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50%. ъ Й 13 h

/g (48 h) [1.19 g/(L h)] 72.9% 288%

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A 1009 606X(2017)02 0375 07 **DOI:** 10.12034/j.issn.1009-606X.216303

High-efficiency L-Lactic Acid Production by *Rhizopus oryzae* Using a Novel One-step Fermentation Strategy

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acid fermentation by *Rhizopus oryzae* was investigated using two different fermentation strategies of one-step nventional fermentation. Based on analysis of specific growth rate of cell ( ), specific consumption rate of glucose te of L-lactic acid, a novel modified one-step strategy was proposed. The results showed that, compared to tation, one-step fermentation reduced the demurrage of the production process and increased the production of lactic specific rate of L-lactic acid formation was significantly lower than during conventional fermentation. A novel rategy was proposed: final spores concentration 10^5 mL $^{-1}$, glucose concentration 100 g/L, peptone concentration 3.0 medium was reduced to 50% of the original amount, while retaining the original total biomass within the tank after the conditions, the lactic acid fermentation time greatly shorten in acid production stage, the maximum lactic acid vity and yield of the lactic acid in acid production stage reached 60 g/L, 4.62 g/(L h) and 0.8 g/g. The fermentation were 72.9% lower and 288% higher than conventional fermentation [48 h and 1.19 g/(L h)], respectively, than the ntional fermentation. Importantly, the specific rate of L-lactic acid and yield did not decrease.

ficiency production; high cell density; L-lactic acid; one-step fermentation strategy; *Rhizopus oryzae*

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Zhang G H et al. High-efficiency L-Lactic Acid Production by *Rhizopus oryzae* U ntation Strategy

se). Chi ng., 2017, 17(2): 375 81, DOI: 10.12034/j.issn.1009-606X

60 120 g/L 0.7 2.5 g/(L h)
[8,12,13]
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Efremenko [14] PVA
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$$q_p = \frac{1}{x}\frac{dp}{dt} = \frac{1}{x}\lim_{\Delta t \to 0}$$

ч 10%

ч 10:1. 1.72 g/(L

ך [1.19 g/(L h)] 45%. ך

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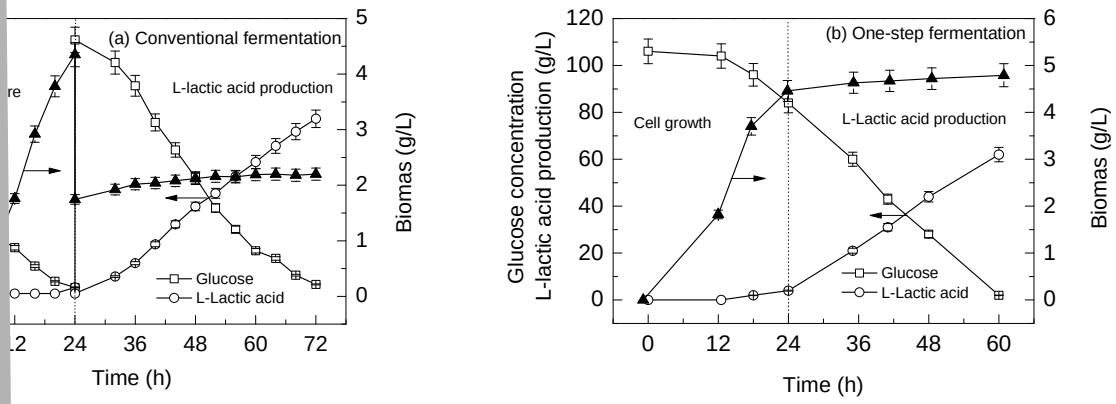
L- g/L) . 62.0

g/L 0.76 g/g (57 g/L 0.71 g/g).

ч 100 g/L طٍ 2(b) . ך ُ .



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course of L-lactic acid production using one-step fermentation and conventional fermentation by *R. oryzae*

Comparison of the parameters of L-lactic acid production by *R. oryzae* using different fermentation processes

Stage	Time (h)	L-Lactic acid production (g/L)	Productivity [g/(L h)]	Acid/sugar conversion yield (g/g)	Biomass (g/L)
Proculture	24	2.00			4.35
Production	48	57.00	1.19	0.71	
Cell growth	24	2.00			
Production	36	62.00	1.72		4.79

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0.29 h^{-1} ч .

