

2002/10/02
2003/07/13

% 90

The Whey Utilization for The Production of Some Important Economic Compounds

M. Al-Bahra, M. Daghestani, S. Al-Shaal & B. Al-Hamwi

Department of chemistry – Faculty of Sciences - Damascus University

Received
02/10/
2002

Accepted 13/07/2003

ABSTRACT

Dairies and cheeses factories produce terrific quantities of whey in which about 90% of them pelts into the sewerage system without making any useful of them. Due to the valuable ingredients in whey (cheese, milk and butter). The content can be separated and extracted in order to be added as a nutrient environment in food industry. The resultant compounds (citric acid, penicillin, amino acids and ergosterol) were identified using HPLC technique.

Key Words: the utilization from whey.

]

.[1997

penicillum

Aspergillus niger

400

240 – 180

(1)

.[1982]

(1)

		*			
12 ±1	0,8 ± 0,1	3,3±0,5	4,9±0,1	3,5±0,7	88,0±1

. % 1 – 0,4

% 4,0 – 2,3

*

.....

. B A, D, E, K 35 C

1] 300 .[1997 (2)

[1982 .] (2)

0,21	1,42	0,91	1,23	96,23	
0,80	4,95	3,90	4,73	85,62	

A . niger 220 A . wentii
250 - 200 100 20 -15
(3) . 123 112
.[1999] 60 %

(3)

68,4%		50 %	A.niger
66,8%		50 %	A. niger

25%

60 %

10%

pH 7.7 – 6.8

.(spray drying)

27 – 25 °C

15 %

-6

.E.Coli

penicillin acylase

A.niger

penicillium

A. niger

. HPLC

.(360)

.....
- SDS
10 5
12

[Smith B.J, 1994]

SDS E833 Consort
4.5 % () 10 % ()
SDS 0.92 } sample solvent .(0.1 x 13 x 13)
2 0.3 4 2
{ 20 (0.1 %W/V)
(98 °C) / 1
20
50 power supply
70 ()
protein .(stain
24 Destaining solution

0.8 6 N 20 2)
24 (100
()

HPLC

- 4 2
.[1987] (DNPF)

HPLC

HPLC

Jasco

: (RP- C18, 250X 4.6 mm ID) :

pH (8 2)

0.1

(100 mM)

/ 0.5

50

320

UV/VIS :

] HCl

- 4 2

HPLC

[1966

. [Shimadzu,2000]

GBC

Atomic Absorption (flam system)

WATERS

IC

932AA

1

1

50

100

K⁺ , Na⁺ , Ca⁺⁺)(Cl⁻ , Br⁻ , HPO₄⁻ , NO₃⁻ , SO₄⁻)

[Waters,2000]

(Mg⁺⁺)

250

100

105 °C

10

pH6.25

100

HPLC

ODS (15 X 0.45 cm) :
 (pH 2.2 60/40) 0.1 % : :
 / 0.3 :
 (200) UV/VIS :

5 100 [kruger ,1994]
 595

[Zaghoul et al, 1998]

PA
 [1997] PA
 25 (6-5) 5
 30 °C 48 24
 10
 600 °C
 15 pH6.25 300
)
 3.5 pH .
 100 250 .
 10)
 14% PA (

4%

30 – 28 °C [1985 . . .]

[Shu P. ,1948]

[1969 . . .]

60 °C

HPLC

[Shimadzu, 2000]

5 10 35 °C

25 0.1%

[Mantu k .G, 1992] HPLC

15 100

50 ()

50 12.5

35

25

100

Shimadzu : 25 4

FID : SHIMADZU GC

250-180 °C CBP1 M50-0.25mm

.10 (Split) .300 °C

°C : 4.5 / 1.5

2

35

250 °C

180

. [Shimadzu, 2000] /

(1: 1) GC :

HPLC
15

-5 °C

HPLC

. [Zill G., 1988]

25

pH 5

5

10 %

1

Riedel De Haen Roche :

. BDH Scharlau Hopkin & William Romil :

(4)

%			(4)	
0.68	0.48	1.88	96.64	
0.26	1.54	2.46	94.50	

1.85 ± 0.07)

.(

PA
 .30 °C (5)

()	()
7	24
10	48
13	72

(6)

