

Salmonella typhi O9

(1) (1) (1)

S. typhi O9 *Salmonella typhi* O9
Lactobacillus bulgaricus *Streptococcus thermophilus*
S. typhi O9 . 4 37
Lb.bulgaricus
Str. thermophilus
12 *S. typhi* O9 4 *S. typhi* O9
. 37 24

S. typhi O9 :

Study of The Inhibition Effect of Yoghurt Starter on *Salmonella typhi* O9 Bacteria

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ABSTRACT

This investigation was done in the laboratories of Faculty of Agriculture – Damascus University Department of Food Sciences. The aim of this research was to study the inhibition effect of the growth of *Lactic acid bacteria* used as starter, on the growth of *S. typhi* O9 bacteria. We used for this study a pure strains of *Salmonella typhi* O9 and *Lactic acid bacteria* (*Streptococcus thermophilus* and *Lactobacillus bulgaricus*). The effect of *Lactic acid bacteria* on the number of *S. typhi* O9 was studied in 37 °C and 4°C. The *Lactic acid bacteria* were inoculated in milk for the yoghurt manufacturing. The number of *S. typhi* O9 decreased gradually with time. This decrease number of this bacteria was more clear when both *Str. thermophilus* and *Lb. bulgaricus* were used as a mixed starter, *Lb. bulgaricus* then when was used a single starter, or when *Str. thermophilus* was used a alone. The *S.typhi* O9 disappeared after 12 hours storage at 4°C, while disappeared after 24 hours of storage at 37°C.

Key Words: *S. typhi* O9, Yoghurt starter, Inhibition.

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Salmonella

1.4

500

Salmonella typhi

(Mead *et al.*, 1999)

Salmonella

(Holcomb *et al.*, 1999)

(Giangiacomo, 2000)

. *Salmonella typhi* O9

2000 Ryser Issa

$\frac{30}{/} \frac{85}{^3 10 \times 6} \frac{^3 10 \times 2}{}$

Salmonella typhimurum DT 104

6

%2

. 16 -12

0.33

S. typhimurum DT 104

. 6

2 0.47

S. typhimurum DT104

S. typhimurium S.pullorum S. . enteritidis 935/79

(Jin *et al.*, 1996) pH

pH

1996 Jay

Chang

2001

Lb. reuteri BSA13

S. typhimurium 2007 Shen
pH

Lactobacillus Streptococcus thermophilus
Shen 5 1:1 *bulgaricus*
24
Shen 48
S. typhimurium

2006
S. enterica ssp. enterica serovar Nassib
Typhimurium PT8

Streptococcus
1:1 *Lactobacillus bulgaricus thermophilus*
41 *Salmonella*
Lb.bulgaricus
pH *Str.thermophilus*

Salmonella typhi

S. typhimurium

Salmonella (Visiting, 2002) *typhi*
(Mead *et al.*, 1999) *Salmonella typhi*

(Giangiacoma, 2000)

. 4 *Salmonella typhi* O9
37

| | | | |
|-----|-------------|--|------|
| | | : | |
| 8.5 |) | | - 1 |
| | .(| 1 | |
| | -MERCK | M17 | - 2 |
| | | <i>.Str.thermophilus</i> | |
| | - MERCK | Rogosa | -3 |
| | | <i>.Lb.bulgaricus</i> | |
| | - MERCK | | - 4 |
| | | <i>.Salmonella typhi O9</i> | |
| | | : | |
| | | <i>Salmonella typhi O9</i> | -1 |
| | | <i>Lactobacillus dlbrueckii subsp bulgaricus</i> | -2 |
| | -CHR HANSEN | <i>Streptococcus thermophilus</i> | |
| | | | .1:1 |
| | | <i>Lactobacillus dlbrueckii subsp bulgaricus</i> | -3 |
| | | - CHR HANSEN | |
| CHR | | <i>Streptococcus thermophilus</i> | -4 |
| | | - HANSEN | |
| | | <i>:S. typhi O9</i> | |
| 15 | 121 | | |
| | / 10^{-5} | 38 | |
| | | <i>S. typhi O9</i> | |
| | | <i>S.typhi</i> | |
| | | | .1:1 |
| | | <i>Str.thermophilus</i> | |
| | | <i>Lb.bulgaricus</i> | |
| | | | |
| | | 42 | |
| | . 4 | 37 | |

S. typhi O9 : / 10^{-5} to 10^{-10}
 37 / 10^{-5} to 10^{-10} *S. typhi* O9
 72 - 48 - 24 - 12 - 6 - 0 4
 / 10^{-6} *S. typhi* O9
 .2.8 3.2 4 4.5 5.2 6.6 pH % 10
 - KOTTERMAUN pH pH