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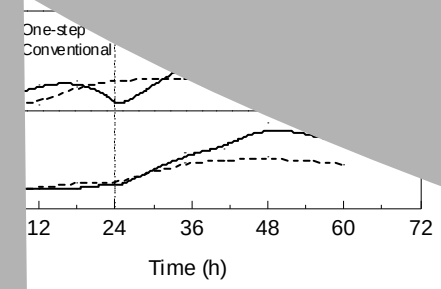

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son of kinetic parameters of L-lactic acid
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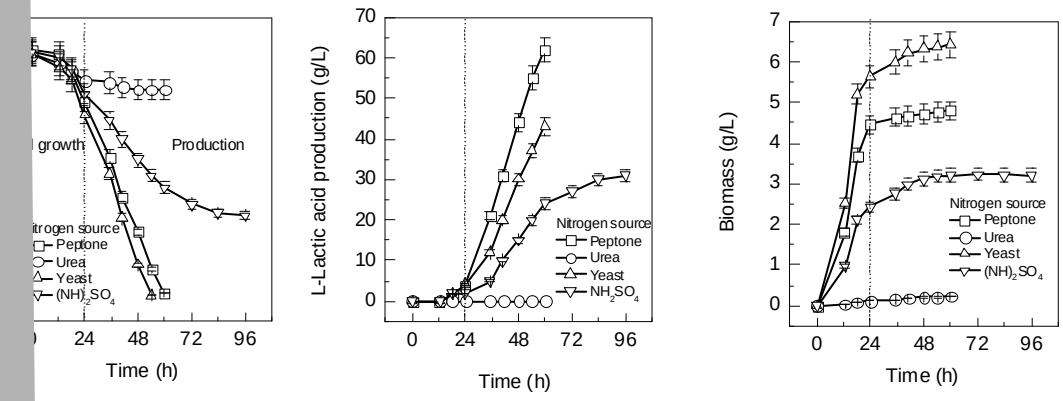

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g.4 Effect of nitrogen source on L-lactic acid production by *R. oryzae* using one-step fermentation

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ч 3.0 g/L

L- 24 h

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24 h 0, 25%, 33% Ь

24 h L- (·|).

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ч 8.94 g/L 5

4.0 g/L [6,17]. 24 h

. ɪ 4.49 g/L

Ь . ɪ 36 h 13 h

Ь g/(L h) 4.62 g/

3)

8.94
g/L .

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Fig.5 Effect of initial peptone concentration on L-lactic acid production using one-step method and specific rate using two methods

Table 2 Effect of initial peptone concentration on acid production of one-step fermentation

Peptone concentration (g/L)	Time (h)	L-Lactic acid production (g/L)	Productivity [g/(L h)]	Acid/sugar conversion yield (g/g)	Biomass (g/L)
2.00	36	62	1.72	0.76	4.79
3.00	36	68	1.88	0.76	5.22
4.00	36	64	1.78	0.73	5.28

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Fig.6 Effect of cell density on L-lactic acid production using one-step fermentation after 24 h by *R. oryzae* and specific rate using two methods

Table 3 Effect of cell density on acid production after fermentation 24 h using one-step fermentation

Cell density (g/L)	Acid production time (h)	Final biomass concentration (g/L)	L-Lactic acid production (g/L)	Productivity [g/(L h)]	Acid/sugar conversion yield (g/g)
4.49	36	5.22	68.00	1.88	0.76
5.64	24	6.48	60.00	2.50	0.75
6.75	18	7.63	61.00	3.39	0.80
8.94	13	9.72	60.00	4.62	0.80

L- Efremenko [14] PVA
ь 4. L- 4.5 g/(L h) ч

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Solid fer...		
Flocs on support in jar-...		
Flocs on support in air-lift bioreac...		
Flocs on support in stirred tank bioreactor		
Immobilized on PVA-cryogel		
zed on cotton cloth(in rotating fibrous bed bioreactor)		
Small pellets in bubble column		
Small pellets in jar-fermentor	0.70	
One-step fermentation total process	1.62	
One-step fermentation production stage	4.62	0.80

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<6.75 g/L)

(>6.75 g/L)

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