%				(6)	
0.32±13.20	0.37±12.72	0.21±11.36	0.32±16.87	0.17 ±10.83*	
0.35±10.58	0.35±12.37	0.23±10.19	0.30±22.68	0.19 ± 9.53	

*

11-9 %

. 6.25

(7)

100 /

(7)

100 /

	S D		S D		S D	*
Ba	-	-	-	-	-	-
Ca	3.80	4235.7	4.09	5140.5	1.08	115.0
K	4.70	6835.9	2.62	355.6	1.55	144.0
Li	-	-	-	-	-	-
Mg	1.96	187.6	1.57	112.7	0.08	9.6
Na	2.85	1401.2	2.95	1360.7	0.15	9.4
Sr	-	-	-	-	-	-
Br	-	-	-	-	-	-
P	4.82	1508.0	0.05	5.01	1.63	125.0
S	1.91	373.3	0.01	0.05	0.07	16.6
Cu	0.01	1.70	0.03	2.13	0.01	0.02
Fe	0.08	5.16	0.05	3.83	0.01	0.02
Mn	-	-	-	-	0.07	0.21
Zn	0.52	12.77	0.21	15.42	0.02	0.76

*

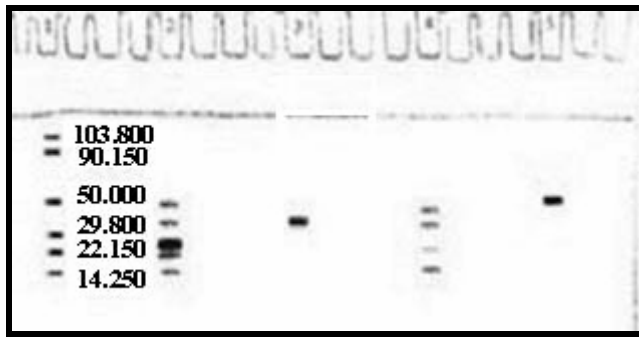
(8)

(1)

- SDS

10 %

. [Belitz H. D., 1999]



(2) -SDS (1) (1) 10 % (5)

(4) (3)

- SDS (8)

()				
50000			1	
37000	-β		2	
24400	α _s	-β	3	2
19000		-x	4	
14000	-γ	-α	5	
33000			1	3
50000			1	
33000	-β		2	4
19000		-x	3	
14176	-γ	-α	4	
50000			1	5

HPLC

(9) - 4 2

.HPLC

(9)

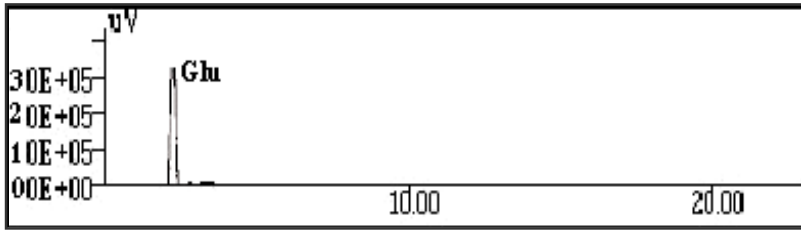
100/ HPLC

SD	%	SD	%	SD	%*	
0.18	18.69	0.21	6.65	0.09	4.50	Ala
0.09	0.07	-	0.00	0.11	2.90	Arg
0.15	0.47	-	0.00	0.23	10.30	Asp
0.13	0.18	0.11	1.43	0.13	1.90	Cys-Cys
0.25	0.18	-	0.00	0.25	19.30	Glu
0.14	8.95	0.11	0.53	0.15	1.90	Gly
0.03	0.93	0.32	23.02	0.25	2.11	His
0.12	0.58	0.11	20.81	0.08	5.10	Ile
0.11	2.58	0.09	13.59	0.10	10.30	Leu
0.10	0.27	0.10	9.21	0.11	9.20	Lys
0.21	0.65	0.18	16.80	0.14	2.00	Met
0.22	2.49	0.15	0.74	-	0.00	Phe
0.11	0.40	0.15	0.23	0.15	6.30	Pro
0.02	0.19	-	0.00	0.17	5.00	Ser
0.22	24.71	0.18	1.37	0.21	5.20	Thr
0.13	3.73	0.11	0.42	-	0.00	Trp
0.15	7.73	-	0.00	-	0.00	Tyr
0.23	27.38	0.25	5.21	0.32	5.40	Val