SPSS

S. typhi O9

10^{-5} *S. typhi* O9 (1)
 %2 / 10^{-6}
 4 37 4 42
S. typhi O9
S. typhi O9 (1)
 4 37

| 2 4 | <i>S. typhi</i> 4 O9 | 1 37 | <i>S. typhi</i> 37 O9 | () | |
|-----------------------|-------------------------|--------------------------|--------------------------|-----|----|
| $10^6 \times 10^{-9}$ | $10^6 \times 10^{-5}$ | $10^6 \times 10^{-5}$ | $10^6 \times 10^{-5}$ | | 0 |
| 6.6 | 6.6 | 6.8 | 6.6 | pH | |
| $10^6 \times 10^{-9}$ | $10^5 \times 10^{-4}$ | $10^8 \times 10^{-7}$ | $10^5 \times 10^{-4}$ | | 6 |
| 6.5 | 5.8 | 6.6 | 5.8 | pH | |
| $10^6 \times 10^{-9}$ | - | $10^8 \times 10^{-7}$ | $10^5 \times 10^{-4}$ | | 12 |
| 6.5 | 5.3 | 6.5 | 5.5 | pH | |
| $10^4 \times 10^{-5}$ | - | $10^9 \times 10^{-8}$ | - | | 24 |
| 6.2 | 5.1 | 6.5 | 4.9 | pH | |
| $10^2 \times 10^{-3}$ | - | $10^{10} \times 10^{-9}$ | - | | 48 |
| 6.2 | 5 | 6.2 | 4.5 | pH | |
| $10^1 \times 10^{-2}$ | - | 10^{10} | - | | 72 |
| 6.2 | 4.8 | 6.2 | 3.8 | pH | |

pH *S.typhi* O9 (1)
 24 37
 4 pH 4.9
 2005 Kudaka
 2006 DST

/ $^{9}10 \times 1 - ^{8}10 \times 1$ 24 *S. typhi* O9 *S.typhi* O9 (2)
 . / $^{10}10$ 72

Lb.bulgaricus / 310 72
 . *Str.thermophilus*

12 *S.typhi* O9 (2) 4

4 *S.typhi* O9
 72 $^210^{-1}10 \times 1$ $^610^{-5}10$
 4
 .(Jay, 1996) 6.7

pH
S. typhi O9
 4 37

S.typhi O9

37 4 *S. typhi* O9
 . 12

/ $^610^{-5}10$ *Lb.bulgaricus*
S.typhi O9 (2)
 .

Lb.bulgaricus *S.typhi* O9 (2)
4 37

| 2 | <i>S.typhi</i> 4 O9 | 1 | <i>S.typhi</i> 37 O9 | () | |
|-------------------------------------|-------------------------------------|--------------------------------------|---|-----|----|
| $6^{10} \times 1 - 5^{10} \times 1$ | $6^{10} \times 1 - 5^{10} \times 1$ | $6^{10} \times 1 - 5^{10} \times 1$ | $6^{10} \times 1 - 5^{10} \times 1$ | | 0 |
| 6.6 | 6.6 | 6.8 | 6.5 | pH | |
| $6^{10} \times 1 - 5^{10} \times 1$ | $5^{10} \times 1 - 4^{10} \times 1$ | $8^{10} \times 2 - 7^{10} \times 2$ | $6^{10} \times 1.6 - 5^{10} \times 2.6$ | | 6 |
| 6.5 | 6 | 6.6 | 6 | pH | |
| $6^{10} \times 1 - 5^{10} \times 1$ | $2^{10} \times 1 - 1^{10} \times 1$ | $8^{10} \times 2 - 7^{10} \times 2$ | $4^{10} \times 1 - 3^{10} \times 1$ | | 12 |
| 6.5 | 5.8 | 6.5 | 5.8 | pH | |
| $4^{10} \times 1 - 5^{10} \times 1$ | - | $9^{10} \times 1 - 8^{10} \times 1$ | $2^{10} \times 1 - 1^{10} \times 1$ | | 24 |
| 6.2 | 5.5 | 6.5 | 5.2 | pH | |
| $2^{10} \times 1 - 3^{10} \times 1$ | - | $10^{10} \times 1 - 9^{10} \times 1$ | - | | 48 |
| 6.2 | 5.3 | 6.2 | 4.1 | pH | |
| $1^{10} \times 1 - 2^{10} \times 1$ | - | 10^{10} | - | | 72 |
| 6.2 | 4.9 | 6.2 | 3.9 | pH | |

37 (2)

6 *S.typhi* O9
48

Lb.bulgaricus

9

24 *S.typhi* O9 (2)
 $- 1^{10} \times 1$ $6^{10} - 5^{10}$

4
12 2^{10}
(4)
(Jay, 1996)

