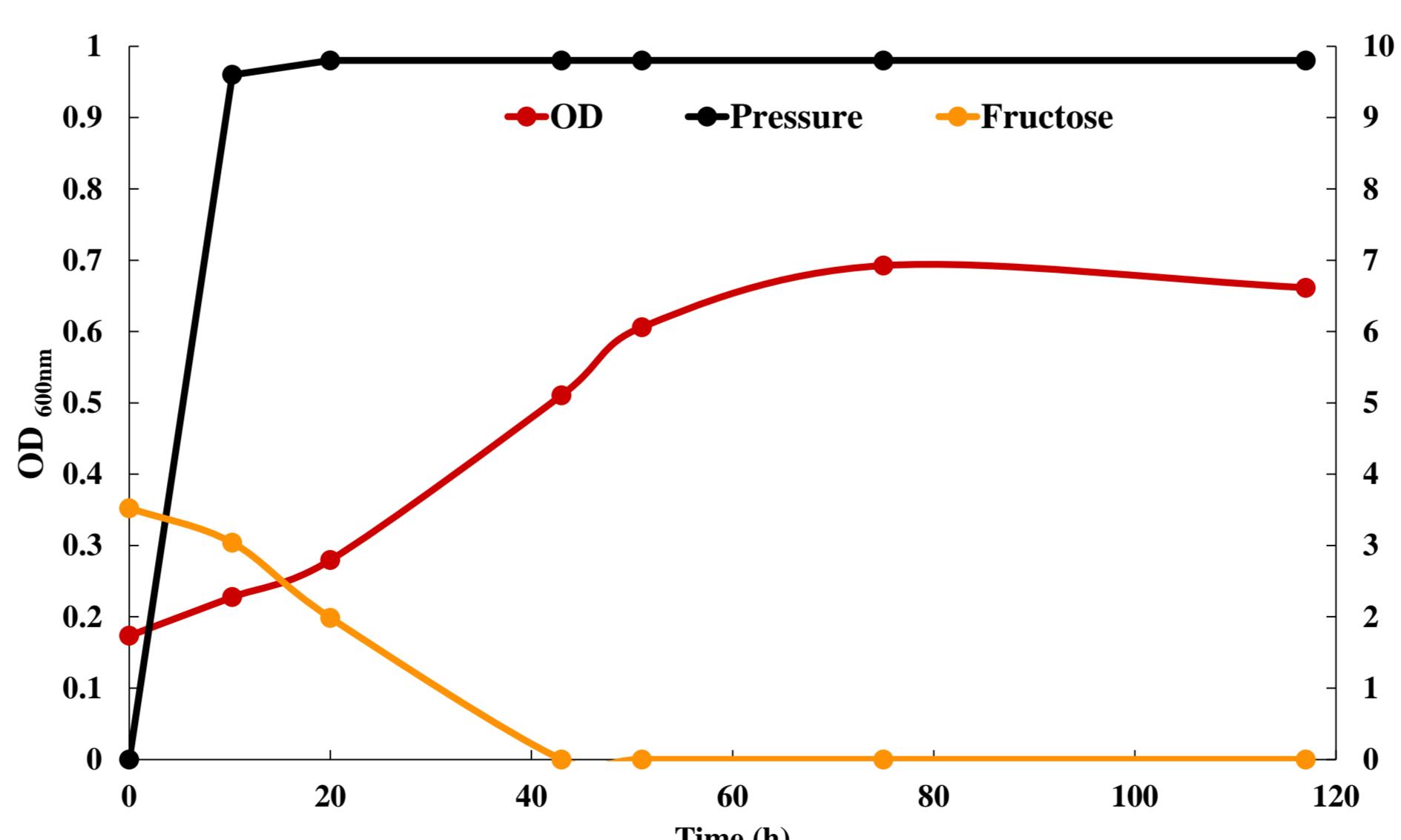
### BIOMASS vs IN-FLOW RATE: COMBINATIONS TESTED

COMBINATIONS	IN-FLOW RATE	BIOMASS
HIGH Biomass & HIGH In-Flow rate	87 ml/min	OD <sub>600nm</sub> = 1.6
LOW Biomass & LOW In-Flow rate	10 ml/min	OD <sub>600nm</sub> = 0.6
HIGH Biomass & LOW In-Flow rate	10 ml/min	OD <sub>600nm</sub> = 1.2

