



가

가

가 0.2 0.5 log cycles (Jockel and Otto, 1990).

가 0.5 log cycles 가 (Bomar, 1988), 가 (Harvey, 1978; (Kafenstein, 1976).

Lund, 1983) 0.4 log cycle 가 (Garg et al., 1990), 1 log cycle 가 (Adams et al., 1989; Mazollier, 1988).

가

가 *B. cereus* 가 1 log cycle (Harmon et al., 1987).

2) (Chlorine)

1.

Eckert Ogawa(1988) (packing house)

Mazollier(1988)

1) (Water Rinsing)

가 가 1991) 5 10
 50 ppm 가
 (200 ppm) 가 1 2
 가 (Table 1). 가 log cycles ,
 0 300 ppm 3 log cycles
 (Adams et al., 1989),
L. monocytogenes
 10, 20, 50 ppm
 70, 100, 90% 가
 70%가
 (Mazollier, 1988). 가
 5 20 30 (Adams et al., 1989; Berrang et al.,
 pH 4.0 8.8 1990).
 (Adams et *in vitro*
 al., 1989; Mazollier, 1988). , *L. monocytogenes* (
)
 ppm 가 , 300 (El-Kest and Marth, 1988). Adams
 가 가 (1989) ()
 가 1×10^6 CFU/g 3×10^3 CFU/g 가
 (Garg et al., 1990). cuticle
 200 250 ppm 가
 1 log cycle 가
 (Berrang et al., 1990). 가
L. monocytogenes Lund(1983) 가
 ,
 (Ho 가
 et al., 1986; Schlech et al., 1983)가 가 *Listeria*가
 . Brussels
L. monocytogenes 10^6 CFU/g (Frank and Koffi, 1990; Lee and
 Frank, 1991; Mustafa and Liewen, 1989).
 가 200 mg/1 , 2 log cycle 가
 10 가
 가 .
 Brussels 2
L. monocytogenes
 . 200 mg/1 3) (Organic Acids)
L. monocytogenes
 (Berrang et al., 1990) (Berrang et al.,

Table 1. Effects of chlorine concentration on total counts in minimally processed green salads.

Total counts (N) (log CFU/g)	Free chlorine (ppm)						
	0	10	20	40	50	150	200
4.5 < N < 5.0	0%	0%	0%	0%	12%	6%	6%
5.0 < N < 5.5	0%	0%	20%	40%	50%	25%	56%
5.5 < N < 6.0	0%	0%	40%	60%	19%	50%	25%
6.0 < N < 6.5	40%	75%	27%	0%	19%	19%	13%
6.5 < N	60%	25%	13%	0%	0%	0%	0%
Number of samples	10	16	15	10	32	32	32

Adapted from Mazollier (1988), *Infos-Ctfl*, 41, 19, 1988.

300 500 mg/l , , , 40% (v/v) 15
 10⁷ CFU/g 1 CFU/g
 (Adams et al., 1989),
 Shapiro Holder 4) (Sanitizers)
 (1960) , 0
 1500 ppm 가
 10 4 가 가 ,
 1500 ppm 가 가 ,
 가 10 가 10 4 90 ppm
 가 (Shapiro and peracetic acid (Masson, 1990),
 Holder, 1960). 가 2 log cycles
 100 ppm 가
 4.4 10 peracetic acid가
 , acetic acid 가
 (Priepke et al., 1976). Karapinar Gonul(1992) (Anon., 1988)
Yersinia enterocolitica 2% (v/v) 가

oxytetracycline 50 ppm 2.

가 3 가
가 1
0 3 2 4%
(Shapiro and Holder, 1960).

Tween 80 (1000 mg/l) 가 (Varoquaux, 1991).

7.4% pH 5 100 ppm hypochlorite
가 37%
, Tween 80 (100 mg/l)
1000 mg/l Tween 80 (20%

(Adams et al., 1989). (Kader et al., 1989). (Carlin et al., 1990a,b) (Chambroy, 1989), (Lopes-Briones, 1992)

5) (Irradiation) (5 20%) (2 5%)
(Table 2),

kGy 10³ 10⁴ 가
Farber(1991) Doyle(1990)
(Scandella and Foures, 1987) (MAP)

Enterobacteriaceae 가 가
10 100 가
1 kGy
(Langerak, 1978; Langerak and Damen, 1978; Scandella and Foures, 1987).

가 , *C. botulinum* 가 2%
가 (Kautter et al., 1992; Solomon et al., 1990; Sugiyama and

Table 2. Effects of irradiation on the microflora of minimally processed fresh fruits and vegetables