6.7

pH
S.typhi O9

S.typhi O9 (3)
/ $6^{10} \times 1 - 5^{10} \times 1$ *S.typhi* O9

42 *Str.thermophilus*
72 4 37

S.typhi O9 (3)

4 37 *Str.thermophilus*

| 4 | 2 | <i>S.typhi</i> 4 O9 | 1 | <i>S.typhi</i> 37 O9 | () |
|---------------------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|-----|
| $6 \times 10^1 - 5 \times 10^1$ | $6 \times 10^1 - 5 \times 10^1$ | $6 \times 10^1 - 5 \times 10^1$ | $6 \times 10^1 - 5 \times 10^1$ | $6 \times 10^1 - 5 \times 10^1$ | 0 |
| 6.6 | 6.6 | 6.6 | 6.8 | 6.6 | pH |
| $6 \times 10^1 - 5 \times 10^1$ | $5 \times 10^1 - 4 \times 10^1$ | $8 \times 10^2 - 7 \times 10^2$ | $5 \times 10^1 - 4 \times 10^1$ | | 6 |
| 6.5 | 6.2 | 6.6 | 6.3 | | pH |
| $6 \times 10^1 - 5 \times 10^1$ | $3 \times 10^1 - 2 \times 10^1$ | $8 \times 10^2 - 7 \times 10^2$ | $4 \times 10^1 - 3 \times 10^1$ | | 12 |
| 6.5 | 5.9 | 6.5 | 5.8 | | pH |
| $4 \times 10^1 - 5 \times 10^1$ | $2 \times 10^1 - 1 \times 10^1$ | $9 \times 10^1 - 8 \times 10^1$ | $3 \times 10^1 - 2 \times 10^1$ | | 24 |
| 6.2 | 5.5 | 6.5 | 5.5 | | pH |
| $2 \times 10^1 - 3 \times 10^1$ | - | $10 \times 10^1 - 9 \times 10^1$ | $2 \times 10^1 - 10^1$ | | 48 |
| 6.2 | 5.2 | 6.2 | 5 | | pH |
| $1 \times 10^1 - 2 \times 10^1$ | - | 10×10^1 | - | | 72 |
| 6.2 | 4.8 | 6.2 | 4.5 | | pH |

S. typhi O9 (3)

4.5 pH 72

Kudaka 4 pH

Str. thermophilus 2005

(3)

48 (3) *S.typhi* O9
 1×10^1 6×10^1 4

24

(Jay, 1996) 6.7 (4)

(5.2 pH) pH
S.typhi O9

(4)

pH pH 15 *S.typhi* O9
 . 48 - 24 37

| % 10 | | | | | | 3 | (4) |
|------|-----|---|-------------------|-------------------|-------------------|-------------------------|-----|
| 2.8 | 3.2 | 4 | 4.5 | 5.2 | 6.6 | pH | |
| - | - | - | $3 \cdot 10^{-2}$ | $5 \cdot 10^{-4}$ | $7 \cdot 10^{-6}$ | (/) <i>S.typhi</i> O9 | |

S.typhi O9 (4)
4= pH pH

SPSS

A
Lb. bulgaricus 1:1)
B (*Stre.thermophilus*
12 6 0) C (37 - 4)
S.typhi O9 (72 48 24

(5)

| LSD 5% | | F | | | | |
|-----------|---|----------|----------|----------|----|-------|
| 14550.56 | * | 1036.863 | 2.486E11 | 4.972E11 | 2 | A |
| | | 3.869 | 9.277E8 | 9.277E8 | 1 | B |
| 20577.6 | * | 1923.240 | 4.611E11 | 2.305E12 | 5 | C |
| 14550.559 | * | 13.440 | 3.222E9 | 6.445E9 | 2 | B*A |
| 25202.308 | * | 1147.419 | 2.751E11 | 2.751E12 | 10 | C*A |
| 30577.598 | * | 2.884 | 6.915E8 | 3.457E9 | 5 | C*B |
| 35640.444 | * | 13.469 | 3.229E9 | 3.229E10 | 10 | C*B*A |
| | | | 2.397E8 | 1.726E10 | 72 | |

:C :B :A
14550.56 = LSD
Str. thermophilus *Lb. bulgaricus*
S. typhi O9
20577.6 = LSD *S. typhi* O9

48

37 4

LSD

14550.559

25202.308

30577.598

.35640.444

Streptococcus

- 1

S. typhi O9

Lactobacillus bulgaricus thermophilus

Streptococcus thermophilus

- 2

Lactobacillus bulgaricus S. typhi O9

S. typhi O9

- 3

S. typhi O9

pH

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