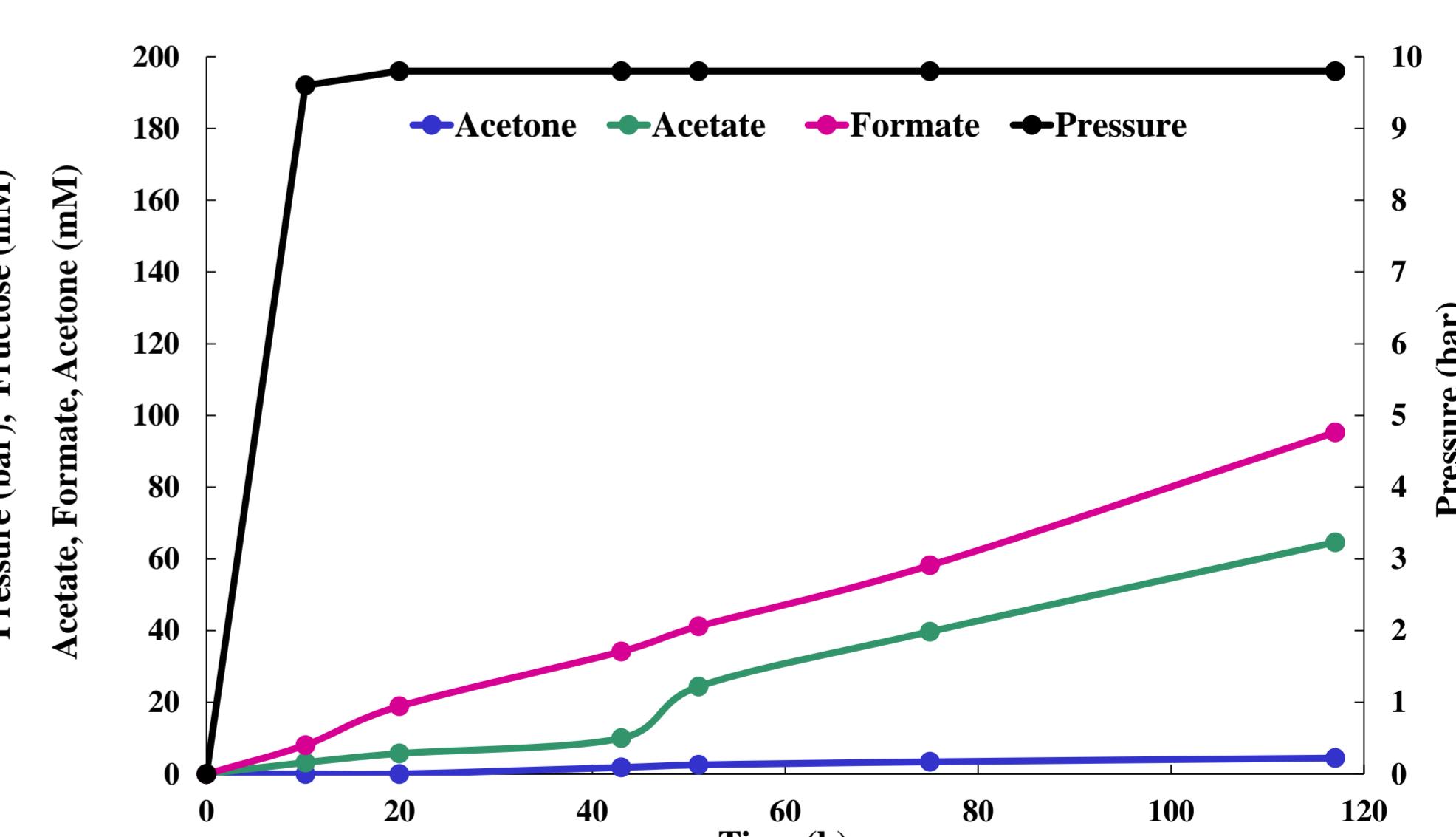
### BIOMASS vs IN-FLOW RATE: METABOLIC PRODUCTS

COMBINATIONS	ACETATE	ACETONE	FORMATE	BIO MASS GROWTH
HIGH Biomass & HIGH In-Flow rate	✓	✓	✓	X
LOW Biomass & LOW In-Flow rate	✓	✓	✓	X
HIGH Biomass & LOW In-Flow rate	✓	✓	✓	X

### 10 bar AUTOTROPHIC FERMENTATION with LOW-BIOMASS and LOW GAS IN-FLOW RATE



Growth curve of modified *A.woodii* at 10 bar in autotrophic liquid batch and gas continuous (30% CO<sub>2</sub> - 70 % H<sub>2</sub> gas mix) fermentation. In-flow rate 10 ml/min. Residual fructose is from heterotrophic inoculum.



Main metabolic products of modified *A.woodii* at 10 bar in autotrophic liquid batch and gas continuous (30% CO<sub>2</sub> - 70 % H<sub>2</sub> gas mix) fermentation. In-flow rate 10 ml/min.