Product	Microorganisms	Dose	Bacterial counts (log CFU/g)
Prepacked endive	Total counts	Control 1 kGy	10^6 at day 0; 10^5 at day 7 at 10 10^3 at day 0; 10^4 - 10^5 at day 7 at 10
	Enterobacteriaceae	Control 1 kGy	10^4 - 10^5 at day 0; 10^7 at day 7 at 10 < 10^2 at day 0 and at day 7 at 10
	Aerobic spores	1k Gy	No significant reduction in irradiated endives
	Anaerobic spores		
Prepacked soup greens	Total counts	Control 1 kGy 2 kGy	10^6 - 10^7 at day 0; 10^8 - 10^9 at day 4 at 10 10^3 at day 0; 10^5 - 10^6 at day 4 10^2 at day 0; 10^1 at day 4
	Enterobacteriaceae	Control 1 and 2 kGy	10^5 at day 0; 10^7 - 10^8 at day 4 at 10 < 10^2 at day 0; 10^2 at day 4
	Yeasts	Control 1 kGy 2 kGy	10^3 - 10^4 at day 0; 10^7 at day 4 at 10 10^2 at day 0; 10^1 at day 4 10^1 - 10^2 at day 0; 10^3 - 10^4 at day 4
	Molds	Control 1 and 2 kGy	10^2 at day 0; 10^2 - 10^3 at day 4 at 10 < 10^2 at day 0 and at day 4
	Aerobic spores	Control 1 and 2 kGy	10^3 between day 0 and day 4 at 10 10^2 between day 0 and day 4
	Shredded carrots	Total counts	Control 0.5 kGy 1.0 and 1.5 kGy
Fecal coliforms		Control 1.0 and 1.5 kGy	10^3 - 10^4 at day 0, day 3 and day 10 <10 at day 3 and day 10
Yeasts		Control 1.0 and 1.5 kGy	10^4 - 10^5 at day 0 and day 3; 10^8 at day 10 10^3 at day 3; <10 at day 10
Red and green chicory mix	Total counts	Control 0.5 kGy 1.0 and 1.5 kGy	10^7 at day 0 and day 3; 10^8 at day 10 at 10 0 10^2 at day 3; 10^7 at day 10 10^2 at day 3; 10^5 - 10^6 at day 10
Shredded carrots	Total counts	Control 0.45 kGy 2 kGy	DT ^a >0.15 h ^{-1b} at day 1 at 10 ; day 3 at 4 DT>0.15 h ⁻¹ at day 4 at 10 ; day 9 at 4 DT>0.15 h ⁻¹ at day 9 at 10 DT<0.15 h ⁻¹ at day 9 at 4
Apple slices	Total bacteria	Control 1, 2 and 5 kGy	10^4 at day 0, 10^3 at day 3; 10^5 at day 7, 10 <DL ^c at day 0 and day 3; 10^2 - 10^3 at day 7
	Yeasts and molds	Control 1, 2 and 5 kGy	10^3 at day 0; 10^6 at day 3; 10^9 at day 7 <DL at day 0 and day 3; < 10^3 at day 7

^a Detection limit; counts performed by conductance metry.

^b 10^7 CFU/g.

^c Detection limit; not mentioned in the article (Hanotel et al., 1990).

Yang, 1975)

가

botulinum

MAP

가

2가

2%

4.4 10 (Priepke et al., 1976), 5 15
(Ballantyne et al., 1988)

가

butterhead (Mazollier et al., 1989)

가

C

3%, iceberg (Ballantyne et al., 1988)

botulinum

가

5% , 8 5 4 5
1%

가

3.

가

5 10 가

가 40% 60% 가

, 4

(Chambroy, 1989) 가

가

15

가

(Carlin et al., 1990b; Chambroy, 1989;
Priepke et al., 1976; Watada et al., 1990).

24 26

가

(*A. bisporus*)

가

가 가

C

botulinum 가 (Sugiyama
and Yang, 1975). 가

가 , 가

가

(Kautter et al., 1992),

가

가

4.

(Varoquaux, 1991),
(Ballantyne et al., 1988;

Mazollier et al., 1989)

, 가

(Carlin et al., 1990b)

(sucrose)

C

GMP

Koek (1983)

GMP(good manufacturing practices)

L.

monocytogenes

(Bolin et al., 1977; Bolin and Huxsoll, 1991), listeriosis 가

가

1988

GMP

Listeria

Listeria

L. monocytogenes

(WHO)

GMP listeriosis가

(WHO, 1988).

가

Listeria

가 (Beckers et al., 1988;

Laine and Michard, 1988)

가

가 (Table 3).

10² CFU/g *L.*

Table 3. Specifications for microbial counts in minimally processed vegetables

Microorganisms	Sample size	c ^a	m ^b	M ^c
Total counts				
Salads and shredded vegetables, final product	5	2	5 × 10 ⁵ CFU/g	5 × 10 ⁶ CFU/g
Parsley, watercress, and aromatic plants, final product	5	2	5 × 10 ⁶ CFU/g	5 × 10 ⁷ CFU/g
Salads, at use-by-date	5	^d	^d	5 × 10 ⁷ CFU/g
Coliforms growing at 44.5	5	2	10 CFU/g	10 ³ CFU/g
<i>Salmonella</i> in 25 g	5		None	None

Note: Values are for counts performed on solid media.

^a Maximum number of samples comprised between m and M for acceptance.

^b Value separating good quality from marginally acceptable quality.

^c Unacceptable value.

^d At use-by-date, m=M.

Adapted from *Bull. Off. Concur. Consum. Repres. Fraudes*, 48, 221, 1988.

monocytogenes

(Anon., 1992a). 가
 listeriosis
 , *C. botulinum*
 가 .
 MAP
 2% 가
 (Anon., 1992b).

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