*

(3)

(2)



(2)



(3)

20
100

(10)
)

(10)

2	%	2	%	
375.00	18.50	386.00	19.30	
3.40	0.17	3.60	0.18	

18.50 %

0.17 %

400- 200

(11)

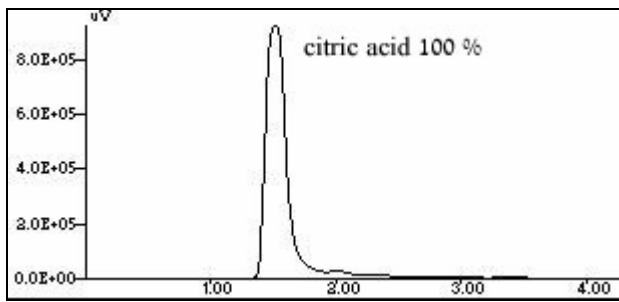
(11)

nm	nm	
-	218.80	
264.20	209.60	
-	338.40	
-	237.00	
-	267.80	
322.80	252.60	

ODS

210

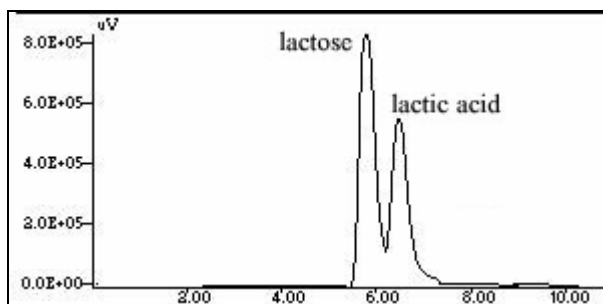
4 30 °C 30 °C .3.8
[100/ 2.27 ± 0.03] (4)



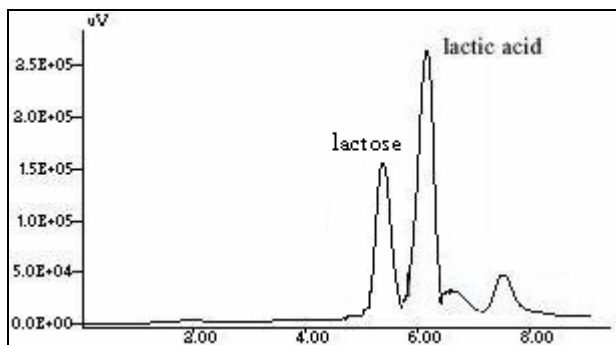
(4)

HPLC

[1973 . .]
/ 1 (5)
(6)



(5)



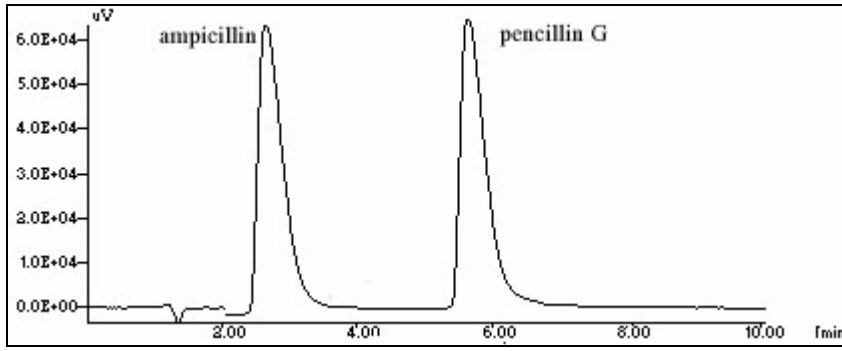
(6)

HPLC
(100/ 50)

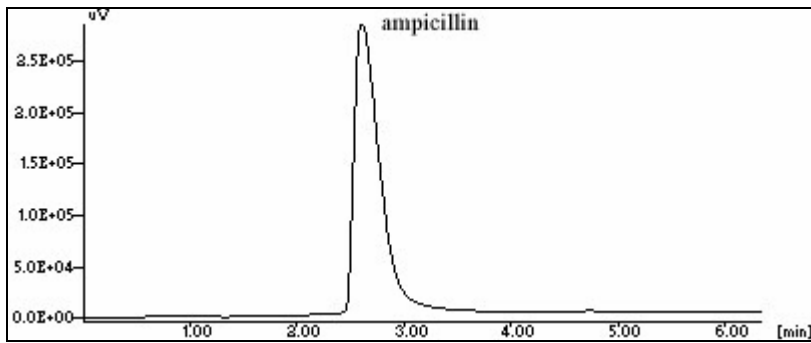
G

(7)

(8)



G (7)



(8)

. G

) G

%97 -β
% 93 (

[Chaplin M., 2002] % 99

. [100/ 75.3 ± 0.09

.....

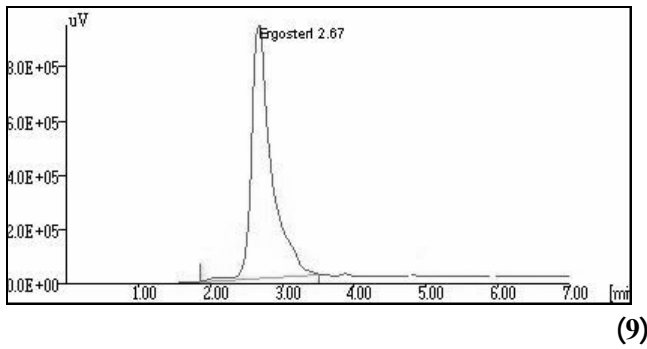
(13) GC
62.24

GC (13)

7.3 %	
25 %	

(1:1) :
(9) HPLC GC
5

[% 0.307 ± 0.071]
.[% 0.986 ± 0.050]



D

12672
19200

REFERENCES

- | | | |
|---------|---------------|-----|
| | 1976 . | .1 |
| | . 13-15 | |
| | 1999 | .2 |
| | .214 | |
| | 1969 | .3 |
| | .340 | |
| - | 1987 | .4 |
| - | .409-408 | |
| | 1985 . | .5 |
| | . 27-25 : (4) | |
| .179 | 1973 | .6 |
| | 1991 | .7 |
| | . 29 - | |
| .15 6 : | 1982 | .8 |
| | 1997 - | .9 |
| | .51 28 8 : | |
| | 1966 | .10 |
| | 245 | |
| - | 1990 | .11 |
| - | .130 128 : | |

-
12. Chaplin M., 2002, Production Of Antibiotics, school of applied sciences. ([http://Ask Jeeves Answer: Production of amino acids.html](http://AskJeeves.com/Answer/Production_of_amino_acids.html))
 13. Jakubke H.D., Jeschkeit H., 1977, An introduction- Amino Acids, Peptid & Proteins, English edition. Akademie-Verlag, Berlin.
 14. Kruger N.J., 1994, The Bradford Method for Protein Quantitation, Methods in Molecular Biology, V.32, oxford, P. 9_10.
 15. Mantu k. Ghosh, (1992), HPLC Methods on drug Analysis, Springer - Verlag Berlin Heidelberg- Germany, P. 30-33,345.
 16. Plummer D.T., 1978, An Introduction To Practical Biochemistry, Ac Graw-Hill Book company (UK) limited.
 17. Shimadzu, high performance liquid chromatography & gas chromatography, application data book, 2002.
 18. Shu P. Johnson M.J., (1948), Journal of Bacteriology 56: 577.
 19. Smith B.J. , 1994, SDS _ Polyacrylamide Gel Electrophoresis of Proteins, From Methods in Molecular Biology, V.32, Humana Press Inc., P. 23 _ 34.
 20. Waters ,2000, waters 432 conductivity Detector , chapter 4 ,pp. 8,9.
 21. Xa,W. Q and Hang Y. D., Roller , August 1988,Culture Technique For Citric Acid Production By Aspergillus Niger, Process Biochem, 117 -118.
 22. Zaghoul T.I., Al-bahra N., Al-Azmeh H., 1998, Isolation, Identification and keratinolytic Activity of Several Feather – Degrading Bacterial Isolates, Applied Biochemistry and Biotechnology, Vol 7 , No 72 , p. 207.
 23. Zill,G.; Engelhardt,G.; Wallnoefer, P.R, Sep 1988, Determination Of Ergosterol using Si60 ,HPLC, Journal :Z.lebensm. Unters. Forsch, 187 (3), P. 246-249.